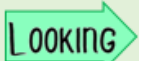


Year 8 Topics In year 7 we teach the following modules over the course of the year. Each module draws on prior learning from KS2 and builds on understanding from the KS2 programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at KS3 and KS4.				
Topic	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i>	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Introduction to science		L ADDERING <i>...that (Declarative) how to (Procedural)</i>		
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	<u>Safety in the lab</u> <i>...that</i> science classrooms are very different from ‘normal’ classrooms <i>.... how to</i> identify hazards in a science lesson	Hazard, Risk, Laboratory, Risk Assessment	a) Numeracy Reading scales Taking measurements Graph drawing skills
		<u>Variables</u> <i>...that</i> there are many variables in an experiment <i>.... how to</i> identify variables in an unknown experiment	Independent Variable, Dependant Variable, Control Variable, Fair Test	b) Literacy Keywords explicitly taught where necessary and shared on KG slide
		<u>Risk assessments</u> <i>...that</i> experiments have risks associated with them <i>.... how to</i> reduce risks during experiments	Hazard, Risk, Control, Risk Assessment	c) Reading Reading practical instructions
		<u>Reacting different metals with an acid investigation</u> <i>.... how to</i> identify risks in an experiment <i>.... how to</i> safely gather experimental data <i>.... how to</i> display experimental data	Independent Variable, Dependant Variable, Control Variable, Fair Test, Safety glasses, Tripod, Bunsen burner, Beaker, Thermometer, Tripod	d) Cultural Capital/Careers Any science career will require knowledge of these basic science skills
		<u>Investigating the effect of concentration on rate of reaction</u> <i>.... how to</i> identify risks in an experiment <i>.... how to</i> safely gather experimental data <i>.... how to</i> display experimental data	Independent Variable, Dependant Variable, Control Variable, Fair Test	e) Cross curricular knowledge links Health and safety links in multiple subjects e.g. technology f) Misconceptions <i>Bar charts do not need gaps</i> – INCORRECT the DO require gaps between bars, histograms do not.

Science Topics

In year 8 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 Breathing, respiration and movement	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> ...that (Declarative) how to (Procedural) L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
To understand how structure of the lungs carry out efficient gas exchange. To understand how energy is released from our food ready to be used for biochemical processes To understand how we move.	KS2 Animals Including Humans describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. identify that humans and some other animals have skeletons and muscles for support, protection and movement. identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood; recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function describe the ways in which nutrients and water are transported within animals, including humans.  KS4 PAPER 1: Organisation PAPER 1: Bioenergetics	1. Aerobic respiration 2. The breathing system 3. Circulatory System 4. Effects of exercise on the body 5. Anaerobic respiration 6. Skeletal system 7. Movement: joints and muscles 8. Factors that can affect health	Oxygen, glucose, respiration, chemical reaction, carbon dioxide, water, energy, Mouth, trachea, bronchus, bronchioles, alveoli, diaphragm, breathing. Artia, Ventricle, Arteries, Veins, capillaries, blood Exercise, heart rate, pulse, breathing rate, Oxygen, glucose, respiration, chemical reaction, lactic acid, oxygen debt. Bone marrow, skeleton, bones, support, movement Antagonistic muscle pair, joints, muscles, ligaments, tendons, cartilage, NEW LESSON ON SMOKING, VAPING, ALCOHOL, OBESITY, DRUGS	a) <u>Numeracy</u> - Measuring pulse rate and calculating difference. - Interpreting graphs showing breathing rates b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task - Read like a scientist HWK on circulatory system d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in personal training and doctor e) <u>Cross curricular knowledge links</u> - Maths – calculations f) <u>Misconceptions</u> Respiration is the same as breathing. This is incorrect: breathing is the use of muscles to change lung volume and therefore pressure to draw air into the lungs. Respiration is a chemical reaction which occurs in all cells to released energy stored in glucose.

Science Topics

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Topic Chemical change	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to</i> (Procedural) L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Energy is conserved in chemical reactions, so the total amount of energy in the universe at the end of a reaction is the same as it was before the reaction. When a chemical reaction happens, energy is transferred either to or from the surroundings. This pair of extremes allows us to utilise a specific type of reaction for a particular purpose.	 Linking KS2 Materials identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses; explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.  Looking KS4 PAPER 1: Chemical changes Energy changes	1. <u>Endothermic and Exothermic reactions</u> <i>...that</i> processes which release energy to their surroundings are called exothermic reactions <i>...that</i> processes which take in energy from their surroundings are called endothermic reactions 2. <u>Endothermic and exothermic carousel</u> <i>...how to</i> identify exothermic and endothermic change 3. <u>Understanding energy change graphs</u> <i>...that</i> energy change graphs can be used to represent the energy changes which take place in a chemical reaction. 4. <u>Conservation of mass</u> <i>...that</i> the mass at the start of a reaction is always present at the end of a reaction. 5. <u>Different materials</u> <i>...that</i> the mass at the start of a process is always present at the end of a reaction.	Exothermic, endothermic, reactant, product, heat, energy, released, absorbed, surroundings Exothermic, endothermic, reactant, product, heat, energy, temperature, change, results Exothermic, endothermic, reactant, product, heat, energy, released, absorbed, surroundings, profile, break, make Mass, increase, decrease, electronic balance, reactant, product, element, compound, mixture, reaction, exothermic, endothermic Composite, matrix, fibre, property, physical, malleable, flexible, waterproof, conductor, insulator, sonorous, brittle, flammable, Thermosetting,	a) <u>Numeracy</u> - recording data - presenting data in tables and graphs - making conclusions from data b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task - Read like a scientist HWK on endothermic and exothermic reactions. d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in XXXXXX and XXXXXX e) <u>Cross curricular knowledge links</u> - Maths – graphs and calculations f) <u>Misconceptions</u> - Make it clear that enthalpy refers to heat energy - Refer to exothermic and endothermic as a process rather than a reaction

Science Topics

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Topic	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Digestive system In this section we will learn about the human digestive system which provides the body with nutrients. Students need to be able to recognise the importance of each nutrient in the body and plan a healthy diet.	KS2 Animals Including Humans identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; describe the simple functions of the basic parts of the digestive system in humans;  KS4 YR10: Paper 1 Organisation – Digestion and enzymes	1. <u>Balanced Diet</u> <i>...that</i> a balanced diet consists of 7 components <i>...that</i> each component has its own role in keeping the body healthy 2. <u>Food labels and energy</u> <i>...that</i> different people need different amounts of energy <i>...how to</i> read food labels correctly 3. <u>Food tests</u> <i>...how to</i> test food to find out what they contain 4. <u>Deficiency diseases</u> <i>...that</i> if we don't have balanced diet, it can lead a various deficiency diseases 5. <u>The digestive system</u> <i>...that</i> the digestive system is made of different organs which work together to allow the breakdown and absorption of food. 6. <u>Digestive enzymes</u> <i>...that</i> enzymes are important as they speed up the breakdown of our food 7. <u>Casein Trypsin</u> <i>...that</i> temperature can affect the rate of digestion <i>...how to</i> investigate the effect of temperature on the rate of digestion	Balanced, unbalanced, protein, carbohydrates, fats, vitamins, minerals, water, fibre. Energy, Calories, Kilojoules, malnourished, starvation, obesity Benedict's, Biuret, iodine, emulsion, qualitative Scurvy, beri beri, kwashiorkor, anaemia, Digestion, mouth, stomach, small intestine, large intestine, oesophagus, mechanical, chemical. Enzyme, substrate, Protease, lipase, amylase, salivary gland, pancreas, Casein, Trypsin, Enzyme, substrate, rate, variables,	a) <u>Numeracy</u> - recording data - presenting data in tables and graphs - making conclusions from data b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task - Read like a scientist HWK on how scientists discovered digestive enzymes. d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in food scientist and dietician. e) <u>Cross curricular knowledge links</u> - Maths – graphs - Food technology – balanced diet - Citizenship – healthy eating f) <u>Misconceptions</u> - Digestion only takes place, or begins, in the stomach. This is incorrect, digestion begins in the mouth and continues to the small intestine. - Digestion is the process which releases usable energy from food. This is incorrect - digestion allows the breakdown and absorption of food molecules. respiration uses the glucose absorbed to release usable energy for cells.

Science Topics

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Topic Earth: structure	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
To understand the structure of the Earth and the changes between different type of rock in the rock cycle To understand the effect of human activities on the Earth To understand how humans use resources and minimise effect on the planet	 LINKING KS2 Materials - compare and group together different kinds of rocks on the basis of their appearance and simple physical properties; - recognise that soils are made from rocks and organic matter.  LOOKING KS4 Chemistry PAPER 2: Chemistry of the atmosphere PAPER 2: Using resources	1. Structure of the Earth <i>...that</i> the Earth is made of different layers 2. Igneous rock <i>...that</i> igneous rocks are formed when lava cools <i>...that</i> crystal size depends on how fast it cools 3. Weathering and Erosion <i>...that</i> rocks can be broken down by weathering <i>...that</i> rocks can be broken down and transported away by erosion 4. Sedimentary rocks <i>...that</i> sedimentary rocks are formed in a process that takes millions of years 5. Metamorphic rocks <i>...that</i> are formed under heat and pressure 6. The rock cycle <i>...that</i> each rock type can change into another be environmental conditions	Crust, mantle, core, Earth, rock, Magma Magma, minerals, crystals, granite, basalt, obsidian. Minerals, erosion, weathering, physical, chemical, biological, water, ice, wind. Strata, layers, fossils. Heat, pressure, marble, slate, schist. Change, rock type.	a) Numeracy - Data and graphs relating to the atmosphere - Interpreting 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 Volcanoes d) Cultural Capital/Careers - Introduction lesson to topic linked careers in Geologist and Oil rig worker e) Cross curricular knowledge links - Geography – Tectonic plates, volcanoes and atmosphere f) Misconceptions Bar charts

Science Topics

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Topic Earth: Climate, Resources	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
To understand the effect of human activities on the Earth To understand how humans use resources and minimise effect on the planet	← Linking KS2 Materials - compare and group together different kinds of rocks on the basis of their appearance and simple physical properties; - recognise that soils are made from rocks and organic matter. Looking → KS4 Chemistry PAPER 2: Chemistry of the atmosphere PAPER 2: Using resources	7. The carbon cycle <i>...that</i> carbon is cycled through organisms and the environment	ecosystems, , photosynthesis, respiration, combustion, decay	a) Numeracy - Data and graphs relating to the atmosphere 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 Greta Thurmberg d) Cultural Capital/Careers - Introduction lesson to topic linked careers in Geologist and Oil rig worker e) Cross curricular knowledge links - Geography – Techtronic plates, volcanoes and atmosphere f) Misconceptions
		8. The greenhouse effect <i>...that</i> gases in the atmosphere can absorb heat energy and prevent it escaping into space	Atmosphere, carbon dioxide, methane, greenhouse gases, radiation, thermal energy	
		9. Global warming <i>...that</i> human activities are adding to the quantities of greenhouse gases in the atmosphere <i>...that</i> a rise of just a few degrees in world temperatures will have a dramatic impact on the climate	Temperature, deforestation, carbon sink, fossil fuels, climate change, carbon emissions, weather patterns	
		10. Recycling <i>...that</i> recycling can reduce the amount of waste and pollution in the environment	Resource, Earth, extracted, mineral, metal, recycling, reduce, reuse.	
		11. Extraction of metals <i>...how to</i> extract metals from their ores depending on their position in the reactivity series	Metals, compound, ores, reactive, separate, carbon, displaces, electrolysis.	

Science Topics

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Topic Evolution	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Natural selection is a theory that explains how species evolve and why extinction occurs. Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans.	 Linking Evolution and Inheritance - recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago; - identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.  Looking KS4 YR10: Paper 2 Inheritance and evolution	1. Evolution <i>...that</i> evolution is the gradual change of a species over time to better suit their environment 2. Natural selection <i>...that</i> evolution is the gradual change of a species over time to better suit their environment <i>...that</i> evolution occurs due to the natural selection 3. Evidence of evolution <i>...that</i> fossils are the remains of organisms from millions of years ago. <i>...that</i> fossil can be formed in many ways 4. Fossil record <i>...that</i> fossil record shows how a species has changed over time. 5. Extinction <i>...that</i> extinction is the permanent loss of species <i>...that</i> extinction can be caused by lots of different things.	Evolution, species, adaptation, environment, offspring Evolution, species, mutation, environment, offspring, survival, breeding, Evolution, Fossil, Decay, Evidence, remains, Evolution, Fossil, Decay, Evidence, remains, transition species Extinction, species, biodiversity,	a) Numeracy - Timeline task 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 Charles Darwin d) Cultural Capital/Careers - Introduction lesson to topic linked careers in Archaeologist and Museum Curator e) Cross curricular knowledge links - History – fossils and evidence for life from the past 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.

Science Topics

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Topic CONTACT FORCES	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know...</i> <i>...that (Declarative) how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied. Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.	 Linking KS2 : FORCES compare how things move on different surfaces; notice that some forces need contact between 2 objects, but magnetic forces can act at a distance; identify the effects of air resistance, water resistance and friction, that act between moving surfaces;  Looking KS4 GCSE Physics Paper 2 Forces	1. Type of forces <i>... that</i> all forces have an opposite force <i>... that</i> forces are measured in Newtons using a newton meter. 2. Balanced and unbalanced forces <i>... that</i> forces are balanced when opposite forces are equal <i>... that</i> forces are unbalanced when opposite forces are not equal 3. Resultant Forces <i>.... how to</i> draw and interpret force diagrams <i>.... how to</i> calculate resultant force 4. Friction <i>...that</i> friction is the force opposing motion, caused by the interaction of surfaces moving over one another. <i>... that</i> depending on the situation, friction can be beneficial or problematic. 5. Investigating friction <i>.... how to</i> investigate the effect of different surfaces on friction 6. Air resistance and drag <i>..that</i> air resistance or drag is friction which occurs between a solid and a fluid (liquid/gas) 7. Stretching and Drag <i>...that</i> compression is a force involving the squashing or pushing together of two objects. 8. Calculating Pressure <i>.... how to</i> calculate pressure <i>... that</i> pressure is ratio of force to surface area. <i>... that</i> pressure is measured in N/m² 9. Pressure in liquids and gases <i>... that</i> pressure changes with depth in liquids <i>... that</i> atmospheric pressure is the pressure caused by the weight of the air above a surface.	Contact force, non-contact force, Newton, Newton meter Newtons, resultant force, equilibrium, balanced, unbalance Newtons, resultant force, equilibrium, balanced, unbalance Friction, Newton, resultant force, equilibrium Friction, Newton, resultant force, equilibrium, aerodynamic. deformation, tension,, Newton, resultant force, equilibrium Pressure, surface area, Force, Mass, N, m², N/m² Pressure, depth, liquids, weight, upthrust, atmospheric pressure	a) <u>Numeracy</u> - recording data - Calculating resultant forces - Measuring newtons - Line graph skills b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task - Read like a scientist HWK on Isaac Newton d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in plumber and civil engineer. e) <u>Cross curricular knowledge links</u> - Maths – graphs f) <u>Misconceptions</u> - If objects are moving, forces are always unbalanced. This is incorrect - forces are balanced if the object is moving at a constant speed.

Science Topics

In year 8 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	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> ...that (Declarative) how to (Procedural) L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Heating and Cooling				
The thermal energy of an object depends upon its mass, temperature and what it's made of. When there is a temperature difference, energy transfers from the hotter to the cooler object. Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation.	 Linking KS2 Plants MATERIALS observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)  Looking KS4 Paper 1: Energy	1. States of matter, temperature and heat ... that temperature and heat are different ... that the 3 states of matter have different particle arrangements due to the amount thermal energy they have 2. Conduction ...that conduction is the transfer of thermal energy by the vibration of particles 3. Convection ...that convection is the transfer of thermal energy when particles in a heated fluid rise. 4. Radiation ...that radiation is the transfer of thermal energy as a wave from all hot objects. 5. Insulation practical ...that a thermal insulator is a material that allows heat to travel slowly through it ...that a thermal conductor is a material that allows heat to travel quickly through it.	temperature, thermal energy, conduction, solid Thermal conductor, thermal insulator, temperature, thermal energy, conduction, solid Convection, temperature, thermal energy, liquid, gas Radiation, temperature, thermal energy Thermal conductor, thermal insulator, temperature, thermal energy, conduction, convection, radiation	a) Numeracy - recording data - making conclusions from data - Numeracy HWK 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 d) Cultural Capital/Careers - Introduction lesson to topic linked careers in HVAC engineers and architect e) Cross curricular knowledge links - Maths – data handling - DT – evaluation of suitable materials f) Misconceptions - Difference between heat and temperature - Heat always rises – this is incorrect, Warm particles tend to rise within a fluid because of density difference within the fluid.... but in conduction direction does not matter... and heat radiation is given out equally in all directions

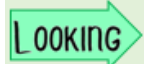
Science Topics

In year 8 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 Inheritance	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> ...that (Declarative) how to (Procedural) L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction. Chromosomes are long pieces of DNA which contain many genes. Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation.	 KS2 Animals Including Humans - notice that animals, including humans, have offspring which grow into adults; - describe the changes as humans develop to old age. Evolution and Inheritance - recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents;  KS4 YR10: Paper 2 Inheritance and evolution	1. Types of variation ...that variation is the differences within a species ...that variation is caused by differences in genes or environment	Genetic, environmental, characteristics, variation, species	a) Numeracy - analysis of punnet square outcomes expressed as ratios and/or percentages. 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 Watson and Cricks d) Cultural Capital/Careers - Discover of DNA by Watson and Crick - Introduction lesson to topic linked careers in landscape genetic counsellor and a forensic scientist. e) Cross curricular knowledge links - Maths – probability, ratios, percentages f) Misconceptions - All mutations are harmful - This is incorrect. Mutations can lead to changes which help an organism survive. - If a parent has a trait/genetic disease their child will always inherit it –This is incorrect as it depends on the parental genotypes.
		2. DNA organisation and structure ...that DNA is a chemical that our chromosomes are made from ...that DNA is the instruction guide to make proteins which control our characteristics	Deoxyribonucleic acid, chromosomes, genes, alleles, nucleus	
		3. Sex inheritance ...that females have XX chromosome and males have XY chromosomes how to predict the probability of a mother having a child who is male or female	genotype, phenotype, dominant, recessive, punnet square,	
		4. Patterns of inheritance ...that an allele is a different version of the same gene. how to predict the probability of a child inheriting a characteristic.	Alleles, genotype, phenotype, dominant, recessive, punnet square, heterozygous, homozygous	
		5. Inherited diseases ...that genetic diseases are caused by mutations and cannot be cured how to predict the probability of a child inheriting a genetic disease.	Cystic Fibrosis, Polydactyly, heterozygous, homozygous, pedigree tree	

Year 8 Topics

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Topic Waves: magnetism and electromagnets	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> LADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Magnetism and Electromagnets Electromagnetic effects are used in a wide variety of devices.	 LINKING KS2 Forces - describe magnets as having 2 poles; predict whether 2 magnets will attract or repel each other, depending on which poles are facing. - Describe magnets as having 2 poles - Predict whether 2 magnets will attract or repel each other, depending on which poles are facing  LOOKING KS4 GCSE physics Paper 2: Magnetism and electromagnetism	1. Properties of metals and non metals <i>...that</i> metals and non metals have different properties that allow them to be used for different jobs	Density, Strength, Malleable, Brittle Conductor, Sonorous Ductile	a) Numeracy Drawing graphs using data from the electromagnet investigation
		2. Magnets <i>...that</i> magnetism is a force that affects magnetic materials; which are attracted to magnets. <i>...that</i> Magnetic force is strongest at the North and South Poles of magnets. Like poles repel (S-S/N-N), unlike poles attract (N-S)	Core, magnetic force, magnetic poles, attract, repel.	b) Literacy Keywords explicitly taught where necessary and shared on knowledge goal slide
		3. Making magnets <i>...that</i> to create a magnet the domains in the magnetic material all need to align; this creates a magnetic field	Domains, align, field, magnetic	c) Reading Introduction to topic task
		4. Permanent and non-permanent magnets <i>...that</i> there are 2 types of magnet: permanent and temporary. <i>...that</i> temporary magnets are made with a soft iron core in a coil of wire.	Magnetic force, permanent magnet, current.	d) Cultural Capital/Careers Introduction lesson to topic linked careers in energy engineer and MRI technician,
		5. Magnetic fields <i>...that</i> the region around a magnet is called a magnetic field which runs in lines from North to South pole. You can show the lines using iron filings.	Magnetic fields, poles, current, attract.	e) Cross curricular knowledge links DT – use of varied materials
		6. Electromagnets <i>...that</i> electromagnets are string magnets which can be turned on and off <i>..how to</i> investigate the factors that affect the strength of an electromagnet	Solenoid, electromagnet, current, magnetic force.	f) Misconceptions Magnets are attracted to all metals. This is incorrect, magnets are only attracted to Only iron, nickel and cobalt and their alloys are attracted to a magnet.

Science Topics

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Topic	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Periodic Table and Elements				
The modern periodic table has changed since Mendeleev's original table, yet both the first tables and the modern table are important for the same reason: The periodic table organizes elements according to similar properties so you can tell the characteristics of an element just by looking at its position on the table.	KS2 Materials describe the simple physical properties of a variety of everyday materials; find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.  KS4 PAPER 1: Atomic structure and the periodic table; PAPER 1: Quantitative chemistry PAPER 1: Bonding, structure, and the properties of matter	1. Elements and atomic structure <i>...that</i> elements are made from one type of atom. <i>...that</i> each atom has sub particles called protons, neutrons and electrons.	Atoms, periodic table, Proton, Neutron, Electron, orbital, nucleus,	a) <u>Numeracy</u> - Calculating number or protons, electrons, and neutrons. - Electronic configuration diagrams b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task - Read like a scientist HWK on how Mendeleev constructed the periodic table. d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in chemical technician and Pharmacologist. e) <u>Cross curricular knowledge links</u> - Maths – calculations f) <u>Misconceptions</u> XXXX
		2. Atomic number and mass number <i>...that</i> each element has an atomic number and a mass number. <i>... how to</i> calculate the number or protons, electrons and neutrons present in an atom.	Proton, Neutron, Electron, orbital, nucleus, atomic number, mass number	
		3. Electronic Configuration <i>...that</i> each shell has a maximum number of electrons that can fit. Once full electrons must be placed on the next shell up. <i>... how to</i> draw the first 20 elements.	Proton, Neutron, Electron, orbital, nucleus, atomic number, mass number	
		4. Periodic Table <i>...that</i> the periodic table is a list of all the known element in the in the universe. <i>...that</i> the periodic table is arranged in rows called periods and columns called groups.	Element, Group, Period, Mass Number, Atomic Number, Metal, Non-metal	
		5. Group 1 elements reactivity <i>...that</i> elements in group 1 are known as alkali metals. <i>...that</i> group 1 elements reactivity changes as you travel down the group.	Lithium, Sodium, Potassium, Rubidium, Caesium, reactivity, alkali, hydrogen	

		6. Group 7 elements reactivity ...that elements in group 7 are knowns are halogens. ...that group 1 elements reactivity changes as you travel down the group.	Halogen, reactivity, displacement, Fluorine, Chlorine, Bromine, Iodine, Astatine	
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Topic Photosynthesis	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
To understand the importance of the biochemical processes within plants to us	 KS2 Plants - Observe and describe how plants need water, light and a suitable temperature to grow and stay healthy - Explore the requirements of plants for life and growth (air, light, water, nutrients from soil and room to grow)  KS4 Year 9 Biology paper 1 – Bioenergetics photosynthesis	1. <u>Photosynthesis equation</u> ..that plants need 4 things to make their own food 2. <u>Pondweed investigation</u> ...how to investigate the rate of photosynthesis 3. <u>Leaf structure</u> ...that the leaf is made of different tissue which are made of cells which allow it to photosynthesis 4. <u>Stomata adaptation</u> ...that plants have structures called stomata in their leaves to allow gas exchange 5. <u>Root structure</u> ...that roots are adapted to their function of water absorption 6. <u>Competition in plants</u> ..that plants compete for resources 7. <u>Making wine</u> ...that glucose made during photosynthesis can be used by yeast to make wine	Plants, Carbon dioxide, water, light, chlorophyll, oxygen, glucose, energy Iodine, starch, chlorophyll, pigment Waxy cuticle, epidermis, palisade mesophyll, spongy mesophyll, xylem, phloem, stomata, air spaces, diffusion Pores, gases, gas exchange, carbon dioxide, oxygen, guard cells, diffusion, gradient Water, surface area, xylem, root hair cells, nutrients, minerals, soil, Competition, resources, population, light, water, space Anaerobic respiration, microorganisms, alcohol, ethanol, carbon dioxide	a) <u>Numeracy</u> - recording data - presenting data in tables and graphs - making conclusions from data b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task - Read like a scientist HWK on photosynthesis d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in landscape gardener and Agronomist. e) <u>Cross curricular knowledge links</u> - Maths – graphs f) <u>Misconceptions</u> - Plants produce oxygen all day long – plants only produce oxygen when they photosynthesise. - Sunlight is food for plants – sunlight is the energy needed for photosynthesis - Plants get their food from the soil – plants only need minerals from the soil

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Topic Chemical reactions	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>.... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain. Use particle diagrams to classify a substance as an element, mixture or compound and as molecules or atoms. Name simple compounds using rules: change non-metal to -ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.	KS2 Materials explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.  KS4 PAPER 1: Bonding, structure, and the properties of matter PAPER 1: Chemical changes PAPER 1: Energy changes	1. Chemical reactions and physical change <i>...that</i> chemical reactions involve the formation of new products and are usually irreversible <i>...that</i> physical changes are reversible reaction and no new product are formed 2. Compounds and mixtures <i>...that</i> compounds are formed when two or more different elements are joined by a chemical bond in a chemical reaction <i>...that</i> mixtures can include an assortment of elements and compounds 3. Naming chemical compounds <i>...that</i> compounds between 2 elements form compounds ending in _ide. <i>...that</i> compounds between three elements one of which is oxygen then the compound name will end in -ate or -ite 4. Fire Triangle <i>...that</i> for a fire to burn you need 2 things. These are shown on a fire triangle. <i>...that</i> removing one of these 3 things will extinguish a fire. 5. Combustion <i>...that</i> is a chemical reaction which occurs when fuels burn in oxygen to release energy. 6. Reactivity series and displacement reactions <i>...that</i> the reactivity series is a chart showing metals in order of decreasing reactivity. <i>...that</i> displacement reactions when a more reactive element can displace a less reactive element out of its compound during a chemical reaction	Chemical reaction, physical change, new product, change state, solid, liquid, gas Element, compound, mixture, chemical bond, molecules, chloride, sulphate, nitrate, hydrogen, chemical reaction Heat, fuel, oxygen, burning, combustion, extinguish Heat, fuel, oxygen, burning, combustion, compounds, reactants, products, Reactivity, displacement, reactive, chemical reactions, reactants, products	a) <u>Numeracy</u> - Recording data - Balancing equations b) <u>Literacy</u> - Spelling practice of keywords on literacy HWK - Keywords explicitly taught where necessary and shared on knowledge goal slide c) <u>Reading</u> - Introduction to topic task d) <u>Cultural Capital/Careers</u> - Introduction lesson to topic linked careers in pyrotechnic engineer and a biochemist. e) <u>Cross curricular knowledge links</u> - Maths – balancing equations f) <u>Misconceptions</u> Students often have difficulty distinguishing between physical and chemical changes. It is important to emphasize to students that chemical changes result in new substances being formed that are likely to have different properties from the substances that existed before the reaction took place

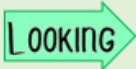
Science Topics

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Topic Waves	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> ...that (Declarative) how to (Procedural) L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy. A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, describes the properties of speed, wavelength and reflection.	 Linking KS2 LIGHT use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye; explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes; SOUND identify how sounds are made, associating some of them with something vibrating; recognise that vibrations from sounds travel through a medium to the ear;  Looking KS4 Year 9 Biology paper 1 – Bioenergetics photosynthesis	1. Types of waves ...that a wave is an oscillation (or vibration) that transfers energy. ...that energy is transferred in the direction of movement of the wave. 2. Measuring Waves ...that amplitude is the height of the wave from rest ...that wavelength is the distance from peak to peak ...how to calculate the speed of a wave 3. Transverse waves ...that in transverse wave the oscillations move up and down, perpendicular to the direction of the wave. 4. EM spectrum ...that EM spectrum consist of different types of waves arrange from longest to shortest wavelength. ...that the shorter the wavelength the more energy in the wave and therefore more dangers 5. Longitudinal waves ...that in longitudinal waves the oscillations move left and right, parallel to the direction of the wave. 6. Ultrasound waves ...that ultrasounds are sound waves with a frequency above 50,000 Hz ...that ultrasounds have many uses.	Vibrations, transfer, energy, oscillations, longitudinal, transverse Oscillations, perpendicular, direction, peak, trough, amplitude, wavelength, Oscillations, perpendicular, direction, peak, trough, amplitude, wavelength, Wavelength, frequency, electromagnetic, visible, radio waves, microwaves, Infra-red, ultra violet, X ray, Gamma rays Oscillations, parallel, direction, longitudinal, sound, Transmission, reflection, Absorption, Ultra sound,	a) Numeracy - Wave speed calculations - presenting data in tables and graphs - making conclusions from data 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 d) Cultural Capital/Careers - Introduction lesson to topic linked careers in landscape radiographer and radio technician e) Cross curricular knowledge links - Maths – calculations, rearranging formula, units of measurement. f) Misconceptions All waves need particles. This is incorrect, transverse waves do not require particle hence why light can travel through space.

Year 8 Topics

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Topic Forces: Work	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> ...that (Declarative) ... how to (Procedural) L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Work is done and energy transferred when a force moves an object. The bigger the force or distance, the greater the work. Machines make work easier by reducing the force needed. Levers and pulleys do this by increasing the distance moved, and wheels reduce friction.	 KS2 Forces Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.  KS4 Physics Paper 1 Energy	1. Work done = force x distance ...that work is the transfer of energy when a force moves an object. ...how to calculate work done when you know force and distance 2. Work – levers and pulleys ...that a lever is a type of machine which is a rigid bar that pivots about a point. ...that forces can turn or rotate objects ...that the length of a lever will change the force required to move an object 3. Moments ...that a moment is the turning effect of a force ...how to investigate moments	Work, energy, force, displacement Work, energy, lever, pivot, input force, output force, displacement Work, energy, lever, pivot, input force, output force, displacement	a) Numeracy - Measuring length, mass and force using the correct units. - Calculating work done using force and distance. b) Literacy - Keywords explicitly taught where necessary and shared on knowledge goal slide c) Reading - Introduction to topic task d) Cultural Capital/Careers - Introduction lesson to topic linked careers in mechanic and Mechanical Engineer. e) Cross curricular knowledge links - Maths – graphs f) Misconceptions In the case of a car moving, unless you are pushing it by hand or it's rolling down hill, all the work done is done by the engine.