



ATS Science Curriculum

Components		
Biology The study of living things (organisms), their structure and environments.	Chemistry The study of matter, forces and motion, sound, light and waves, electricity and magnetism and Earth in Space.	Physics The study of the composition, behaviour and properties of matter, and of the elements of the Earth and its atmosphere.

	<u>Topics/units</u>	<u>Knowledge</u>	<u>Skills</u>	<u>Vocabulary</u>
N	Taught as topics following the children's interests: Human body & senses, environment, healthy diet, seasonal change, weather	Understanding the World: <ul style="list-style-type: none">• Explore the natural world around them, making observations and drawing pictures of animals and plants• Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class• Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	Observation, communication, similarities and differences	Look Feel Hear Smell Taste Big Small

	Sensory play, animals, habitats, materials, plants and growth, minibeasts.			
R	Taught as topics following the children's interests: Human body & features, senses, environment, healthy diet, seasonal change, habitats, animals, materials, oral hygiene, Plants and growth, minibeasts, lifecycles, space	<p>Understanding the World:</p> <ul style="list-style-type: none"> ● Explore the natural world around them, making observations and drawing pictures of animals and plants ● Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class ● Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. 	Observation, communication, similarities and differences	<p>Plants: plant, tree, fruit, flower, roots, leaf, garden living, grow</p> <p>Seasons: sun, rain, snow, cloud, day, night</p> <p>Animals/Humans: animal, human, living, plant</p> <p>Materials: hard, soft, stretch, bend</p>

<u>½</u> Cyc le A	½.1 Animals (Environment ½)	<ul style="list-style-type: none"> Identify and name a variety of animals, identify and name carnivores, herbivores and omnivores Describe and compare the structure of a variety of common animals and their offspring. 	Identifying, classifying and grouping:	Blood Senses, Young, Feathers Fur Scales Mammal Amphibians Reptile Herbivore Carnivore Omnivore
	½. 2 Seasonal Changes (Space ½)	<ul style="list-style-type: none"> Observe changes across four seasons, and describe weather associated with the seasons. 	Pattern Seeking:	Dawn Dusk Mild Rotate Soaked Weather Month Season Spring Summer Autumn Winter
	½.3 Plants (Environment ½)	<ul style="list-style-type: none"> Identify and name a variety of common wild and garden plants including deciduous and evergreen. Identify and describe basic structure of common flowering plants including trees. 	Observations over time:	Bud Trunk Stem Branch Bark

				Seed Nutrients Respiration Reproduction Excretion Deciduous Evergreen	
	½.4 Everyday Materials (Particles ½)	<ul style="list-style-type: none"> Distinguish between an object and the material from which it is made Identify and name a variety of everyday materials Describe physical properties of materials and compare and group them together. 	Comparative and fair testing:	Absorb Rough Smooth Waterproof Metal Plastic	Materials Properties Flexible Transparent Opaque Physical
½ Cyc le B	½.1 Humans (Systems ½)	<ul style="list-style-type: none"> Identify, name, draw and label the basic parts of the human body and the senses Find out about and describe the basic needs of animals including humans. Describe the importance for humans of exercise, diet and hygiene. 	Pattern seeking:	Healthy Survive Exercise Heart Lungs Muscles Hygiene	
	½.2 Living things and their habitats (Environment ½)	<ul style="list-style-type: none"> Explore and compare differences between things that are living and have never been alive. Explore habitats and how they suit different animals and plants. Describe how animals obtain food from plants and other animals. 	Identifying, classifying and grouping:	Thrive Depend Producer Consume Prey Predator	

	½.3 Plants (Environment ½)	<ul style="list-style-type: none"> Observe and describe how seeds and bulbs grow into mature plants. Find out and describe what plants need to grow and stay healthy. 	Observations over time:	Thrive Absorb Stem Nutrients Perennial Germination	
	½.4 Everyday Materials (Particles ½)	<ul style="list-style-type: none"> Compare the suitability of a variety of everyday materials on the basis of their simple physical properties. Find out how the shapes of solid objects can be changed by squashing, bending, twisting and stretching 	Comparative and fair testing:	Artificial Brittle Extracted Fabric Manufactured Natural	Ceramic Durable Inflexible Reflective Rigid Translucent
3	3.1 Rocks (Particles 3)	<ul style="list-style-type: none"> Compare and group together different kinds of rocks on the basis of their appearance, and classify igneous, metamorphic and sedimentary rocks. Investigate the simple physical properties of rocks e.g. hardness, durability, permeability. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter. 	Identifying, classifying and grouping:	Cemented Compacted Decay Prehistoric Soil Transform Fossil Igneous Magma Metamorphic Minerals Sedimentary	
	3.2 Animals including humans	<ul style="list-style-type: none"> Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot 	Research using secondary sources:	Skeleton Skull Voluntary	

	(Systems 3)	<p>make their own food; they get nutrition from what they eat.</p> <ul style="list-style-type: none"> Identify that humans and some other animals have skeletons and muscles for support, protection and movement. 		<p>Involuntary Nerves Biceps Triceps Vertebrae Vitamins Proteins Carbohydrates</p>
	3.3 Forces and Magnets (Forces 3)	<ul style="list-style-type: none"> Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract or repel each other and attract some materials and not others. Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing. 	Comparative and fair testing:	<p>Consequence Contact Force Attract North South Magnet Resistance Friction Repel Pole Magnetic field</p>
	3.4 Plants (Environment 3)	<ul style="list-style-type: none"> Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. Investigate the way in which water is transported within plants. 	Observations over time:	<p>Adapt Essential Glucose Transport Variety Vital Transpiration Stoma</p>

		<ul style="list-style-type: none"> Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. 		Pollination Stamen Pistil Photosynthesis
	3.5 Light (Waves 3)	<ul style="list-style-type: none"> Recognise that we need light in order 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 there are ways to protect our eyes. Recognise that shadows are formed when the light from a light source is blocked by an object. Find patterns in the way that the size of shadows change throughout the day. 	Pattern seeking:	Absence Cast (shadow) Impenetrable Reflect Shadow Source Constant Dependent Independent Illuminate Translucent Variable
4	4.1 States of Matter (Particles 4)	<ul style="list-style-type: none"> 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, and measure or research the temperature at which this happens in degrees Celsius (°C). Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. 	Observation over time:	Permanent Particle Solid Liquid Gas Vapour Evaporate Condense Melt Matter State Volume

	<p>4.2 Animals including humans (Systems 4)</p>	<ul style="list-style-type: none"> Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in animals and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey. 	<p>Research using secondary sources:</p>	<p>Expel Compact Digestion Acid Stomach Intestines Incisor, Canine Molar Enzyme Saliva Peristalsis</p>	
	<p>4.3 Living things and their habitats (Environment 4)</p>	<ul style="list-style-type: none"> Recognise that living things can be grouped in a variety of ways. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose dangers to living things e.g. the positive and negative changes from human and physical influences. 	<p>Identifying, classifying and grouping:</p>	<p>Classification Environment Interdependence Interact Beneficial Hierarchy Vertebrate Invertebrate Biotic Ecosystem Species Niche</p>	
	<p>4.4 Electricity (Electricity 4)</p>	<ul style="list-style-type: none"> Identify common appliances that run on electricity. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. 	<p>Comparative and fair testing:</p>	<p>Perimeter complete Completion Recharge Associate</p>	<p>Appliance Series Component Electrical insulator</p>

		<ul style="list-style-type: none"> Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors. 		Identify Portable Effect	Electrical conductor Circuit Hypothesis Variable
	4.5 Sound (Waves 4)	<ul style="list-style-type: none"> Identify how sounds are made, associating some of them with something vibrating. Recognise that vibrations from sounds travel through a medium to the ear. Find patterns between the pitch of a sound and features of the object that produced it. Find patterns between the volume of a sound and the strength of the vibrations that produced it. Recognise that sounds get fainter as the distance from the sound source increases. 	Pattern seeking	Produce Property Source Frequent Regular Affect Vibrate Pitch Volume Medium Vacuum Sound wave	
<u>5</u>	5.1 Earth and Space (Space 5)	<ul style="list-style-type: none"> Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Describe the movement of the Moon relative to the Earth. Describe the Sun, Earth and Moon as approximately spherical bodies. 	Research using secondary sources:	Anticlockwise Hemisphere Equinox Luminous Phenomenon Attraction Approximately Relative	Apparent Orbit Axis Crescent Gravitational Waxing Waning

	<ul style="list-style-type: none"> Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. 			
5.2 Forces (Forces 5)	<ul style="list-style-type: none"> Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. 	Pattern seeking:	Opposite Reaction Advantage Displace Weight Mass Pulley	Gear Pivot Fulcrum Lever Upthrust
5.3 Properties and Changes of materials (Particles 5)	<ul style="list-style-type: none"> Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Demonstrate that dissolving, mixing and changes of state are reversible changes. Explain that some changes result in the formation of new materials, and that this kind of change is not 	Comparative and fair testing:	Property Particle Separate Combine Recover Comparative Atom Molecule Chemical (changes) Physical (changes) Reversible Reaction	

		usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.			
	5.4 Living things and their habitats (Genes 5)	<ul style="list-style-type: none"> Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals. Understand the life cycle of flowering plants, including the structure and function of different parts of a flower and the processes of pollination, fertilisation and seed dispersal. 	Observation over time:	Deduce Process Re-form Transform Adolescence Contrast Embryo Sexual Metamorphosis Incubate Biochemical Fertilisation	
	5.5 Animals including humans (Systems 5)	<ul style="list-style-type: none"> Describe the changes as humans develop to old age. 	Identifying, classifying and grouping:	Development Diverse Unique Generation Mature Equipped	Puberty Gestation Embryo Foetus Womb
<u>6</u>	6.1 Electricity (Electricity 6)	<ul style="list-style-type: none"> Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. 	Comparative and fair testing:	Component Consequence Systematic Represent Source Generate Proton Neutron	Terminal Series Potential Difference

		<ul style="list-style-type: none"> Use recognised symbols when representing a simple circuit in a diagram. 		Electron	
	6.2 Living things and their habitat (Genes 6)	<ul style="list-style-type: none"> Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. Give reasons for classifying plants and animals based on specific characteristics. 	Identifying, classifying and grouping:	Characteristic Interdependence Specific Categorise Primitive Hierarchy	Fungus Arthropod Taxonomy Kingdom Phylum Genus
	6.3 Animals including humans (Systems 6)	<ul style="list-style-type: none"> 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. 	Pattern seeking:	Filter Expel Substance Function Regulate Transform	Kidney Bladder Urine Excretion Toxin Nutrient
	6.4 Evolution and Inheritance (Genes 6)	<ul style="list-style-type: none"> Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. 	Research using secondary sources:	Characteristic Adaptation Acquire Theory Modify Generation	Evolve Survival Species Clone Inherit Fossil
	6.5 Light (Waves 6)	<ul style="list-style-type: none"> Recognise and explain that light appears to travel in straight lines. 	Comparative and fair testing:	Impurity Emit	Refraction Incidence

		<ul style="list-style-type: none"> 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. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. 		Absorb Constituent Filter Artificial	Spectrum Prism Lux Pigment
Z	Cells 7	<p>The skeleton</p> <p>Structure & function of:</p> <ul style="list-style-type: none"> plant and animal cells specialised cells unicellular cells <p>Movement in and out of cells</p>	Using a microscope Preparing microscope slides	Nucleus Cell wall Cell membrane Cytoplasm Vacuole	Mitochondria Ribosomes Chloroplasts Organelles Magnification
	Environment 7	Plant organs and their functions Flowering plants Sexual reproduction in flowers Seed dispersal	Dissecting a flower to identify parts	Pollen Ova Stamen Stigma Style Carpel	Filament Anther Ovule Seed coat Pollination Fertilisation Germination
	Genes 7	Compare different types of variation Describe the male and female human reproductive systems Explain the process of fertilisation in humans Explain the importance of a healthy lifestyle during pregnancy	Collecting, presenting and analysing data	Penis Vagina Fallopian tube Uterus/womb Ovaries Testes Sperm duct Sperm cells	Egg cells Foetus Zygote Embryo Placenta Umbilical cord

Particles 7A	Pupils learn to describe changes of state by referring to arrangement, forces and internal energy (motion) of particles. Key terminology is learned and diffusion is revisited linking surface area in cells (Cells 7) to the effect of temperature on the rate of diffusion.	Practical skills, research and extended writing, presenting data	Particles Melting Melting point Freezing Boiling Boiling point Evaporation evaporates Condensation Condenses	Sublimation Deposition Diffusion Collide Gas pressure Variables Controlled variables Independent Dependent variable
Particles 7B	Students learn to use the mass number and atomic number to draw different atoms. Students also learn to understand chemical formulae and learn some simple chemical formulae at this stage.	Drawing atomic structure	Element Chemical symbol Atom Chemical formula Molecules Mass number Atomic number Protons Electrons	Neutrons Nucleus Orbits Atom Chemical formula Electron Configuration
Reactions 7A	This unit introduces students to different families of chemicals and a very common chemical reaction - neutralisation. This chemical reaction provides a good introduction to chemical reactions as there are many everyday examples that students know about. It also introduced students to key terminology and general word equations needed for later chemistry topics about	Revisit accuracy & precision, introduction to required practical: making salts	Reactants Products Acids Alkalis Corrosive Concentrated Dilute	pH scale Neutral Neutralisation Base Salt Excess, Filter

		chemical reactions.		Indicators Litmus Universal indicator	Evaporation, Crystallisation
Energy 7	Students get an overview of a range of energy stores and how they can be transferred usefully or otherwise. The unit focuses on chemical energy and gravitational potential energy and includes two of the energy equations that need to be memorised ($E=pt$ and $GPE = mgh$). Students learn how electricity is produced and evaluate the resources used to do this in preparation for learning about environmental chemistry in Year 8.	Research skills, communicating ideas, using equation triangles	Kinetic energy, Potential Gravitational Joules (J) Kilojoules (kJ), fuel, Law of conservation of energy Chemical store Energy store Dissipated,	Renewable Non-renewable Fossil fuels Nuclear fuel Biomass Geothermal Hydroelectric reliable Appliances Efficiency Dissipated Watts Kilowatts	
Forces 7	In this unit students will look at forces acting in everyday situations, and be able to describe them using the correct scientific vocabulary. They will then go on and look at what happens when things are stretched, and describe patterns in their results. Students will look at forces that slow things down, and when these forces are useful and not useful. The concepts of weight and mass will be introduced, and how this alters around the Universe. Students will learn about factors affecting buoyancy as well as about pressure in liquids and solids. Students will also learn 2 physics equations ($W=mg$ and $p=F/s$).	Describing relationships between 2 variables using simple data Drawing a line graph, describing variables, identifying anomalies	Contact force Friction Air resistance Non-contact force Gravity Interaction pairs Newton metre Newtons (N) Weight Gravitational field strength	Newtons Deforms Compress Stretch Reaction Tension Elasticity Extension Elastic limit Hooke's law Linear	

				Mass Acceleration Constant speed Deceleration Pressure Surface area Weight Displacement Density Upthrust Buoyancy	Friction Lubrication Water resistance Air resistance Drag forces Streamlined Balanced Resultant force Equilibrium Unbalanced Stationary
Waves 7	<p>Students will look at how sound travels in waves. They will look in detail about how this happens in terms of particles in solids, liquids & gases. They will examine how our ears work and how to avoid ear damage. Finally, they will look at ultrasound and how it is used in everyday life.</p>		Data analysis	Oscillation Vibration Sound wave Longitudinal Compression Rarefaction Volume Amplitude Wavelength Frequency Pitch Audible range Acoustics Echo Absorption Soundproofing	Vacuum Collide categoric/discontinuous Ear Pinna Auditory canal Eardrum Outer ear Ossicles middle ear Cochlea Auditory nerve The inner ear Decibels Auditory range Ultrasound Echolocation

8	Cells 8	Students will have studied the respiratory system and this will follow allowing a good comparison of breathing to respiration. Students will learn about the importance of respiration during exercise and learn to compare aerobic and anaerobic respiration. Students learn about practical applications of anaerobic respiration in yeast.	Collecting and recording data Analysing data	Mitochondria Respiration Lactic acid Oxygen debt Muscle fatigue Fermentation Ethanol		
	Systems 8A	This unit covers two major body systems and how they work together to support cellular respiration. Students focus on the digestive system and the respiratory system. Later in the year students learn about the circulatory system in Systems 8B and how this links the digestive system and respiratory system. This unit covers a lot of key content that students must learn to prepare them for the more difficult KS4 human biology topics.	Describing variables, data analysis	<table border="1"> <tr> <td>Carbohydrates Lipids (fats and oils) Proteins Biuret solution Iodine Deficiency Scurvy Rickets Anaemia</td> <td>Malnutrition/malnourished Excess Deficiency Deficient Obesity Diabetes II Salivary glands Digestive system</td> </tr> </table>	Carbohydrates Lipids (fats and oils) Proteins Biuret solution Iodine Deficiency Scurvy Rickets Anaemia	Malnutrition/malnourished Excess Deficiency Deficient Obesity Diabetes II Salivary glands Digestive system
	Carbohydrates Lipids (fats and oils) Proteins Biuret solution Iodine Deficiency Scurvy Rickets Anaemia	Malnutrition/malnourished Excess Deficiency Deficient Obesity Diabetes II Salivary glands Digestive system				
Systems 8B	In this unit students learn about the circulatory system as a transport system but also its important role in immunity. Students link the respiratory system and digestive system from Systems 8A to the circulatory system. This provides a foundation to learn about the importance of heart rate in providing the reactants for respiration. Students are introduced to pathogens and the role of the body in keeping pathogens from entering the bloodstream.	Dissection skills	<table border="1"> <tr> <td>Artery Vein Capillary Ventricle Atrium Valves Platelet Biconcave Oxygenated Deoxygenated Haemoglobin Pathogen</td> <td>Digestion Oesophagus Small intestine Stomac Large intestine Anus Rectum Villi Bile Enzymes Catalysts Carbohydrase</td> </tr> </table>	Artery Vein Capillary Ventricle Atrium Valves Platelet Biconcave Oxygenated Deoxygenated Haemoglobin Pathogen	Digestion Oesophagus Small intestine Stomac Large intestine Anus Rectum Villi Bile Enzymes Catalysts Carbohydrase	
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				Malaria Protist Communicable Non-communicable Transmitted Mucus Cilia Platelets Enzymes Antiseptic Phagocytes Lymphocytes Antigen Antibodies Memory cells Engulf Digest Anti-toxins Toxins Specific Vaccine Immune Immunity	Protease Lipase Amino acids Fatty acids & glycerol Glucose Denatured Gaseous exchange Trachea Bronchus Bronchioles Alveoli Diffusion Drugs Medicinal drugs Recreational drugs Addictive Withdrawal symptoms Stimulant Depressant
Genes 8	Students learn about the organisation of genetic material and how random mutations in genes lead to variation. Students learn about the relationship between genes and the environment through the process of evolution by natural selection. Students learn that evolution leads to adaptation and the formation of new species.	Communicating ideas	Nucleus Chromosomes Genes DNA Helix Proteins	Survival advantage Mutation Sexual reproduction Out-compete	

				Mutation Gametes Fertilisation Allele Dominant Recessive Probability Genetic diagrams Genotype	Extinct Mass extinction Biodiversity Endangered Ecosystem Fossil Sediment
Environment 8	<p>This unit focuses on the importance of plants at the starting organism in a food chain. There is lots of ecological vocabulary that pupils learn to confidently use and apply to different ecosystem examples. There are opportunities for research into different ecosystems around the world and factors that can cause them disruption. The unit aims to foster guardianship in pupils for their environment and its future.</p>	<p>Random sampling, describing variables, calculating a mean</p>	Food chain Food web population Producer Primary & secondary consumer Apex predator Herbivore	Carnivore Omnivore Scavenger Predator Prey ecosystem Biotic Abiotic	
Particles 8	<p>This unit is about atoms and grouping of atoms in the periodic table. Students will identify patterns in the properties of elements and learn how to use the Periodic Table to predict properties. Students will also link the group number to the number of outer electrons and know that metals lose electrons and non-metals gain electrons.</p>	<p>Presenting data, data analysis</p>	Transition Chemical symbols State symbol Alkali metals Halogens Noble gases Period (row) Group (column) Physical properties	Bioaccumulation Quadrat Line transect Guard cells stomata/stoma Waxy cuticle Palisade mesophyll Spongy mesophyll Light intensity Magnesium	

				Chemical properties Metal hydroxide Diatoms	Nitrates Minerals Phosphates Potassium fertilisers
Reactions 8	This unit teaches students a range of chemical reactions in readiness to develop a deeper knowledge at KS4. Students learn the key differences between chemical reactions and physical changes. Students will learn to write word equations and some balanced chemical equations for oxidation reactions, combustion reactions and thermal decomposition reactions as well as revisiting neutralisation reactions and displacement reactions. Students also learn about energy changes that take place in chemical reactions.	Maths skills: decimal places and significant figures, discussing limitations (zero error), collecting data	Chemical reaction rearrangement Reversible Physical change Reactant Product Word equations Exothermic Endothermic Bond Thermal decomposition	Hydrocarbon methane Displacement Reactive Reactivity Base Catalyst Activation energy Catalytic convertor Reactivity series	
Mixtures 8	This unit is about the separation techniques used in science. Students will complete practicals to separate solutions using a range of different properties such as solubility and boiling point. Chromatography will be focused on in more detail as it is a key part of the KS4 curriculum and GCSE exam reports show that students underachieve in questions relating to chromatography methodology and calculations.	Analysing data, calculating Rf values	Mixture, pure, impure, element, compound, mixture, aqueous Soluble Filtration Evaporation Soluble Insoluble Residue Filtrate Dilute	Concentrated Concentration Solute Solvent Solution insoluble Saturated solution solubility Distillate Liebig condenser	

	Environmental Chemistry 8	<p>In this unit students learn about human impact on the environment and solutions to problems that have been created due to an increase in population and a need for greater amounts of resources. This unit focuses on damage to the atmosphere and Earth's crust in preparation for this topic in greater depth at KS4.</p>	<p>Data analysis: global warming</p>	<p>Sulfur dioxide Global warming Greenhouse gases Acid rain Decomposition Decomposers Carbon store/sink Sustainable development</p>	<p>Ore Extraction Electrolysis Reduction with carbon</p>
	Energy 8	<p>In this unit students focus on learning about thermal energy and how it is transferred by conduction, convection and radiation. Students learn about surfaces that are good IR absorbers and emitters and how insulation works to reduce unwanted energy transfers.</p>	<p>Designing an investigation</p>	<p>Temperature Thermometer Degrees Celsius Thermal energy Thermal conductors Conduction Thermal conductivity Convection currents</p>	<p>Infrared radiation Emit/transmit Absorb Reflect Thermal conductivity Insulation Cavity wall insulation</p>
	Forces 8	<p>This unit covers motion in more detail, in particular speed and interpreting distance-time graphs. Students learn about the effects of balanced and unbalanced forces on motion. They also learn 2 core physics equations to calculate speed and acceleration. This unit includes the development of maths skills when interpreting graphs.</p>	<p>Using & rearranging equation triangles</p>	<p>Stationary Constant speed Acceleration Deceleration Speed Scalar</p>	<p>Vector Velocity Magnitude Stopping distance Braking distance Thinking distance</p>

9	Cells 9	<p>In this unit, students will learn about the electron microscope and how it allows us to view smaller organelles called ribosomes. Students learn how to use the magnification equation and carry out a required practical about microscopy.</p> <p>Students will be able to differentiate between animal and plant cells, differentiate between eukaryotic and prokaryotic cells, and identify adaptations of specialised animal and plant cells. Students will revisit the transport of material into and out of cells by diffusion but learn about it in relation to surface area, a key concept in Systems 10.</p> <p>Students also learn about the cell cycle and should be able to state the genetic material in the nucleus is doubled <i>before</i> the cell divides into two. Students will also learn that stem cells are undifferentiated cells that have the potential to become a specialised cell within an organism. Students should be able to describe some potential uses of stem cells, as well as the disadvantages and objections to the use of stem cells, particularly about medical treatments.</p>	<p>Maths Skills: Using and rearranging equation triangles Converting millimetres into micrometres</p> <p>Investigation Skills: Describing the function of the fine focus dial and objective lenses Preparing slides using the correct stains/dyes</p>	<p>Objective lens Magnification Eyepiece lens focus Eukaryotic, prokaryotic Domains Archaea Unicellular Multicellular Palisade mesophyll Ethics Rejection</p>	<p>Ciliated epithelial cell (cilia) Diploid Haploid Mitosis Double chromosomes Differentiate unspecialised Stem cells Pluripotent Multipotent Embryonic</p>
	Systems 9	<p>In this unit students learn about the immune system. Students will see how the concept of health (as a state of physical and mental well-being) is affected by non-communicable and communicable (infectious) diseases. They will look at the different pathogens that can cause communicable disease, including bacteria,</p>	<p>Describing and analysing graphs Using data comparatively</p>	<p>non-communicable disease cholesterol Obesity Carcinogenic Carcinogens</p>	<p>Agar plate Inoculating loop Culture medium Lag phase Log phase Fungicide</p>

		<p>viruses, and protists, and how these can be spread between organisms – both animals and plants. As part of this, they will look at the development of simple hygiene methods to prevent the spread of pathogens as well as the isolation of individuals who are infected, the destruction of or control of vectors, and the use of vaccination.</p> <p>Students will be able to describe the different pathogens, the symptoms and treatments of a range of different animal and plant diseases, and the different defense mechanisms of the human body and plants. They also complete the required practical to grow bacteria in the laboratory to investigate the effect of disinfectants and antibiotics.</p>		<p>Tumour Benign Malignant HPV Pathogen Protist Transmission Epidemic pandemic Gonorrhoea Salmonella Antibiotics Condoms Incubation period Binary fission Sterilised Nutrient broth Efficacy Toxicity Dosage Placebo Double-blind trial Bias Control group Sample size</p>	<p>Spores Pruning Vector Protist Plasmodium Mucus Cilia Sebum Enzymes Goblet cells Ciliated epithelial cells Antigens Antibodies Engulf Digest Neutralise Anti-toxins Memory cell Immunity Control Antibiotic resistance MRSA</p>
<p>Environment 9</p>		<p>Environment 9 aims to embed maths skills needed for GCSE Biology. Students learn to calculate surface area: volume as a useful adaptation, calculate percentage change and understand maths used in random sampling.</p>	<p><u>Maths Skills:</u> Continuous and discontinuous data Calculating % change Calculating the area of a field and a quadrat</p>	<p>Extremophiles Tundra SA:volume ratio Functional adaptations</p>	<p>Line transect Lightmeter Short wave radiation</p>

		Calculating SA: Volume Investigation Skills: Distribution sampling methods and maths	Structural adaptations Physical adaptations	Longer wave radiation Absorbed re-radiated/re-emitted
Particles 9	<p>In this chapter, students extend their Year 8 learning about the atom to use atomic structure to explain trends in reactivity in Groups 1 and 7 in the Periodic Table. Students learn more about the way the Periodic Table is organised as well as learning about isotopes and how to calculate the relative atomic mass.</p> <p>The history of the Periodic Table and an appreciation of the work involved in its evolution is taught. The history of atomic theory is taught later in the year after Atoms 9 topic in Physics. This allows a greater understanding of Rutherford experiments with alpha particles and gold foil.</p>	<p>Maths skills: calculating relative atom mass of isotopes</p> <p>Balancing equations</p>	<p>Atomic weight</p> <p>Metal oxide</p> <p>Electrostatic force</p> <p>Isotope</p> <p>Relative atomic mass (RAM)</p>	
Reactions 9A	Students explore 5 different types of chemical reactions in much greater detail and begin to learn about families of chemicals, developing confidence using chemical formulae and describing acids, bases, and alkalis. They begin to write balanced chemical equations and learn about the ionic equation for neutralisation.	<p>Balancing equations</p> <p>Writing methods for required practicals</p>	<p>Hydrochloric</p> <p>Sulfuric</p> <p>Nitric</p> <p>Hydroxides</p> <p>Ammonium hydroxide</p> <p>Metal carbonates</p> <p>Ionise</p> <p>Dilute</p> <p>Concentrated</p> <p>REDOX</p>	

	Reactions 9B (Higher only)	In this topic, students learn about ionic bonding which is one of three types of bonding needed for GCSE. They also learn about the properties of ionic compounds and how to write ionic formula		Ions Ionic charges Ionic bonds Ionic compounds
	Environmental chemistry 9	In this topic, students learn about the formation of different types of rocks. Students will also investigate their properties, how they are weathered and where they sit in the rock cycle.	Comparing properties of different types of rocks Experimental practical skills	Sedimentary Igneous Metamorphic Ore Porosity Permeability Weathering Extrusive Intrusive Erosion Deposition Cementation Transportation Compaction
	Energy 9	In this topic, students practise recalling and revising energy equations. Students become competent in rearranging equations and learn to calculate KE. Students learn to describe the relationship between GPE and KE using energy values.	Using equations to perform calculations Rearranging equations Interpreting graphs Describing relationships between variables	Dissipates Generator Turbine Non-renewable Decommissioning Radioactive waste Acid rain Global warming Replenished Biomass Insulation
	Atoms 9	In this topic, students will learn about the properties of the states of matter; focusing on density, energy and pressure. Students will learn about the link between changing temperature and how particles behave, explaining the changes as they are taught.	Using equations to perform calculations Rearranging equations Interpreting graphs Describing relationships between variables	Density Eureka can Displacement can Latent heat Latent heat of fusion Latent heat vaporisation
	Forces 9	In this topic students learn about how these forces affect objects in space, resulting in motion, orbits and the formation of stars. This is expanded into current theories	Comparing data Research Evaluating data	Crust Mantle Core Luminous Non-luminous Planet

		of the development of the universe.		Axis Rotation Orbit Natural satellite Eclipse Waxing Waning Gibbous Crescent Artificial satellite Reflection Universe Telescope	Asteroids Comet Nebula Protostar Red giant Red dwarf White dwarf Neutron star Black hole Supernova Fusion Galaxy
10	Cells	<p>In this topic students learn about 2 other types of transport in and out of cells. Osmosis is taught with a particular focus on plants and students develop their investigation skills through a required practical on osmosis and draw a graph to extrapolate the concentration of salts in a potato. Students also revisit how to calculate percentage change that was taught previously. Active transport is taught in context using the root hair cell and small intestine as examples. Students learn about the link between respiration and active transport, revisiting cell organelles such as mitochondria. Students revisit both types of respiration in humans and yeast.</p>	Required practical: Osmosis Microscopy Maths skills: calculating concentration Graph drawing	Concentration gradient Dilute Concentrated Semi-permeable Plasmolysis Turgid Flaccid Lysis	Crenated Concentrated Dilute Water concentration Resting HR & BR Fermentation Ethanol Brewing

<p>Systems</p>	<p>Students will revisit the principles of organisation using more detailed examples. Building on their knowledge of differentiation and specialisation of cells, they should be able to define a tissue, an organ, and an organ system. Students should be familiar with the enzymes that digest carbohydrates, proteins, and lipids, along with the sites of production of these enzymes in the digestive system. Students will also secure their knowledge about enzyme specificity and sensitivity to pH and temperature.</p> <p>Students will revisit the circulatory system and develop their understanding of problems related to the circulatory system. Students will link the digestive, circulatory and respiratory systems together.</p> <p>Students will also learn about transport in plants and the structure and function of leaf parts.</p>	<p>Required practical: Enzymes Microscopy Interpreting graphs and experimental data</p>	<p>Differentiation Tissue Organs organ system Epithelial cells Digestive system, enzymes Bile Peristalsis Oesophagus Emulsifies Neutralise Biological catalyst carbohydrase/amy lase Oxygenated Deoxygenated Ventricles Atrium/atria Vena cava Pulmonary vein Pulmonary artery Aorta Haemoglobin Oxyhaemoglobin Platelets Plasma Stents valves</p>	<p>Catalase Lipase amylase/carbohydr ase Protease Protein Amino acids Fatty acids Glycerol Glucose Lock and key hypothesis Active site Substrate Variables Iodine Valves Septum Permeable Impermeable Elastic muscular fibres Valves Biconcave Cholesterol Statins Upper and lower epidermis Spongy mesophyll Air spaces</p>
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				Artificial pacemaker External gills Spiracles Tracheae Internal gills Lamellae Palisade mesophyll	Waxy cuticle Stomata Guard cells Xylem Phloem Transpiration Lignin Companion cells
Environment	<p>In Year 9 the students learnt all about the different habitats that animals and plants can live in, along with extremophiles.</p> <p>They also looked at the different sampling techniques that are used to sample areas for different species, this included quadrats and transect lines.</p> <p>The Carbon cycle and the effects of pollution with a closer look at air pollution is also studied.</p>	Comparing data Interpreting graphs Determining variables in an investigation	Ecosystem Habitat Adaptation Surface area Volume ratio Features leaves evaporation water diffusion stomata transpiration	stem roots cohesion Xylem Glucose Oxygen Light Chlorophyll Energy Photosynthesis Water Carbon dioxide	

Reactions	<p>In Reactions 8 students are introduced to energy being released during some chemical reactions e.g. burning. Students are taught about energy stored in bonds and that bonds are broken in reactants and new bonds formed in products. In this topic students extend their learning to calculate an energy value for the energy absorbed or released overall.</p> <p>Triple content links the electrochemical series to energy changes due to differences in reactivity. Students learn how batteries work and to evaluate the use of hydrogen fuel cells in vehicles in comparison to other types of energy sources.</p>	<p>Writing word and symbol equations Required practical: measuring temperature changes Interpreting graphs and tables of data Experimental practical skills</p>	<p>Exothermic Endothermic Reactants Products Bond energy KJ/mol Activation energy Variables Discontinuous data Electrochemical series</p>	
Mass	<p>In Particles 7 students learn about what makes up the mass of an atom and the mass number of elements on the Periodic Table. In Reactions 8 students learned about conservation of mass using simple calculations. In Particles 9 students learned how to calculate the relative atom mass of a range of isotopes.</p> <p>The triple content links directly to A level Chemistry</p>	<p>Maths skills Comparing data</p>	<p>Relative formula mass Conservation of mass Gas syringe Degree of uncertainty Cubic decimetre Atom economy</p>	
Particles	<p>In this topic students learn about 3 types of bonding and 2 types of forces that exist between molecules. Students learn about polymers and alloys and how structure and bonding relate to different properties.</p>	<p>Drawing dot and cross diagrams Writing ionic formulae</p>	<p>Conductors Malleable Ductile Alloys Lattice</p>	<p>Ionic bond Electrostatic forces Giant lattice Delocalised electrons Hexagonal</p>

				Delocalised electrons Ion Charged atom Positively charged Negatively charged	Tetrahedral
Particles	In Particles 9B and 10 students learn about ionic bonding which is essential learning to being successful in this topic. Students learn about the interchangeability between atoms and ions, learning electrolysis rules to support them throughout.	Practical skills Evaluating data		Cation, anion, cathode, anode, electrode, electrolyte, molten, aqueous solution, product, electrons Extraction, reduction	
Electricity	<p>In Electricity 8 students learned about series and parallel circuits and how to use a voltmeter and ammeter correctly. Students learned about electric current, potential difference and were introduced to the $V=IR$ equation to calculate resistance</p> <p>This topic revisits and extends student's knowledge and understanding about electricity. Students learn about 3 power equations and can link equations together to solve problems. Students learn about domestic electricity supplies and safety in the home.</p> <p>The required practicals involve measuring the resistance in different components and students understand the link between electric current, resistance and heat.</p>	Describing relationships between variables, evaluating data		Thermistor Resistor Diode Variable resistor Current Charge flow Potential difference Watts Frequency	Resistance Ohmic conductor I-V characteristic Series Parallel Earth Neutral Live Fuse

	Atoms	Pupils are introduced to isotopes which leads to the topic of the existence of radioisotopes. Students gain an appreciation of why radioisotopes release mass and/or energy from their nuclei.	Calculating numbers of protons, electrons and neutrons Calculating the half-life of a substance Graph skills - interpreting half-life data Writing nuclear equations Evaluating and interpreting	Radioisotopes Nuclear radiation Ionising ability Ion Penetrating power Contamination Irradiation	Deflected Chadwick Bohr Thomson Rutherford
11	Genes	Pupils learn about variation and evolution of species, and sexual and asexual reproduction. Pupils understand monohybrid inheritance and the chances of inheriting disorders, as well as how genes expression results in the production of proteins. Pupils also learn about selective breeding, genetic engineering and ethical concerns of GM crops development.	Carrying out genetic crosses using Punnett Squares	Alleles, homozygous, heterozygous, dominant, recessive, genotype, phenotype, mitosis, meiosis	
	Systems	Pupils learn about the nervous system and endocrine system and how they work to achieve homeostasis in humans. Pupils learn about hormones used in contraception and fertility treatment. Triple students learn about the eyes and kidneys as well as thermoregulation.	Analysing data in graphs Calculating speed	Neurone Sensory neurone Central nervous System motor neurone, Relay neurone Impulse Axon Receptors, stimulus, effectors, oestrogen, progesterone, LH, FSH, ovulation	
	Environment	Pupils learn about the effects of air pollution and water pollution on ecosystems in more detail. They learn about	Analysing data	Eutrophication	

	sustainable resources and look at food security in the long term.		
Reactions	<p>Pupils develop their investigation skills further learning about rates of reaction and collecting evidence to support collision theory.</p> <p>Pupils learn about reversible reactions and how equilibrium is achieved. They learn about Le Chatelier's Principle and its effects on the position.</p>	Plotting data in a graph, describing and analysing data	Collision frequency, equilibrium, Le Chatelier
Mixtures	<p>Pupils learn how to separate crude oil and its uses as hydrocarbon fractions. Pupils learn about complete and incomplete combustion.</p> <p>Pupils learn about formulations and separating mixtures, such as inks in chromatography. They also learn about the processes used to purify water from a range of water sample types.</p>	Measuring the Rf value in chromatography	Formulations, Chromatography, Chemical cracking, Fractional distillation, Hydrocarbons, Saturated, Unsaturated, Methane, Ethane, Propane, Butane, Bromine water, Combustion
Particles	This short topic teaches students how to test for a range of gases and cations and anions, as well as instrumental		Precipitation, Anions, Litmus

	methods to analyse chemicals (triple).		
Environmental Chemistry	<p>Pupils learn about the evolution of the atmosphere and the effects of the combustion of fossil fuels. In particular, pupils learn about global warming, acid rain, and global dimming.</p> <p>Pupils learn about metal recycling and alternative extraction methods such as phytomining and bioleaching.</p>		<p>Particulates</p> <p>Carbon monoxide</p>
Waves	<p>Pupils learn about the electromagnetic spectrum in detail; its properties and uses. The main focus for practical work is measuring the behaviour of light waves when they hit a surface.</p>	Measuring angles of reflection and refraction	<p>Transverse</p> <p>longitudinal</p>
Forces	<p>Pupils learn about forces and acceleration, investigating their relationship. Pupils learn about road safety and momentum.</p> <p>Pupils learn a range of physics equations including how to measure elastic potential energy and weight due to gravity.</p>	<p>Planning variables, collecting, presenting and analysing data</p>	Momentum
Electricity	<p>Pupils learn about the interaction between electric and magnetic fields in a number of applications e.g.</p>	<p>Problem-Solving: Analysing circuits and solving problems related to electricity and magnetism.</p> <p>Practical Skills: Setting up and measuring current, voltage, and resistance in electrical circuits.</p>	<p>Electric Current</p> <p>Voltage (Potential Difference)</p> <p>Resistance</p> <p>Ohm's Law</p> <p>Electromagnetism</p> <p>Magnetic Field</p>

			<p>Scientific Enquiry: Investigating the relationship between electric and magnetic fields (e.g., in electromagnets or motors).</p> <p>Mathematical Application: Using formulas to calculate electrical quantities like voltage, current, resistance, and magnetic forces.</p> <p>Critical Thinking: Applying knowledge of electric and magnetic fields to real-world applications like electric motors, generators, and transformers.</p>	<p>Electromagnetic Induction Transformer Motor Effect Induced Voltage Right-Hand Rule</p>
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