

Holywell School Curriculum Overview

Key Stage 3 Year 9 Curriculum Overview - Science

Curriculum Intent

Science is a diverse and exciting discipline that enables students to explore and make sense of the world around them. It helps them understand phenomena that are directly relevant to their everyday lives, supporting our wider aim for students to “live life in all its fullness.” Our curriculum is designed to inspire curiosity, foster a sense of wonder, and challenge students through scientific enquiry, while developing both substantive and disciplinary knowledge. At Holywell, the core principles of science teaching are to develop students’ knowledge and understanding of scientific concepts and to equip them with the skills required to work scientifically. We aim to nurture students’ confidence as scientists, encouraging them to question, investigate, and develop their ideas through collaboration and independent thinking. Our school values underpin everything we do. In science, we actively promote curiosity alongside values such as respect, responsibility, perseverance, courage, honesty, humility, kindness, and empathy. Students are encouraged to set high aspirations, reflect on their learning, and strive to become the best version of themselves. We foster a culture of high expectations where all students are supported to aim high, work hard, and achieve personal success. We also recognise the importance of wellbeing, encouraging students to take care of their physical and mental health through balanced lifestyle choices, including good nutrition, regular exercise, adequate sleep, and stress management. Our classrooms provide a positive, supportive, and encouraging environment. Practical work and collaboration are central to our approach. Students frequently work in pairs and groups, sharing ideas, discussing findings, and giving and receiving feedback. This builds a strong sense of community within lessons and develops communication and teamwork skills. We believe all students can make progress from their starting points when taught by skilled, reflective teachers who use effective and imaginative strategies. Students are taught to recognise, describe, apply, and explain key scientific ideas, including abstract concepts. Scientific enquiry is embedded throughout the curriculum, linking hands-on experiences with theoretical understanding and encouraging students to evaluate evidence critically. Above all, science should be engaging, meaningful, and enjoyable, inspiring a lifelong interest in the subject.

Term		
Autumn term 1	Title of unit: Respiration Main foci: Students recap their understanding of aerobic respiration from Year 8, including chemical formulae, how the reactants enter a cell and how products are used or excreted. They are introduced to ATP (adenosine triphosphate) as a molecule that powers other processes in cells. Students learn about anaerobic respiration in humans. They link their understanding of physiological changes during exercise to the effects of anaerobic activity. Students interpret data on breathing rate before, during and after exercise and link this to the decomposition of lactic acid. Students explore anaerobic respiration in plants and microorganisms. They consider its application in baking and brewing. They link the production of ethanol to the duration of anaerobic respiration and explain why the process is harmful to the organisms over time. Students work scientifically to investigate anaerobic respiration in yeast by counting the bubbles of carbon dioxide produced in 2 minutes. The focus is on using an appropriate technique and recording data. Students compare and contrast aerobic and anaerobic processes.	
	Steps in learning: Step 1: Aerobic respiration Step 2: Anaerobic respiration in humans Step 3: Anaerobic respiration in plants and microorganisms Step 4: Investigate anaerobic respiration in microorganisms Step 5: Compare aerobic and anaerobic respiration	Key questions: What is respiration and why is it essential for living organisms? What is the difference between respiration and breathing? What is aerobic respiration and what are its word and symbol equations? How does aerobic respiration release energy in cells? What is anaerobic respiration in humans and when does it occur? What are the products of anaerobic respiration in humans? What is anaerobic respiration in plants and microorganisms? How do we measure energy release from respiration? What are the effects of exercise on respiration and oxygen demand? How do respiration processes differ between plants and animals?

Holywell School Curriculum Overview

	<p>Title of unit: Heating and Cooling</p> <p>Main foci: Students explore how temperature relates to particle motion and the energy in the thermal store, learning that faster-moving particles increase temperature and internal energy. Using the particle model, they explain that heating or cooling can cause a change in temperature or a change of state, linking internal energy to particle movement and arrangement. They apply these ideas to explain conduction and consider the role of conducting and insulating materials. Students plan and investigate to determine how insulation thickness affects the rate of cooling of hot water. They identify variables, make predictions, follow a method, and record results in tables. Data is plotted to show how the rate of heat transfer changes, and conclusions are drawn: thicker insulation reduces heat loss by maintaining a larger temperature difference. Students estimate the rate of temperature change by calculating the temperature drop over time. Finally, students examine how temperature differences drive fluid movement, explore insulation strategies to prevent convection, and investigate heating by radiation, including how objects emit and absorb electromagnetic radiation. This unit combines particle theory, energy transfer, and practical investigation skills to understand conduction, convection, and radiation in everyday contexts.</p>		
	<p>Steps in learning:</p> <p>Step 1: Temperature and energy</p> <p>Step 2: Changes of state or temperature</p> <p>Step 3: Rate of heating</p> <p>Step 4: Conduction and insulation</p> <p>Step 5: Plan – Thermal insulation</p> <p>Step 6: Investigate – Thermal insulation</p> <p>Step 7: Evaluate – Thermal insulation</p> <p>Step 8: Convection and insulation</p>	<p>Key questions:</p> <p>How is thermal energy transferred between objects?</p> <p>What is the difference between heat and temperature?</p> <p>How do particles behave in solids, liquids, and gases when heated or cooled?</p> <p>What is conduction and how does it occur in different materials?</p> <p>What is convection and how do convection currents form?</p> <p>What is radiation and how does heat travel through empty space?</p> <p>Why are some materials better conductors or insulators than others?</p> <p>How does temperature change affect the volume and density of substances?</p> <p>How is heating and cooling used in everyday life and technology?</p> <p>How can we reduce heat loss in homes and improve energy efficiency?</p>	
Evidence of learning	<p>Activities & Adaptation</p> <p>Pre-teaching key vocabulary</p> <p>Retrieval quizzes – hinge questions / MWB</p> <p>Sentence starter / writing frames</p> <p>Adaptive questioning – cold calling / targeted Q's</p> <p>Practical scaffolding</p> <p>Live feedback</p> <p>Flexible grouping – expert/mixed/intervention tables</p> <p>Dual coding and visual supports</p> <p>Metacognition – revision / self-assessment</p> <p>Spaced learning</p> <p>Modelling</p> <p>Anticipate and address common misconceptions</p>	<p>Formative Assessment (during learning)</p> <p>Let's recall (flashback 4)</p> <p>Mini whiteboard activities</p> <p>Recap learning</p> <p>Questioning and discussion</p> <p>Retrieval practice</p> <p>SPARX Science homework tasks</p>	<p>Summative Assessment (of learning)</p> <p>Respiration – End of block assessment</p> <p>Heating and cooling – End of block assessment</p>
Links to prior and future learning	<p>Respiration</p> <p>Y7 Autumn Block 2 – Cells</p> <p>Y8 Spring Block 4 – Bioenergetics</p> <p>Y8 Autumn Block 5 – Energetics</p> <p>Y9 Autumn Block 2 – Heating and cooling</p> <p>Y9 Spring Block 3 – Cells</p>	<p>Heating and cooling</p> <p>Y7 Autumn Block 1 – Matter as particles</p> <p>Y8 Autumn Block 1 – The periodic table</p> <p>Y8 Autumn Block 4 – Energy and power</p> <p>Y8 Spring Block 1 – Light</p> <p>Y8 Spring Block 3 – Density and pressure</p>	

Holywell School Curriculum Overview

	<p>Y9 Summer Block 4 – Transport in organisms Y10 Autumn Block 3 – Digestion and enzymes Y10 Summer Block 3 – Bioenergetics</p>	<p>Y8 Summer Block 4 – Graphs and charts Y9 Autumn Block 3 – Earth and the atmosphere Y10 Autumn Block 1 – Electricity Y10 Spring Block 4 – The particle model Y11 Spring Block 3 – Earth’s atmosphere and resources</p>
Careers links	<p>Respiration Physiologist, Respiratory Therapist, Biomedical Scientist, Medical Researcher, Exercise Physiologist, Biochemist, Pharmacologist, Sports Scientist, Nutritionist, Science Educator</p> <p>Heating and Cooling Thermal Engineer, Mechanical Engineer, HVAC Engineer, Energy Engineer, Physicist, Materials Scientist, Chemical Engineer, Aerospace Engineer, Climate Scientist, Science Educator</p>	
Autumn term 2	<p>Title of unit: Earth and the Atmosphere Main foci: Students explore the Earth’s structure, learning about its four internal layers and how convection currents drive tectonic plate movement, causing earthquakes, volcanoes, and influencing rock formation. They examine the rock cycle, describing how igneous, metamorphic, and sedimentary rocks form and transform through physical and chemical processes. Students investigate material resources, comparing properties of metals, rocks, wood, ceramics, polymers, and composites to determine their suitability for different uses. They classify resources as finite or renewable, consider methods of extraction, and evaluate the environmental impact of mining, drilling, and quarrying. The importance of recycling for conserving resources and reducing environmental damage is emphasised. Energy resources are explored, including non-renewable sources like nuclear power and renewable sources such as solar, wind, hydroelectric, geothermal, tidal, wave, and biofuels. Students study the Earth’s atmosphere, carbon cycle, and the role of greenhouse gases in climate change. They apply knowledge of photosynthesis, respiration, and infrared radiation to explain global warming, rising sea levels, melting ice caps, and extreme weather events. Students evaluate human impacts, the consequences of climate change, and strategies—such as renewable energy, plant-based diets, and electric vehicles—to reduce greenhouse gas emissions, justifying their choices using evidence and reasoning.</p>	
	<p>Steps in learning: Step 1: Structure of the Earth Step 2: Types of rock Step 3: The rock cycle Step 4: Material resources Step 5: Ceramics, composites and synthetic polymers Step 6: Uses of materials Step 7: Recycling Step 8: Energy resources Step 9: The Earth’s atmosphere Step 10: The carbon cycle Step 11: Causes of climate change Step 12: Effects of climate change Step 13: Reducing climate change</p>	<p>Key questions: What is the structure of the Earth and how is it composed? What is the composition of the Earth’s atmosphere? How has the Earth’s atmosphere changed over time? What is the greenhouse effect and how does it work? What causes climate change and what evidence supports it? What are the effects of human activity on the atmosphere? How do the carbon and water cycles help maintain balance on Earth? What is the role of greenhouse gases in regulating temperature? How do scientists measure and model climate change? What actions can be taken to reduce environmental impact and improve sustainability?</p>

Holywell School Curriculum Overview

	<p>Title of unit: Engineering</p> <p>Main foci: Students explore forces and their effects on objects, including stretching, compression, and rotation. They investigate elasticity, planning experiments to test whether materials, such as plastic, obey Hooke's law, identifying variables, taking measurements, and analysing data. They learn to account for systematic errors and plot graphs to interpret non-linear relationships. The concept of moments is introduced, quantifying the turning effect of a force on a pivoted object. Students calculate clockwise and anticlockwise moments, determine equilibrium positions, and apply standard form and significant figures in calculations. They explore real-world applications, including balanced beams, gears, and pulleys, examining how gear size and pulleys affect rotation speed, force, and distance. Students apply the energy model to these scenarios, distinguishing between useful and wasted energy. They calculate mechanical work and system efficiency, recognizing that no device is completely efficient due to energy loss to thermal stores. Assumptions, such as ignoring friction, are used to simplify problems while focusing on key physics principles. This block develops experimental, analytical, and problem-solving skills while linking forces, moments, energy transfer, and efficiency in practical contexts.</p>		
	<p>Steps in learning:</p> <p>Step 1: Hooke's law</p> <p>Step 2: Plan – Elasticity of plastic</p> <p>Step 3: Investigate – Elasticity of plastic</p> <p>Step 4: Evaluate – Elasticity of plastic</p> <p>Step 5: Calculate moments</p> <p>Step 6: Investigate moments in equilibrium</p> <p>Step 7: Calculate moments in equilibrium</p> <p>Step 8: Machines and energy</p>	<p>Key questions:</p> <p>What is engineering and what different types of engineering are there?</p> <p>How do engineers use science to solve real-world problems?</p> <p>What is Hooke's law?</p> <p>What is elasticity of plastic?</p> <p>How are moments calculated?</p>	
Evidence of learning	<p>Activities & Adaptation</p> <p>Pre-teaching key vocabulary</p> <p>Retrieval quizzes – hinge questions / MWB</p> <p>Sentence starter / writing frames</p> <p>Adaptive questioning – cold calling / targeted Q's</p> <p>Practical scaffolding</p> <p>Live feedback</p> <p>Flexible grouping – expert/mixed/intervention tables</p> <p>Dual coding and visual supports</p> <p>Metacognition – revision / self-assessment</p> <p>Spaced learning</p> <p>Modelling</p> <p>Anticipate and address common misconceptions</p>	<p>Formative Assessment (during learning)</p> <p>Let's recall (flashback 4)</p> <p>Mini whiteboard activities</p> <p>Recap learning</p> <p>Questioning and discussion</p> <p>Retrieval practice</p> <p>SPARX Science homework tasks</p>	<p>Summative Assessment (of learning)</p> <p>Earth & the atmosphere – End of block assessment</p> <p>Engineering – End of block assessment</p> <p>Autumn – End of term assessment</p>
Links to prior and future learning	<p>Earth and the atmosphere</p> <p>Y8 Spring Block 1 – Light</p> <p>Y8 Spring Block 4 – Bioenergetics</p> <p>Y8 Spring Block 6 – Interpret and represent data</p> <p>Y8 Summer Block 4 – Graphs and charts</p> <p>Y9 Autumn Block 2 – Heating and cooling</p> <p>Y9 Autumn Block 2 – Percentages</p> <p>Y9 Spring Block 1 – Variation</p>	<p>Engineering</p> <p>Y7 Autumn Block 1 – Matter as particles (diffusion – equilibrium)</p> <p>Y7 Autumn Block 3 – Forces</p> <p>Y7 Autumn Block 7 – Rounding and estimation</p> <p>Y7 Spring Block 1 – Graphing data</p> <p>Y8 Autumn Block 2 – Proportion and scale (direct proportion)</p> <p>Y8 Autumn Block 4 – Energy and power</p> <p>Y8 Spring Block 3 – Percentages</p>	

Holywell School Curriculum Overview

	<p>Y9 Summer Block 3 – Bonding Y10 Autumn Block 4 – Energy Y11 Autumn Block 4 – Organic chemistry Y11 Spring Block 3 – Earth’s atmosphere and resources Y11 Spring Block 4 – Ecology</p>	<p>Y8 Spring Block 5 – Standard form Y8 Summer Block 1 – Coordination Y9 Autumn Block 2 – Heating and cooling (rate of heating – equilibrium) Y9 Autumn Block 4 – Equations, inequalities and formulae Y10 Autumn Block 4 – Energy Y10 Summer Block 2 – Forces and motion (GCSE Physics only) Y11 Autumn Block 3 – Resistive forces</p>
Careers links	<p>Earth and the Atmosphere Geologist, Meteorologist, Climatologist, Environmental Scientist, Oceanographer, Volcanologist, Seismologist, Hydrologist, Atmospheric Scientist, Science Educator</p> <p>Engineering Mechanical Engineer, Civil Engineer, Electrical Engineer, Chemical Engineer, Aerospace Engineer, Structural Engineer, Materials Engineer, Environmental Engineer, Robotics Engineer, Software Engineer</p>	
Spring term 1	<p>Title of unit: Variation Main foci: Students build on their understanding that genes code for proteins, which determine an organism’s characteristics, to explore variation within species. They classify traits as continuous or discontinuous and link advantageous adaptations in plants and animals to improved survival, competition for resources, and reproductive success. Students learn that adaptations arise through genetic variation and that the environment selects traits that increase survival chances, forming the basis of natural selection. Students apply these concepts to the theory of natural selection, discussing how scientific theories evolve and strengthen with new evidence. They extend their learning to speciation, examining the pressures that can lead to the development of new species. The causes of endangerment and extinction are explored, and students consider how the fossil record provides evidence of common ancestors. Human impacts on species survival are investigated, including habitat loss and conservation efforts. Students evaluate the benefits and drawbacks of breeding programmes and other strategies to protect biodiversity. This block develops understanding of variation, adaptation, natural selection, speciation, and conservation, linking genetics to evolutionary processes and environmental influences.</p>	
	<p>Steps in learning: Step 1: Variation Step 2: Adaptations and competition Step 3: Natural selection Step 4: Speciation Step 5: Extinction</p>	<p>Key questions: What is variation and why does it occur in living organisms? What is the difference between genetic and environmental variation? How do inherited characteristics influence variation? What role does DNA play in determining variation? What is mutation and how can it lead to variation? What is the difference between continuous and discontinuous variation? How can we represent and analyse variation in populations? Why is variation important for survival and evolution? How does natural selection act on variation within a species? How can variation lead to adaptation and the evolution of new species?</p>

Holywell School Curriculum Overview

	<p>Title of unit: Electromagnetism</p> <p>Main foci: Students build on their prior learning of magnetic fields and electricity to explore electromagnetism. They investigate how a current-carrying wire produces a magnetic field, representing it with concentric circular field lines and using the right-hand thumb rule to determine direction. Students form a solenoid and enhance it into an electromagnet by adding an iron core, exploring factors that affect its strength. They plan and carry out an investigation to test how the number of turns in a solenoid affects the strength of an electromagnet, measuring strength by the number of paper clips it can lift. Students identify independent, dependent, and control variables, perform risk assessments, record results, plot graphs, and analyse accuracy and precision. Conclusions are drawn, improvements suggested, and further investigative questions proposed. Students also explore practical applications, such as using solenoids and permanent magnets to form electric motors. They examine how microphones and loudspeakers convert between pressure waves and electrical current, linking concepts of sound and electromagnetism. This block develops understanding of magnetic fields, electromagnets, forces, and energy transfer, while reinforcing experimental planning, data analysis, and problem-solving skills.</p>		
	<p>Steps in learning:</p> <p>Step 1: Magnetic field around a conductor</p> <p>Step 2: Electromagnets</p> <p>Step 3: Plan – electromagnetism</p> <p>Step 4: Investigate – electromagnetism</p> <p>Step 5: Evaluate – electromagnetism</p> <p>Step 6: Loudspeakers and microphones</p>	<p>Key questions:</p> <p>What is a magnetic field and how can it be represented?</p> <p>How does an electric current create a magnetic field?</p> <p>What is an electromagnet and how is it made?</p> <p>How can we increase the strength of an electromagnet?</p> <p>What is the difference between permanent magnets and electromagnets?</p> <p>How does the direction of current affect the magnetic field produced?</p> <p>How do electromagnets work in real-world devices?</p> <p>What is the motor effect and how does it cause movement?</p> <p>How do electric motors convert electrical energy into movement?</p> <p>How is electromagnetism used in technologies such as speakers, relays, and MRI scanners?</p>	
Evidence of learning	<p>Activities & Adaptation</p> <p>Pre-teaching key vocabulary</p> <p>Retrieval quizzes – hinge questions / MWB</p> <p>Sentence starter / writing frames</p> <p>Adaptive questioning – cold calling / targeted Q's</p> <p>Practical scaffolding</p> <p>Live feedback</p> <p>Flexible grouping – expert/mixed/intervention tables</p> <p>Dual coding and visual supports</p> <p>Metacognition – revision / self-assessment</p> <p>Spaced learning</p> <p>Modelling</p> <p>Anticipate and address common misconceptions</p>	<p>Formative Assessment (during learning)</p> <p>Let's recall (flashback 4)</p> <p>Mini whiteboard activities</p> <p>Recap learning</p> <p>Questioning and discussion</p> <p>Retrieval practice</p> <p>SPARX Science homework tasks</p>	<p>Summative Assessment (of learning)</p> <p>Variation – End of block assessment</p> <p>Electromagnetism – End of block assessment</p>
Links to prior and future learning	<p>Variation</p> <p>Y8 Spring Block 6 – Interpret and represent data</p> <p>Y8 Summer Block 3 – Genetics</p> <p>Y8 Summer Block 4 – Graphs and charts</p> <p>Y9 Autumn Block 3 – Earth and the atmosphere</p> <p>Y10 Spring Block 2 – Health and disease</p>	<p>Electromagnetism</p> <p>Y7 Autumn Block 6 – Averages and range (mean)</p> <p>Y7 Spring Block 1 – Magnetism</p> <p>Y7 Summer Block 4 – Waves</p> <p>Y8 Autumn Block 2 – Charge and electrical current</p> <p>Y8 Summer Block 4 – Graphs and charts</p>	

Holywell School Curriculum Overview

	Y11 Spring Block 1 – Variation and inheritance Y11 Spring Block 4 – Ecology	Y11 Autumn Block 5 – Electromagnetism
Careers links	Variation Geneticist, Evolutionary Biologist, Molecular Biologist, Biomedical Scientist, Population Geneticist, Ecologist, Conservation Scientist, Wildlife Biologist, Bioinformatician, Science Educator Electromagnetism Electrical Engineer, Electronics Engineer, Electrical Technician, Power Systems Engineer, Control Systems Engineer, Telecommunications Engineer, Robotics Engineer, Physicist, Renewable Energy Engineer, Science Educator	
Spring term 2	Title of unit: Cells Main foci: Students build on Year 7 knowledge of cells by defining eukaryotic cells as those containing membrane-bound organelles and identifying plant and animal cells and their functions. They contrast these with prokaryotic cells, recognising their simpler structure and DNA, and considering how this supports rapid reproduction and adaptation. Students develop understanding of cell size and scale through order-of-magnitude calculations, unit conversions and use of standard form. They apply and rearrange the magnification formula to calculate image size, actual size or magnification, and judge relative sizes of sub-cellular structures. Practical work includes preparing and observing cheek and onion epidermis cell slides, producing labelled scientific drawings and calculating actual cell sizes. Students then compare light and electron microscopes, focusing on differences in magnification, resolution and observable detail. Learning extends to stem cells, including embryonic and adult stem cells in animals and meristems in plants, alongside their uses, risks, benefits and ethical considerations. Students explore cell differentiation through genes being switched on or off and explain adaptations of specialised animal and plant cells. Finally, they are introduced to the cell cycle and mitosis, understanding their roles in growth and repair, recognising why cell cycle length varies, and observing mitosis in microscope images or root tip slides.	
	Steps in learning: Step 1: Eukaryotes Step 2: Prokaryotes Step 3: Sizes of cells Step 4: Calculate sizes of cells Step 5: Observe cells Step 6: Compare microscopes Step 7: Stem cells Step 8: Uses of stem cells Step 9: Cell differentiation Step 10: Cell specialisation – animals Step 11: Cell specialisation – plants Step 12: The cell cycle Step 13: Cell division – mitosis	Key questions: What is a cell and why is it the basic unit of life? What are the differences between animal and plant cells? What are the functions of the main subcellular structures (nucleus, cytoplasm, cell membrane, mitochondria, etc.)? How do specialised cells differ in structure and function? How do cells become specialised for specific roles in the body? How are cells organised into tissues, organs, and organ systems? What is the role of diffusion in cells? How do substances move in and out of cells by osmosis and active transport? Why is surface area to volume ratio important in cells? How do multicellular organisms depend on specialised cells to survive?

Holywell School Curriculum Overview

	<p>Title of unit: Atoms</p> <p>Main foci: Students explore how scientific ideas develop over time, using atomic theory and the periodic table as key examples. They revisit fundamental concepts from Year 7, including atoms, elements, compounds and mixtures, and examine how the arrangement of the periodic table reflects atomic structure and supports the nuclear model of the atom. Students review the nuclear model, considering the relative sizes of atoms and nuclei, and link atomic and mass numbers to protons, neutrons and electrons. They explore how models of the atom have evolved, from Dalton's model to the accepted modern model, as new evidence emerged. Building on Year 8 learning, students revisit electron configuration, drawing configurations for the first 20 elements and relating group and period numbers to electron arrangement. Students then explore isotopes, comparing atoms of the same element with different numbers of neutrons, and investigate how isotope abundance affects relative atomic mass. Using relative atomic mass values, students calculate relative formula mass and percentage composition of compounds. They use the periodic table as a source of quantitative data and apply their understanding of atomic structure and isotopes to explain the development of the periodic table, including Mendeleev's work and why elements are now arranged by atomic number.</p>		
	<p>Steps in learning:</p> <p>Step 1: Atoms, elements, compounds and mixtures</p> <p>Step 2: The nuclear model of the atom</p> <p>Step 3: Development of the atomic model</p> <p>Step 4: Electronic structure</p> <p>Step 5: Isotopes</p> <p>Step 6: Relative atomic mass</p> <p>Step 7: Relative formula mass</p> <p>Step 8: The periodic table</p> <p>Step 9: Development of the periodic table</p>	<p>Key questions:</p> <p>What is an atom and what is it made of?</p> <p>What are protons, neutrons, and electrons and where are they found in an atom?</p> <p>How did the atomic model change, over time?</p> <p>What is the structure of the nucleus and why is it important?</p> <p>What is the difference between atomic number and mass number?</p> <p>What are isotopes and how do they differ from each other?</p> <p>How are electrons arranged in atoms (electron configuration)?</p> <p>How does atomic structure relate to the periodic table?</p> <p>How do atoms form ions by gaining or losing electrons?</p> <p>How does understanding atoms help explain the properties of materials?</p>	
Evidence of learning	<p>Activities & Adaptation</p> <p>Pre-teaching key vocabulary</p> <p>Retrieval quizzes – hinge questions / MWB</p> <p>Sentence starter / writing frames</p> <p>Adaptive questioning – cold calling / targeted Q's</p> <p>Practical scaffolding</p> <p>Live feedback</p> <p>Flexible grouping – expert/mixed/intervention tables</p> <p>Dual coding and visual supports</p> <p>Metacognition – revision / self-assessment</p> <p>Spaced learning</p> <p>Modelling</p> <p>Anticipate and address common misconceptions</p>	<p>Formative Assessment (during learning)</p> <p>Let's recall (flashback 4)</p> <p>Mini whiteboard activities</p> <p>Recap learning</p> <p>Questioning and discussion</p> <p>Retrieval practice</p> <p>SPARX Science homework tasks</p>	<p>Summative Assessment (of learning)</p> <p>Cells – End of block assessment</p> <p>Atoms – End of block assessment</p> <p>Spring – End of term assessment</p>
Links to prior and future learning	<p>Cells</p> <p>Y7 Autumn Block 2 – Cells</p> <p>Y7 Summer Block 3 – Reproduction</p> <p>Y8 Autumn Block 1 – The periodic table</p> <p>Y8 Autumn Block 2 – Proportion and scale</p>	<p>Atoms</p> <p>Y8 Autumn Block 1 – The periodic table</p> <p>Y10 Summer Block 1 – Atoms and radioactivity</p> <p>Y10 Summer Block 4 – Quantitative chemistry</p> <p>Y11 Autumn Block 4 – Organic chemistry</p>	

Holywell School Curriculum Overview

	<p>Y8 Spring Block 1 – Light</p> <p>Y8 Summer Block 3 – Genetics</p> <p>Y9 Summer Block 2 – Cell transport</p> <p>Y9 Summer Block 4 – Transport in organisms</p> <p>Y10 Spring Block 2 – Health and disease</p> <p>Y11 Autumn Block 1 – Homeostasis and control</p> <p>Y11 Spring Block 1 – Variation and inheritance</p> <p>Y11 Spring Block 2 – Waves</p>	
Careers links	<p>Cells</p> <p>Cell Biologist, Molecular Biologist, Biomedical Scientist, Microbiologist, Geneticist, Immunologist, Pharmacologist, Biotechnologist, Medical Researcher, Science Educator</p> <p>Atoms</p> <p>Physicist, Chemist, Nuclear Scientist, Materials Scientist, Quantum Physicist, Atomic Researcher, Analytical Chemist, Chemical Engineer, Nanotechnologist, Science Educator</p>	
Summer term 1	<p>Title of unit: Forces</p> <p>Main foci: Building on Year 7 learning of $W = mg$, students locate an object's centre of mass and plot graphs showing that weight is directly proportional to mass, with gravitational field strength as the gradient. Students consolidate their understanding of contact and non-contact forces by identifying and drawing force and free-body diagrams for stationary objects and those moving at constant speed. They calculate resultant forces and apply Newton's First Law to explain changes in motion. Newton's Third Law is introduced to describe how interacting objects exert equal and opposite forces on each other, ensuring both objects are represented clearly in diagrams. Finally, students formalise prior knowledge of quantities by distinguishing between scalars and vectors. They categorise examples accordingly and are introduced to velocity as the vector equivalent of speed, preparing them for more advanced vector work at Key Stage 4.</p>	
	<p>Steps in learning:</p> <p>Step 1: Weight, mass and gravity</p> <p>Step 2: Contact and non-contact forces</p> <p>Step 3: Newton's 1st law</p> <p>Step 4: Newton's 3rd law</p> <p>Step 5: Scalar and vector quantities</p>	<p>Key questions:</p> <p>What is a force and how does it affect objects?</p> <p>What different types of forces are there (e.g. contact and non-contact forces)?</p> <p>How do balanced and unbalanced forces affect motion?</p> <p>What is resultant force and how do we calculate it?</p> <p>How does friction affect movement and energy transfer?</p> <p>What is weight and how is it different from mass?</p> <p>How does gravity affect objects on Earth and in space?</p> <p>How is speed, distance, and time related to motion?</p> <p>How are forces used in real-life situations such as transport, sports, and engineering?</p>
	<p>Title of unit: Cell Transport</p> <p>Main foci: Building on prior learning about diffusion, students apply their understanding to processes such as gas exchange and excretion. They identify temperature, concentration gradient and surface area as factors affecting diffusion rate and calculate surface area to volume ratio to compare exchange needs in unicellular and multicellular organisms. Students then study osmosis as a special type of diffusion. They interpret diagrams to explain water movement across partially permeable membranes and predict the effects of concentrated and dilute solutions on plant and animal cells, linking this to real-life examples such as food preservation and wilting. Students plan and carry out an investigation into how different sucrose concentrations affect the mass of plant tissue, identifying variables, risks and sources of random and systematic error. They analyse results by plotting a graph, calculating percentage change in mass and determining the isotonic point. Accuracy, precision and improvements are evaluated. Finally, students explore active transport in plants and animals, explaining how substances move against a concentration gradient using membrane proteins and energy from ATP.</p>	

Holywell School Curriculum Overview

	Steps in learning: Step 1: Factors affecting diffusion Step 2: Calculate surface area to volume ratio Step 3: Osmosis Step 4: Plan – osmosis Step 5: Investigate – osmosis Step 6: Evaluate – osmosis Step 7: Active transport	Key questions: What is cell transport and why is it important for living organisms? What is the structure and function of the cell membrane? What is diffusion and how does it occur in cells? What factors affect the rate of diffusion? What is osmosis and how does it differ from diffusion? How does water move in and out of cells by osmosis? What is active transport and how is it different from passive transport? Why do cells need energy for active transport? How are specialised cells adapted for efficient transport of substances? How is cell transport used in real-life contexts such as the human body, plants, and medicine?	
Evidence of learning	Activities & Adaptation Pre-teaching key vocabulary Retrieval quizzes – hinge questions / MWB Sentence starter / writing frames Adaptive questioning – cold calling / targeted Q’s Practical scaffolding Live feedback Flexible grouping – expert/mixed/intervention tables Dual coding and visual supports Metacognition – revision / self-assessment Spaced learning Modelling Anticipate and address common misconceptions	Formative Assessment (during learning) Let’s recall (flashback 4) Mini whiteboard activities Recap learning Questioning and discussion Retrieval practice SPARX Science homework tasks	Summative Assessment (of learning) Forces – End of block assessment Cell transport – End of block assessment
Links to prior and future learning	Forces Y7 Spring Block 3 – Space Y7 Autumn Block 3 – Forces Y8 Autumn Block 2 – Charge and electrical current Y8 Autumn Block 4 – Energy Y8 Spring Block 3 – Density and pressure Y9 Spring Block 2 – Electromagnetism Y10 Summer Block 5 – Forces and motion Y11 Autumn Block 3 – Resistive forces		Cell transport Y7 Autumn Block 1 – Matter as particles Y7 Summer Block 1 – Gas exchange Y8 Autumn Block 3 – Transport systems Y8 Spring Block 4 – Bioenergetics Y9 Spring Block 3 – Cells Y9 Autumn Block 1 – Respiration Y9 Summer Block 4 – Transport in organisms Y10 Summer Block 3 – Bioenergetics Y10 Autumn Block 3 – Digestion and enzymes
Careers links	Forces Mechanical Engineer, Civil Engineer, Aerospace Engineer, Automotive Engineer, Structural Engineer, Materials Scientist, Physicist, Sports Scientist, Robotics Engineer, Marine Engineer Cell Transport Cell Biologist, Molecular Biologist, Biochemist, Biomedical Scientist, Pharmacologist, Physiologist, Microbiologist, Geneticist, Medical Researcher, Science Educator		

Holywell School Curriculum Overview

Summer term 2	Title of unit: Bonding Main foci: Students progress from KS3 ideas about particle arrangement and energy to a deeper understanding of chemical bonding and structure. They link melting point to the strength of forces between particles and the energy needed to overcome them, forming a foundation for bonding. Building on prior knowledge of electron configuration and the periodic table, students learn how ions form through the loss or gain of electrons and how charge relates to group position. Ionic bonding is defined as electrostatic attraction between oppositely charged ions, and students practise drawing dot and cross diagrams and calculating ion ratios before learning to write formulae for ionic compounds. Using the lattice model, students explain the properties of ionic solids such as melting point and conductivity. They then revisit metallic bonding, using models to explain why metals conduct electricity. Students define covalent bonding, draw dot and cross diagrams for simple molecules, and compare models and their limitations. They explain shared properties of simple covalent substances using intermolecular forces, then explore giant covalent structures including diamond, graphite and silicon dioxide, relating structure to properties. Finally, students apply this understanding to graphene, fullerenes and polymers, linking structure to real-world uses, and evaluate the strengths and limitations of different bonding models.	
	Steps in learning: Step 1: States of matter Step 2: Ions Step 3: Ionic bonding Step 4: Properties of ionic compounds Step 5: Structure and properties of metals Step 6: Structure and properties of alloys Step 7: Covalent bonding Step 8: Simple covalent molecules Step 9: Giant covalent structures Step 10: Graphene and fullerenes Step 11: Polymers Step 12: Model bonding	Key questions: What is chemical bonding and why does it happen? How do atoms become more stable through bonding? What is the difference between ionic, covalent, and metallic bonding? How are ions formed and how do ionic bonds form? What is a covalent bond and how do atoms share electrons? What is metallic bonding and how does it explain the properties of metals? How does bonding affect the properties of substances such as melting point and conductivity? How do we represent different types of bonding using diagrams? Why do different substances have different properties based on their bonding? How is knowledge of bonding used in materials science and everyday applications?
	Title of unit: Transport in Organisms Main foci: Students build on prior learning about gas exchange, circulation, and transport in plants and animals. From Year 7 and 8, they recall the structure of the lungs, heart, blood, and blood vessels, and how these are adapted for efficient transport. In Year 9, they apply their understanding of diffusion to transfer surfaces and review the structure and function of the respiratory system. They revisit blood composition, focusing on how its components are adapted to their roles, and identify the main vessels entering and leaving the heart. Students also explore how heart rate is controlled by natural pacemaker cells and how artificial pacemakers can support this. In plant transport, students identify adaptations of root hair cells, xylem, guard cells, and stomata for water movement, linking this to prior knowledge of diffusion. They explain how environmental factors such as temperature, humidity, light intensity, and air movement affect transpiration. Using a potometer, students investigate how these factors change transpiration rate, identifying variables and explaining results. Finally, they apply knowledge of phloem structure and active transport to describe how sucrose is absorbed and transported in plants, preparing them to apply this understanding to the water cycle and plant processes in later study.	
	Steps in learning: Step 1: Transport in organisms Step 2: The respiratory system Step 3: Blood Step 4: Blood vessels Step 5: The circulatory system Step 6: Transpiration	Key questions: Why do organisms need transport systems? What are the main components of the human circulatory system? What is the structure and function of the heart? How does blood travel through the heart and around the body? What is the difference between arteries, veins, and capillaries? What are the components of blood and what are their functions?

Holywell School Curriculum Overview

	Step 7: Factors affecting transpiration Step 8: Investigate transpiration Step 9: Translocation	How do gases move in and out of the blood during gas exchange? What adaptations do alveoli have for efficient gas exchange? How do plants transport water and nutrients through xylem and phloem? How do transport systems in plants and animals compare in structure and function?	
Evidence of learning	Activities & Adaptation Pre-teaching key vocabulary Retrieval quizzes – hinge questions / MWB Sentence starter / writing frames Adaptive questioning – cold calling / targeted Q's Practical scaffolding Live feedback Flexible grouping – expert/mixed/intervention tables Dual coding and visual supports Metacognition – revision / self-assessment Spaced learning Modelling Anticipate and address common misconceptions	Formative Assessment (during learning) Let's recall (flashback 4) Mini whiteboard activities Recap learning Questioning and discussion Retrieval practice SPARX Science homework tasks	Summative Assessment (of learning) Bonding – End of block assessment Transport in organisms – End of block assessment Summer – End of term assessment
Links to prior and future learning	Bonding Y7 Autumn Block 1 – Matter as particles Y7 Autumn Block 1 – Step 1 – Properties of solids, liquids and gases Y7 Spring Block 2 – Chemical reactions Y7 Spring Block 5 – Digestion and health Y8 Autumn Block 1 – The periodic table Y8 Autumn Block 2 – Charge and electrical current Y8 Spring Block 4 – Bioenergetics Y8 Summer Block 3 – Genetics Y9 Autumn Block 2 – Heating and cooling Y9 Autumn Block 3 – Earth and the atmosphere Y10 Spring Block 1 – Reactivity Y10 Spring Block 2 – Health and disease Y10 Spring Block 4 – The particle model Y10 Spring Block 5 – Electrolysis Y10 Autumn Block 3 – Digestion and enzymes Y11 Autumn Block 2 – Rates of reaction Y11 Autumn Block 4 – Organic chemistry Y11 Spring Block 4 – Earth's atmosphere and resources	Transport in organisms Y7 Summer Block 1 – Gas exchange Y8 Spring Block 4 – Bioenergetics Y8 Autumn Block 3 – Transport systems Y9 Summer Block 2 – Cell transport Y9 Autumn Block 1 – Respiration Y10 Spring Block 2 – Health and disease Y10 Autumn Block 3 – Digestion and enzymes Y11 Spring Block 5 – Ecology	
Careers links	Bonding Chemist, Chemical Engineer, Materials Scientist, Biochemist, Molecular Biologist, Nanotechnologist, Pharmacologist, Metallurgist, Polymer Scientist, Industrial Chemist		

Holywell School Curriculum Overview

	<p>Transport in Organisms Physiologist, Cardiologist, Pulmonologist, Biomedical Scientist, Medical Researcher, Biochemist, Pharmacologist, Exercise Physiologist, Nutritionist, Veterinarian</p>
<p style="text-align: center;">Reading in the curriculum (Literacy & Vocabulary)</p> <p>We implement a range of evidence-based strategies to develop students’ reading abilities through the study of science. During read-aloud sessions, new vocabulary is explicitly introduced and discussed in context. Students are encouraged and supported to incorporate newly acquired words into their speaking and writing. Subject-specific terminology is consistently reinforced both verbally and in written work. Students engage in in-depth exploration of specific topics to strengthen both vocabulary acquisition and reading comprehension. They are guided to identify and summarise key ideas after reading. Students are provided with opportunities to investigate topics of personal interest through research projects. This process enhances vocabulary development, comprehension, and critical thinking skills. Regular opportunities are provided for students to discuss content, share ideas, and articulate understanding throughout lessons. Paired and group reading activities further support fluency and confidence. Visual supports such as charts, diagrams, and illustrations are incorporated to enhance understanding and support comprehension of complex concepts. Students are exposed to a variety of writing styles and sentence structures, including practical scientific writing, comprehension texts, and biographical writing, to broaden their understanding of different text types. Dedicated time is allocated for independent reading to allow students to consolidate learning and develop reading stamina. Teachers explicitly model effective reading strategies, including predicting, questioning, clarifying, and inferring, to support students in becoming strategic and confident readers.</p>	
<p style="text-align: center;">Protected Characteristics in the curriculum</p> <p>Our science curriculum has been designed to integrate and celebrate protected characteristics in a meaningful, age-appropriate way. Throughout the year, lessons highlight diversity, promote inclusion and challenge stereotypes, helping students see science as a subject that is relevant and accessible to everyone. When studying key scientific figures, we introduce a wide range of scientists from different genders, ethnic backgrounds, religions, sexual orientations and abilities. This ensures students encounter role models who reflect the diversity of our school community and the wider world. By discussing their contributions, we emphasise that scientific discovery is shaped by people from many different backgrounds. Classroom discussions, practical work and group activities encourage mutual respect and positive collaboration. We reinforce expectations around valuing individual differences and support students in recognising how protected characteristics—such as race, disability, sex and religion—should never limit someone’s opportunities in science or society. Topics such as health, human biology and environmental issues are taught with sensitivity and with an awareness of students’ varied experiences. Where relevant, we embed examples that avoid stereotyping and instead promote understanding, empathy and fairness. Through these approaches, the science curriculum not only develops scientific knowledge and enquiry skills but also supports our wider commitment to equality, respect and representation. Students learn that science thrives when diverse perspectives are welcomed, and they gain a stronger appreciation of the importance of inclusion in scientific communities.</p>	
<p style="text-align: center;">Safeguarding including safety in the curriculum</p> <p>Although safe working practices have always been embedded within science teaching, there is now a broader expectation that students develop a clear understanding of health and safety principles and how these are applied in practice. This extends beyond simply following instructions; students are supported to understand the reasoning behind safe procedures and to apply these principles in a range of contexts. Science lessons provide authentic, practical situations in which students can engage with health and safety in meaningful ways. Through hands-on experiences, students gain insight into recognising hazards, assessing risk, and working responsibly. These are essential life skills that extend beyond the laboratory into everyday situations at home and in the wider community. Students are taught to identify hazards through the use of hazard labels, written instructions, and prior knowledge or experience. They learn to evaluate the nature and level of risk to which they may be exposed and to understand that, while risks cannot always be completely eliminated, informed judgements can be made about what constitutes an acceptable level of risk. The health and safety principles students develop include Recognising and identifying hazards; Understanding the potential risks associated with those hazards; Identifying actions required to reduce risks to an acceptable level; Developing an understanding of what constitutes an acceptable level of risk; Implementing appropriate safety measures in practice; Assessing risks and planning suitable actions before undertaking tasks. Opportunities to teach and reinforce health and safety arise naturally through a wide range of scientific activities, including (but not limited to): Handling specialised equipment that may be sharp, heavy, fragile, or awkward to use; Exploring forces such as pushes, pulls, gravity, and mass; Investigating friction and the effects of reduced friction; Handling living organisms, including plants and animals, and plant cultivation; Working in outdoor environments; Dissection of animal specimens; Cultivating microorganisms; Using a variety of materials and chemicals under supervision; Observing and conducting chemical reactions and understanding the substances produced; Working with flames, heat sources, and hot equipment; Investigating electricity, including mains and higher voltages; Learning about the Sun and ultraviolet radiation; Using lasers and other intense light sources; Exploring the concept of radioactivity.</p>	

Holywell School Curriculum Overview

Values across the curriculum

Living Our Values - Our school values underpin students' attitudes, behaviours, and actions across all areas of learning. In science, we actively nurture curiosity and the confidence to explore ideas, encouraging students to think and work as scientists. This approach aligns closely with values such as patience, responsibility, courage, kindness, respect, honesty, humility, perseverance, and empathy. Lessons are designed to promote these values while fostering a collaborative and supportive learning environment.

Being the Best We Can Be - We encourage students to develop high aspirations and strive to be the best versions of themselves. Through questioning, curiosity, and a genuine love of learning, students are supported to aim high and work diligently towards their goals. They are guided to set personal targets and reflect on the steps needed to achieve them. We also promote the importance of physical and mental wellbeing, encouraging healthy habits such as balanced nutrition, regular exercise, sufficient sleep, and effective stress management. Our classrooms are positive, inclusive spaces where all students feel supported and motivated to succeed.

In Community - Science lessons, with their strong emphasis on practical investigation, naturally foster a sense of community. Students regularly engage in paired and group work, whole-class discussion, and collaborative practical activities. They are encouraged to develop skills collectively, share knowledge and findings, and provide constructive feedback to one another. This collaborative approach strengthens both learning and relationships within the classroom.

Spirituality in the curriculum

Our curriculum supports students' spiritual development by fostering curiosity, encouraging exploration of interconnected ideas, and promoting open-mindedness. Through these attributes, we aim to help students develop a sense of connection to something greater than themselves, enabling them to "live life in all its fullness" by living our values, striving to be the best they can be, and learning within a strong sense of community. Within the science curriculum, students are encouraged to consider the ethical dimensions of scientific work in order to develop a sense of responsibility. Discussions around topics such as dissection, animal testing, environmental impact, and technological advancement provide meaningful opportunities to explore moral considerations alongside scientific understanding. Curiosity is actively nurtured through engagement with the 'big questions' that arise naturally from scientific study. Students are encouraged to reflect on ideas such as the origins of life, the possibility of life beyond Earth, and the meaning and purpose found within natural and physical phenomena. They are given space to experience a sense of wonder at the complexity of life, the vastness of space, and the beauty of the natural world, developing an emotional drive to learn more and to question deeply.

Opportunities for mindfulness are incorporated into lessons through short reflective moments that support self-awareness, focus, and thoughtful engagement with learning. Students are also supported in recognising how scientific concepts are interconnected, helping them to see patterns, relationships, and coherence across different areas of study. An open-minded approach to scientific inquiry is consistently promoted. Students are encouraged to listen to the ideas of others, challenge stereotypes, and consider alternative perspectives. Respect for the environment is reinforced by linking scientific knowledge to responsible stewardship of the Earth and an understanding of humanity's impact on the natural world. Creative expression is supported through opportunities to combine art and science, allowing students to explore scientific ideas in imaginative and reflective ways. Social development is further enhanced through collaborative practical work, where students develop teamwork skills, take responsibility for their own and others' safety, and recognise the significant role science plays in improving quality of life. They are encouraged to consider both the benefits of scientific developments and the responsibilities that accompany them. Cultural awareness is promoted by exploring scientific discoveries as part of human heritage across different societies and time periods. Students learn about contributions made by a diverse range of men and women from many cultures, developing an appreciation of science as a shared global endeavour.

How we track your progress

We employ a range of strategies to evaluate the impact of our curriculum and teaching on student learning, progress, and outcomes. In line with our progress descriptors, students' development is continually monitored through the work they produce in lessons and their contributions to class discussions and activities. Both formative and summative assessment approaches are used to gain a comprehensive understanding of student understanding and progress. These include ongoing dialogue with students through questioning, the provision of next-step challenges, and immediate, responsive feedback during lessons. Regular assessment opportunities such as quizzes, concept mapping, reflection tasks, and verbal and written outcomes allow students to demonstrate their understanding in a variety of ways. Periodic assessment tasks, presentations, and assessed pieces of work provide further insight into students' learning over time. More formal evaluations, including end-of-block tests, and end-of term tests, alongside online assessments and assessed practical investigations, contribute to a well-rounded and continuous picture of student achievement and progress.

Parents/Carers can support their child by:

We encourage parents and carers to support their child's learning in science by reinforcing the subject's importance as a core discipline and highlighting its relevance across a wide range of careers and future opportunities. We value the role of curiosity and encourage families to engage with their child's questions, exploring ideas together where possible. When answers are unknown, learning alongside the child can be a powerful way to develop understanding and enthusiasm. Simple prompts such as "What do you think?" or "Let's find out together" can help

Holywell School Curriculum Overview

stimulate deeper thinking and discussion at home. Independent learning can be further supported through the use of online platforms such as BBC Bitesize Science for KS3, which can be used to consolidate learning or preview upcoming topics. In addition, revision guides and science workbooks, such as those provided by CGP and available from retailers like WHSmith or online, can be valuable resources for reinforcing understanding. We also encourage students to engage with science in the media and to make connections between their classroom learning and real-world applications. Supporting students with key scientific vocabulary, spelling, definitions, and homework completion will further strengthen their progress. Parents and carers can also help by discussing everyday phenomena and encouraging students to explain the science behind what they observe in daily life. Finally, supporting students in understanding how to structure and write up practical investigations correctly is an important aspect of consolidating their scientific skills.

Sustainability within the subject

We recognise the importance of teaching sustainability in order to develop students' understanding of environmental issues and their responsibility as global citizens. Within the science department, sustainability is addressed both through planned curriculum content and through the use of naturally occurring opportunities that arise within lessons, ensuring that learning is meaningful and contextualised. Students explore key concepts such as energy conservation, including the importance of efficient energy use and the role of renewable energy sources such as solar and wind power. They also study water management, focusing on the water cycle, water conservation, and the prevention of pollution. Waste reduction is another key theme, where students consider recycling, composting, and the impact of single-use plastics, alongside strategies to reduce waste in everyday life. Biodiversity is examined through the study of ecosystems and habitats, with an emphasis on the impact of human activity and the importance of conservation efforts. The curriculum also addresses climate change, enabling students to understand the greenhouse effect, global warming, and potential strategies for mitigation. In addition, students explore sustainable agriculture, including plant life cycles, organic farming practices, crop rotation, and the effects of pesticides on ecosystems. Further areas of study include ecological footprints, where students consider both personal and global environmental impact, and life cycle analysis, which involves evaluating the environmental effects of products from production through to disposal. Students are also introduced to environmental laws and policies, developing an understanding of how regulations contribute to the protection of the natural world.