Year 7 Topics

In year 7 we teach the following modules over the course of the year. Each module draws on prior learning from KS2 and builds on understanding from the KS2 programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at KS3 and KS4.

Topic **Introduction to science**	**Rationale (layering, Why this why now?)**	**Knowledge goals: *You need to know….*** LADDERING *…that (Declarative)* *…. how to (Procedural)*	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
This unit introduces students to general science practices – safety, variables, equipment etc. This ensures that all students have the same level of knowledge.	 KS2 Simple experiments may have been carried out during KS2. Some emphasis may have been placed on variables.  Practical skills will continue to develop across the year groups/key stages	Safety in the lab *…that* science classrooms are very different from 'normal' classrooms *…. how to* identify hazards in a science lesson	Hazard, Risk, Laboratory, Risk Assessment	a**) Numeracy** Reading scales Taking measurements Graph drawing skills **b) Literacy** Keywords explicitly taught where necessary and shared on KG slide **c) Reading** Reading practical instructions **d) Cultural Capital/Careers** Any science career will require knowledge of these basic science skills **e) Cross curricular knowledge links** Health and safety links in multiple subjects e.g. technology f) **Misconceptions** *Bar charts do not need gaps* – INCORRECT the DO require gaps between bars, histograms do not.
		Scientific equipment *…. how to* identify pieces of scientific equipment *…that* certain pieces of equipment have risks associated with them	Safety glasses, Spatula, Tongs, Tripod, Bunsen burner, Beaker, Thermometer, Measuring cylinder, Test Tube, Tripod, Conical flask	
		Using a Bunsen Burner *…. how to* use a Bunsen Burner safely	Safety glasses, Tripod, Bunsen burner, Beaker, Thermometer, Tripod	
		Variables *…that* there are many variables in an experiment *…. how to* identify variables in an unknown experiment	Independent Variable, Dependant Variable, Control Variable, Fair Test	
		Bar chart skills *…. how to* construct a bar chart *…. how to* interpret information in a bar chart	Independent Variable, Dependant Variable, Axis	
		Line graph skills *…. how to* construct a line graph *…. how to* interpret information in a line graph	Independent Variable, Dependant Variable, Axis, Co-ordinate, Line of best fit	
		Risk assessments *…that* experiments have risks associated with them *…. how to* reduce risks during experiments	Hazard, Risk, Control, Risk Assessment	
		Method writing *…. how to* write a scientific method *…that* a scientific method contains information on variables, safety and should be easy to follow	Independent Variable, Dependant Variable, Control Variable, Fair Test, Hazard, Risk, Control, Risk Assessment	
		Heating water investigation *…. how to* identify risks in an experiment *…. how to* safely gather experimental data *…. how to* display experimental data	Independent Variable, Dependant Variable, Control Variable, Fair Test, Safety glasses, Tripod, Bunsen burner, Beaker, Thermometer,	
		Tea bag investigation *…. how to* identify risks in an experiment *…. how to* safely gather experimental data *…. how to* display experimental data	Independent Variable, Dependant Variable, Control Variable, Fair Test	

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Topic Universe	**Rationale (layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
Know why we have day and night and seasons. Know how the Solar System is arranged.	LINKING **KS2** Know that that the Earth and other planets orbit the Sun Know that the Moon orbits the Earth LOOKING **KS4** Further development of the concept of movement in space and the life cycle of a star (Separate science only)	Day and night *…that* the Earth rotates completely on its axis once every 24 hours. This rotation results in the Earth having day and night.	Earth, Sun, axis, rotation, orbit, day, night	a***) Numeracy*** • Plotting month against daylight hours • Analysis/comparison of planetary data • Uses of different units to measure distance (kilometres/light year) **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide ***c) Reading*** • Skimming and summarising key information about Space Exploration • Read like a scientist on Neil Armstrong and the moon landings ***d) Cultural Capital/Careers*** • History of Space Exploration • Read like a scientist on Neil Armstrong and the moon landings • Careers linked to topic include Aerospace engineer and Astrophysist. ***e) Cross curricular knowledge links*** • Links to History - the Space Race (links to Cold War History) ***f) Misconceptions*** • *9 planets in our universe* – This is incorrect. Pluto was downgraded to a dwarf planet in 1996 by the international Astronomical Union.
		Seasons *…that* the amount of daylight a country receives can change throughout the year.	Earth, Sun, seasons, axis, tilt, orbit, hemisphere,	
		Phases of the Moon *…that* the Moon changes shape as it orbits the Earth.	Earth, Sun, Moon, crescent, wanning, waxing,	
		Our Solar System *…that* the Earth is one of 8 planets that orbit the Sun.	Galaxy, Light year, Stars, Orbit, Universe, Asteroid,	
		Space Exploration *…that* our knowledge of the Solar System has grown due to the ‘Space Race.’	Earth, Sun, galaxy, Light year, Stars, Orbit, Exoplanet	

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Topic Cells	**Rationale (Layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
The building blocks of life that will allow a clearer understanding of how living organisms function. How complex organisms function will have links to all aspects of work on living organisms e.g adaptations, respiration, sensitivity	LINKING **KS2** Animals Including Humans Living Things and Their Habitats LOOKING Y8 ORGANISM: Digestion YR9: Paper 1 Cell structure and transport YR10: Paper 1 Organisation – Digestion and enzymes	**7 life processes** *…that* all living organisms must have the seven life processes *…that* animals and plants have adaptations for each living process	Respiration, Movement, Sensitivity, Nutrition, Excretion, Reproduction, Growth	**a) Numeracy** • Units of measurement • Calculating magnification • Rearrange equations • Diffusion practical- use of timers • Conversion of mins to secs **b) Literacy** • Spelling practice on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide **c) Reading** • Read like a scientist comprehension homework on stem cell research at the Centre for Life • Functions of specialised cells task **d) Culture capital/ careers** • Read like a scientist HWK focus on work at the Centre for life **e) Cross curricular links** • History - Pasteur and Germ theory • Maths – rearranging equations and converting units of length **Misconceptions** Respiration is the same as breathing – IT IS NOT Plants don't respire – THEY DO
		Microscopes and Magnification *…. how to* identify parts of the microscope and use the microscope *…. how to* view specialised cells and draw in your exercise books with labels *…. how to* calculate the magnification and actual size using the magnification formula triangle.	Microscope, Magnification, Actual, Image, Focus, Specialised cells	
		What makes a cell? *…that* animal and plant cell contain different parts *…that* each part of the cell has a function *…that* animal and plant share some similarities but also have some differences	Nucleus, Cytoplasm, Cell membrane, Mitochondria Ribosomes, Cell wall Vacuole, Chloroplasts	
		Specialised cells *…that* specialised cells are adapted to their function *… how to* apply knowledge to identify unknown examples of specialised cells	Adaptation, Red blood cells, Neurone, Palisade, White blood cell, ciliated cells, Xylem, Phloem	
		Cell organisation *…that* cells are organised in the body *…that* each main organ has a particular role *…that* tissues which make up the Stomach and explain their role	Tissues, Cells, Organs, Organ systems, Organism,	

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Topic **Sound**	**Rationale (layering, Why this why now?)**	**Knowledge goals: You need to know….** …that (Declarative) …. how to (Procedural) LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
Sound travels in waves. Students investigate how sound travels and how these changes in different media.	 **KS2** How sounds are made. How to describe in terms of 'pitch' and 'volume'. Students should know that we hear using our ears.  **KS3 -Y8** Comparisons between longitudinal and transverse waves **KS4** How waves behave in different situations will be developed	Soundwaves …that sound waves are produced when objects vibrate. Soundwaves travel at different speeds through solids, liquids and gases.	Sound, Wave, Vibrations, Echo, Solid, Liquid, Gas, Vacuum	a) **Numeracy** • Use of appropriate units (dB's, m, Hz) **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide **c) Reading** • Introduction to topic task • Diagnosis and treatment of hearing problems task **d) Cultural Capital/Careers** • Introduction lesson to topic exploring careers as a sound technician and an audiologist. **e) Cross curricular knowledge links** • Health and safety issues around protecting hearing (Design and Technology) • Personal hygiene (Citizenship) **f) Misconceptions** • Wave produced on an oscilloscope represents what an actual sound wave looks like. This is incorrect the wave produced is the result of pressure waves representing compression and rarefactions of the longitudinal waves. This is taught in Y8 Waves and their properties.
		Amplitude, wavelength and frequency …that different sounds have different wave characteristics.	Volume, Pitch, Amplitude, Wavelength, Frequency	
		Drawing and interpreting soundwaves …. how to represent different sounds using wave diagrams.	Volume, Pitch, Amplitude, Wavelength, Frequency	
		How we hear …that the 'ear' is structured to gather and transmit sound waves to our brains. …that the different parts of our ear can be damaged, leading to hearing loss.	Cochlea, pinna, small bones, ear canal, ear drum, auditory nerve	

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Topic Particle Model	Rationale (layering, Why this why now?)	Knowledge goals: You need to know…. …that (Declarative) …. how to (Procedural) LADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Properties of solids, liquids and gases can be used to rationalise ever day occurrences. Observations where substances change temperature or state can be described in terms of particles gaining or losing energy and students can gain awareness of what causes them to feel the temperature of different substances and how heating works	LINKING KS2 Describe the simple physical properties of everyday materials; find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Compare and group materials together, according to whether they are solids, liquids or gases Observe that some materials change state when they are heated or cooled LOOKING Continued development of the atomic model (throughout KS3, 4 and 5), changes of state relating to separating mixtures (Year 7 topic) and links to other areas of the curriculum e.g. water cycle in Biology.	Solids, liquids and gases …. how to draw particle diagrams of solids, liquids and gases	Particles, Particle models, solid, liquid, gas, kinetic energy, volume, regular, irregular	**a) Numeracy** • Reading scales • Calculation of density. Rearrangement of the density equation • Plotting/interpreting time/temp graphs **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide **c) Reading** • Introduction to topic task • Read like a scientist HWK on states of matter **d) Cultural Capital/Careers** • Introduction lesson to topic linked careers in materials scientist and analytical chemist **e) Cross curricular knowledge links** • Geography/Biology – water cycle **f) Misconceptions** • Particles in a solid don't move. This is incorrect as particles in solids vibrate.
		Properties of Solids, Liquids and Gases …that solids, liquids and gases have particular properties …that their properties can be explained by the arrangement of their particles	Particles, Particle models, solid, liquid, gas, kinetic energy, volume, regular, irregular	
		Changing States …that materials can change 'state' between solid, liquid and gas …that changing the temperature of a material results in a change of state	Melting, evaporating, condensing, freezing, vibrate, kinetic energy	
		Changing State Graphs …that a change of state is due to a change in the amount of kinetic energy in a material …. how to interpret a change of state graph	Melting, evaporating, condensing, freezing, vibrate, kinetic energy	
		Investigating Changing States …. how to safely measure the melting and boiling points of a substance	Melting, evaporating, condensing, freezing, vibrate, kinetic energy	
		Density …that the density of a material is related to its volume and mass …. how to calculate density	Density, Volume, Mass, Calculate	
		Density Practical …. how to safely gather data to be able to calculate density …. how to calculate density of regular and irregular objects	Density, Volume, Mass, Eureka Can, Calculate	

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Topic Separating Mixtures	**Rationale (layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
A pure substance consists of only one type of element or compound and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties, application to separate different substances – this is something that needs to be done in many different industries.	 KS2 Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution; Use knowledge to decide how mixtures might be separated, including through filtering, sieving and evaporating; Demonstrate that dissolving, mixing and changes of state are reversible changes;  Continued development of the theme of physical separation throughout Key stage 4 and Key stage 5 (e.g. Potable water and calculation of Rf values)	Solutions *…that* a solution is the result of as solute dissolving in a solvent *…that* the mass of the substances involved in making a solution does not change	Solute, solvent, solution, soluble, insoluble	a) **Numeracy** • Graph skills (solubility practical) • Taking measurements • Converting units of time • Calculating Rf values **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide **c) Reading** • Introduction to topic task • Practical method/ instructions **d) Cultural Capital/Careers** • Survival techniques (removing salt from sea water) • Introduction lesson to topic linked careers in distiller and Cosmetic scientist **e) Cross curricular knowledge links** • Survival techniques (removing salt from sea water) • Forensic science (chromatography) **f) Misconceptions** • Solutes melt into the solvent- This is incorrect. Difference between dissolving and melting should be explicitly taught to avoid misconceptions.
		Solubility *…that* different substances dissolve at different rates *…that* factors like temperature can affect the solubility of a substance	Solute, solvent, solution, dilute, concentrated, saturation	
		Solubility Practical *…that* factors like temperature can affect the solubility of a substance *…. how to* safely gather experimental data *…. how to* present experimental data	Solubility, temperature, rate, variables, risk assessment	
		Separation of Rocksalt : Dissolving and Filtering *…that* filtering allows solids and liquids to be separated *…. how to* separate dissolved substances from solutions	Solute, solvent, solution, soluble, insoluble, Filter,	
		Separation of Rocksalt: Evaporation *…that* evaporation can be used to separate solutes from a solution *…. how to* use a variety of separation techniques to separate substances from a mixture	Solute, solvent, solution, soluble, Filter, Evaporation, crucible	
		Distillation *…that* distillation allows mixtures of liquids to be separated *…. how to* carry out distillation	Distillation, boiling, boiling point, evaporation, condensing, Liebig condenser	
		Chromatography *…that* chromatography can be used to separate substances such as ink or paint *…. how to* carry out a simple chromatography	Chromatography, soluble, solvent, ink	

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Topic **Acids and Alkalis**	**Rationale** **(layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative) …. how to (Procedural)*	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
Topic Acids and Alkalis The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids. Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water. Students can use this knowledge to rationalise different reactions. Some of the reactions they may have come across in everyday life. Why certain substances are harmful and how you can make them safe i.e. neutral.	 **KS2** Students will have gathered and presented data Students will have seen acid reacting with bicarbonate of soda as an example of a chemical reaction  Reactions between acids and other materials (metals, carbonates etc) are developed later in KS3 KS4 continuation of the theme including further details around the chemistry of neutralisation KS5 analytical neutralisation reactions (titrations) alongside the development of the chemistry behind the pH scale.	<u>Acid and Alkali safety</u> *…that* acids and alkalis are chemical opposites. *…that* they can be dangerous and need to be handled safely	Safety, acid, alkali, irritant, corrosive, harmful	a***) Numeracy*** • Reading scales/units on equipment • pH scale **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide ***c) Reading*** • Introduction to topic task • Reading practical work instructions ***d) Cultural Capital/Careers*** • Uses of neutralisation in farming • Introduction lesson to topic linked careers in animal biologist and botanist. ***e) Cross curricular knowledge links*** Links to Acid Rain and environmental issues (Geography) f) ***Misconceptions*** Difference between “strong” and “weak” and dilute and concentrated. In a concentrated acid or alkali there is a relatively large amount of solute dissolved, compared with a dilute acid or alkali. However, this does not tell us what the concentration of H+ ions is in the acid or OH- ions is in the alkali. This depends on the strength of the acid or alkali. Strength refers to the degree of ionisation in water.
		<u>Indicators</u> *…that* various chemicals can be used to indicate whether a solution is an acid or an alkali	Indicators, acids, alkalis, litmus, phenolphthalein, universal indicator solution.	
		<u>Different Indicators</u> *…. how to* test different indicators and use data to decide which one is the most appropriate to use	Indicators, acids, alkalis, litmus, phenolphthalein, universal indicator solution.	
		<u>The pH scale</u> *…that* acids and alkalis have different strengths, we use the pH scale to indicate the strength of an acid or alkali	Indicators, pH, acids, alkalis	
		<u>Neutralisation</u> *…that* when an acid and an alkali react they neutralise one another and produce a salt and water	Indicators, pH, acids, alkalis, neutralisation	
		<u>Neutralisation practical</u> *…. how to* safely neutralise an acid or alkali	Indicators, pH, acids, alkalis, neutralisation	
		<u>Applications of Neutralisation</u> *…that* neutralisation reactions have numerous uses	Neutralisation, pH, acids, alkali, neutral	

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Topic Metals and Non metals	**Rationale (layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
Know why different metals are used for different applications Metals and non-metals react with oxygen to form oxides which are either bases or acids. Link to rusting. Metals can be arranged as a reactivity series in order of how readily they react with other substances.	LINKING KS2 Group together materials based on their physical properties Decide on suitable materials based on their properties Know that some changes result in new materials being formed and that these changes are not reversible LOOKING Year 8 – periodic table, reactivity series, chemical reactions GCSE – continued development of these themes across a multitude of topics including reactivity and chemical reactions A level – continued explanation of physical/chemical properties based on electron arrangement etc	Properties of metals and non metals *…that* metals and non metals have generalised properties *…that* these properties determine the uses of these materials	Malleable, brittle, conductor, insulator, sonorous, shiny, dull, melting point	a) **Numeracy** • Reading scales • Recording data • Graph plotting **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide **c) Reading** • Introduction to topic task • Read like a scientist HWK on The Angel of the North. **d) Cultural Capital/Careers** • Read like a scientist HWK on breeds of dogs • Introduction lesson to topic linked careers in metallurgist and Welder **e) Cross curricular knowledge links** • Links to product design in Design and Technology f) M**isconceptions** • Test for hydrogen should not be referred to as the squeaky pop test. Instead refer to it as the lit spill test – which gives you a squeaky pop as a positive result
		Reactions to make metal oxide *…that* metals react with oxygen to produce metal oxides *…. how to* write chemical equations to represent reactions	Reaction, reactants, products, metal oxide	
		Magnesium oxide practical *…. how to* safely complete practical work	Reaction, reactants, products, metal oxide	
		Metals and acids *…that* metals react with acids to produce a salt and hydrogen *…. how to* write chemical equations to represent reactions	Reaction, reactants, products, salt, hydrogen	
		Metals and acid practical *…. how to* safely gather experimental data *…. how to* present experimental data	Reaction, reactants, products, salt, hydrogen	
		Reactions of carbonates *…that* metal carbonates react with acid to produce a salt, carbon dioxide and water.	Reaction, reactants, products, carbonate, salt, carbon dioxide	

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Topic **Light**	**Rationale** **(layering, Why this why now?)**	**Knowledge goals:** ***You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
Light travels in waves. Students investigate how light travels and how light behaves in different media.	LINKING KS2 Light is needed to see things and that dark is the absence of light; notice that light is reflected from surfaces; recognise that light from the sun can be dangerous and that there are ways to protect their eyes; Shadows are formed when the light from a light source is blocked by an opaque object; Light travels in straight lines LOOKING **KS3** Comparisons between sound and light waves will be made **KS4** How waves behave in different situations will be developed	How light travels *…that* light travels from luminous objects in straight lines *…that* light can pass through different materials	Luminous, Transparent, Translucent, Opaque	a) **Numeracy** • Measuring and comparing angles • Using a protractor **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide **c) Reading** • Introduction to topic task • Read like a scientist HWK on Newtons wheel • Read like a scientist HWK on the northern light **d) Cultural Capital/Careers** • How a periscope works • Northern lights • Introduction lesson to topic linked careers in animal biologist and botanist. **e) Cross curricular knowledge links** Maths – measuring angles Art – Primary colours DT – Filters and how they work f) **Misconceptions** Light can only be reflected from shiny surfaces such as a mirror – this is incorrect all objects absorb and reflect light to different degrees.
		Reflection *…. how to* draw a ray diagram *…that* there is a relationship between the angle of incidence and the angle of reflection	Incident ray, Reflected ray, Normal line, Angle of reflection, Angle of incidence	
		Reflection Practical *…. how to* draw a ray diagram *…that* there is a relationship between the angle of incidence and the angle of reflection	Incident ray, Reflected ray, Normal line, Angle of reflection, Angle of incidence	
		Refraction *…. how to* draw a ray diagram *…that* light travels at different speeds in different materials	Refraction, Incident ray, Normal line, Angle of refraction, Angle of incidence	
		Refraction Practical *…. how to* draw a ray diagram *…that* light travels at different speeds in different materials	Refraction, Incident ray, Normal line, Angle of refraction, Angle of incidence	
		Dispersion *…that* white light is actually a mixture of different colours *…. how to* split white light into the visible spectrum	Dispersion, Prism, Refraction, Spectrum	
		How we see colour *…. how to* draw ray diagrams *…that* we see colour because objects reflect different parts of the visible spectrum	Reflection, Absorption, transmission, Wavelength	

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Topic Current, Voltage and Resistance	**Rationale (layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)*	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
The understanding of how electricity flows around a circuit is vital in the wider context of how machines work and drawing links between the key scientific principles of particle model and energy.	 KS2 Identification of devices that run on electricity Building simple circuits from circuit diagrams Know that a circuit must be complete to work Recognise electrical conductors and insulators Link number of batteries to brightness of a bulb or amplitude of a buzzer  On going development of the concepts covered in this topic: Year 8 – electromagnets GCSE – Physics topics that continue to develop these concepts A level/BTEC – continuation/development of the themes around resistance etc	<u>Basic Circuits</u> *…that* scientists use symbols to represent the components in a circuit *…that* an incomplete circuit will not work	Electrical conductor, electrical insulator, circuit, wire, bulb, switch, cell, battery	a***) Numeracy*** • Reading scales • Spotting patterns in data • Using and manipulating formula (resistance) **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide ***c) Reading*** • Introduction to topic task • Read like a scientist HWK on current wars ***d) Cultural Capital/Careers*** Current wars between Tesla and Eddison. Introduction lesson to topic linked careers electrician and electric engineer ***e) Cross curricular knowledge links*** Symbols and terminology also used in Design and Technology f) ***Misconceptions*** Batteries have current inside them. This is incorrect, batteries store chemical energy Voltage flows through components. This is incorrect. Voltage is the force that makes charges flow, the voltage will cause a uniform flow of charge carriers through that circuit called a current.
		<u>Series and Parallel Circuits</u> *…that* a series circuit has only one loop and a parallel circuit has multiple loops	Series, parallel, flow, wire, bulb, switch, cell, battery	
		<u>Building circuits</u> *…. how to* build a circuit based on a circuit diagram	Series, parallel, flow, wire, bulb, switch, cell, battery	
		<u>Current and using models</u> *…that* current is a measure of the flow of electricity and is measured in Amps *…that* adding or removing components affects the current	Current, ampere, flow, electrons, series	
		<u>Current in circuits practical</u> *…that* the size of the current is affected by the type of circuit *…. how to* measure current in a series and parallel circuit *…. how to* spot patterns in data	Current, ampere, flow, electrons, series, parallel	
		<u>Potential difference</u> *…that* potential difference is a measure of the difference in energy between two points in a circuit *…that* the potential difference between 2 different points is affected by the type of circuit	Potential difference, voltage, energy, series, parallel	
		<u>Investigating voltage practical</u> *…. how to* measure potential difference in a circuit *…. how to* spot patterns in numbers	Potential difference, voltage, energy, series, parallel	
		<u>Resistance</u> *…that* different components can change the flow of electrical current *…. how to* calculate resistance	Resistance, Potential difference, Current, Voltage, Amps	
		<u>Ohms Law Practical</u> *…. how to* calculate resistance *…. how to* spot patterns in data	Resistance, Potential difference, Current, Voltage, Amps	

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Topic Variation	**Rationale (Layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary** .	**Core skills and enrichment opportunities.**
There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment and some is a combination. Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment.	LINKING **KS2 Living Things and Their Habitats** recognise that living things can be grouped in a variety of ways; LOOKING **YR10: Biology** Paper 2 Inheritance and evolution	1. Variation …that organisms have similarities and differences ..how to classify characteristics into the types of variation	Genetic, variation, environmental, similarities, differences, characteristics, species,	a) ***Numeracy*** • Measuring height and wrist circumference. • Construction of tally chart • Drawing graphs using data collected in variation survey. **b) Literacy** • Spelling practice of keywords on literacy HWK • Keywords explicitly taught where necessary and shared on knowledge goal slide ***c) Reading*** • Introduction to topic task • Read like a scientist HWK on breeds of dogs ***d) Cultural Capital/Careers*** • Introduction lesson to topic linked careers in animal biologist and botanist. ***e) Cross curricular knowledge links*** • Maths – graphs • Citizenship – idea that all humans may be different but all the same species. f) ***Misconceptions*** • Bar charts do not need gaps – INCORRECT the DO require gaps between bars, histograms do not. • Organisms can ADAPT to their environment to survive. This is incorrect adapting to their environment is evolution, adaptation is a SPECIAL FEATURE the animal has which helps it survive.
		2. Continuous variation …that variation can be continuous …how to present continuous variation on a graph	Variation, Inheritance, Characteristic, Environmental, Genetic, Discontinuous Continuous	
		3. Discontinuous variation …that variation can be discontinuous …how to present discontinuous variation on a graph	Variation, Inheritance, Characteristic Environmental, Genetic, Discontinuous, Continuous	
		4. Variation survey …how to collect variation data and present in a table	Circumference, height, eye colour, Discontinuous, Continuous, variation	
		5. Analysing data from variation survey …how to present data from tables in graphical forms …how to draw conclusions from data	Frequency, bar chart, line graph, histogram, line of best fit, co-ordinates	
		6. Why is variation important? …that different organism are adapted to different environments …that species can go extinct …that variation increases a species chance of survival	Variation, Extinction, Adaptation, Mutation, Natural selection, Evolution	

Year 7 Topics

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THIS IS A COMPULSORY TOPIC IN YEAR 7, ALL STUDENTS MUST BE TAUGHT HUMAN REPRODUCTION AS PART OF THE KS3 SCIENCE NATIONAL CURRICULUM

Topic Human Reproduction	**Rationale (Layering, Why this why now?)**	**Knowledge goals:** ***You need to know….*** LADDERING *…that (Declarative)* *…. how to (Procedural)*	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
On a basic level it is imperative that all students gain a detailed understanding of where and how human life starts. Understanding human reproduction is also a vital precursor to a deeper understanding of variation, how and why organisms differ.	LINKING KS2 **Animals Including Humans** • notice that animals, including humans, have offspring which grow into adults; • describe the changes as humans develop to old age LOOKING **YR10:** Paper 2 Inheritance and evolution	1. Adolescence and Puberty …that the body changes during puberty to ensure humans can reproduce	Puberty, sex, hormones, oestrogen, progesterone	a) **Numeracy** graphical representation of hormones in menstrual cycle, sequencing gestation sizes/weeks **b) Literacy** Keywords spellings definitions Keyword recap each lesson **c) Reading** Introduction lesson Read like a scientist - Twins comprehension task HWK Read like a scientist - Plant reproduction comprehension HWK **d) Cultural Capital/Careers** Introduction lesson to topic linked careers - midwifery and maternity support worker **e) Cross curricular knowledge links** citizenship links to relationship education **f) Misconceptions** Egg same as a chicken egg: when teaching about the egg/ovum remember to reference the egg is microscopic.
		2. Reproductive organs …that gametes are produced by the organs in the reproductive system … that the male/female reproductive system is made of many different parts	Ovaries, Oviduct, Uterus, Cervix, Vagina, Penis, Sperm duct, Urethra, Testis, Scrotum	
		3. Fertilisation …that human gametes are specialised for their function in reproduction …that sperm fuses with egg during fertilisation	Ovaries, Oviduct, Uterus, Cervix, Vagina, Placenta, Amniotic fluid, Umbilical cord	
		4. Pregnancy …that the fertilised egg develop into an embryo implants into the uterus …that the embryo develops into a foetus during pregnancy …that the placenta passes substances to and from the mother to the foetus	Sperm, egg, fuse, pregnancy, embryo, foetus, placenta, uterus,	
		5. Menstrual cycle …that the female reproductive system goes though monthly changes in preparation for pregnancy	Ovaries, egg, uterus, menstruation, lining,	

Topic Energy cost and transfer (2023 update)	**Rationale (Layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
The fundamental concepts that underpins all scientific understanding.	LINKING **KS2** ELECTRICITY identify common appliances that run on electricity; LOOKING **KS4** Physics Paper 1: Energy	**1. Energy stores and transfer** …that energy can be described as being in different 'stores'. …that energy can be transferred from one store to another.	Storage, transfer, kinetic, gravitational, elastic, magnetic, electrostatic, chemical, thermal,	a**) Numeracy** Numeracy manipulation of data - calculating % efficiency. Also calculating electricity bills **b) Literacy** Key word definitions and spellings Literacy skills in developing an evaluation of the most effect type of energy resource including use of contrasting connectives. **c) Reading** Read like a scientist - Article analysis First News Issue 760 8 – 14 December 2021 Reading and comprehension task on Lord Armstrong and hydroelectric power. **d) Cultural Capital/Careers** Reading and comprehension task on Lord Armstrong and hydroelectric power. Careers linked to topic wind turbine engineer and energy consultant. Understanding electricity bills **e) Cross curricular knowledge links** Maths – calculations f**) Misconceptions** Energy can be made – incorrect energy is stored or transferred. Wood is non-renewable – this is false as it is now classed as renewable as it is s sustainable material.
		2. Energy stores and transfer …that energy can be transferred from one store to another. …that energy cannot be created or destroyed. …that not all energy transferred is useful.		
		3. Energy efficiency …that efficiency is a measure of how much energy is usefully transferred by a device. …. *how to* calculate efficiency of a device.	Efficiency, device, input, output, Sankey diagram	
		4. Energy costs …that power is the rate at which energy is used. …that electricity is measured in kilowatt hours and each hour costs money. …. *how to* calculate an energy bill	Energy, useful, waste, Sankey diagram, transfer, kilowatt, Efficiency	
		5. Reducing energy costs …. *how to* reduce household energy bills	Energy, useful, waste, transfer, Efficiency	
		6. Generating Electricity from non-renewable sources …that Coal, Crude and natural gas are non-renewable energy sources called fossil fuels …that Electricity can be generated by burning fossil fuels in power stations.	Non-renewable, Coal, Crude oil, Natural gas, fossil fuel, turbine, generator, boiler,	
		7. Generating Electricity from renewable sources …that geothermal, biomass, hydroelectric, solar power and wind turbines are renewable energy sources that can generate electricity. …. *how to* evaluate the advantages and disadvantages of the different energy sources.	Renewable, geothermal, biomass, hydroelectric, solar power, wind turbines,	
		8. Energy in food …that food is a chemical store of energy. …. *how to* calculate the amount of energy in food.	Storage, transfer, chemical, temperature change.	

Year 7 Topics

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Topic Interdependence	**Rationale (Layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative)* *…. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
Energy from the sun is harnessed by producers. These producers are consumed and the energy is transferred. Organisms are suited to different environments depending on biotic and abiotic factors	 **KS2** Animals Including Humans Plants Living things and their habitats  **KS4** Biology paper 2: Ecology	**1. Ecosystems** …that organisms need certain things in their environment to survive …that ecosystems are different so only certain plants and animals can survive in different places	Abiotic Biotic Ecosystem Habitat Population. Organism. Survival	a) **Numeracy** Graph interpretation of predator-prey cycles **b) Literacy** Keywords spellings definitions Keyword recap each lesson **c) Reading** Introduction to topic task Read like a scientist – Beyond biodiversity problem articles Read like a scientist on human impact **d) Cultural Capital/Careers** Introduction lesson to topic linked careers in Zookeeper and Ecologist. **e) Cross curricular knowledge links** Links to geography **f) Misconceptions** Organisms can ADAPT to their environment to survive. This is incorrect adapting to their environment is evolution, adaptation is a SPECIAL FEATURE the animal has which helps it survive.
		2. Habitats and Adaptations …that animals and plants are adapted to the environment they live in (Adaptation design task)	Habitat. Adaptation. Survive. Behavioural. Structural. Functional.	
		3. Feeding relationships …that energy is transferred through organism when they eat …that feeding relationships can be linked in food chains and food webs	Producer, consumer, Herbivore, carnivore, food chain, food web, energy	
		4. Predator / prey adaptations …that predators and prey have adaptations for their survival …that there is a relationship between population size of predators and prey and that it fluctuated in cycles	Predator, prey, carnivore, herbivore, adaptation	
		5. **Biodiversity** …that biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction.	Biodiversity, populations, impact, species	

Year 7 Topics

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Topic Speed	**Rationale (Layering, Why this why now?)**	**Knowledge goals: *You need to know….*** *…that (Declarative) …. how to (Procedural)* LADDERING	**Key Tier 3 vocabulary**	**Core skills and enrichment opportunities.**
If the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. Measuring the speed of a moving object	LINKING **KS2** FORCES LOOKING **KS4** Physics Paper 2: Forces	**1. Calculating speed** …how to calculate speed and rearrange the equation to calculate distance and time	Speed, Distance, Time, Kilometre, Metre, Centimetre, Millimetre, Second, Minute, Hours, Calculate	a) **Numeracy** Numeracy manipulation of data -rearranging equations and converting units Graph interpretation and drawing **b) Literacy** Keywords spellings and definitions Keyword recap each lesson **c) Reading** Introduction lesson to topic **d) Cultural Capital/Careers** Careers explored in this topic are traffic engineer and sports coach. **e) Cross curricular knowledge links** Maths – calculations **f) Misconceptions** *Weight measured in kg* – this is incorrect, weight is measured in N, mass is measured in Kg
		2. Distance time graphs (2 LESSONS) …that speed can be determined from a distance time graph	Speed, Distance, Time, Speed, Gradient, Steep, Acceleration, Deceleration	
		3. **Speed time graphs** …how to interpret changes in speed on a speed time graph	Speed, Distance, Time, Speed, Gradient, Steep, Acceleration, Deceleration	
		4. Mass vs Weight …that mass and weight are not the same thing, but they are related ...that weight changes depending on the gravitational field strength	Gravity, Mass, Weight, Gravitational field strength, force	