

# STUDIO WEST LEARNING JOURNEY - Science



	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<p><b>Year 7</b></p> <p>Students will build on KS2 learning to further develop their understanding of...</p>	<p><b>Cells</b> Students will study the key features and functions of plants and animal cells. They will develop understanding of how cells are adapted for their function. They will understand structural differences between unicellular and multicellular organisms and how substances can be transported by diffusion.</p> <p><b>Particles</b> Students further their understanding of the properties of materials, focusing on the different states of matter in terms of the particle model. Students learn about changes in state of matter and will explore how to represent this with diagrams. Students</p>	<p><b>Interdependence</b> Students will be able to classify animals based on their physical characteristics and understand how changes in the environment can impact food chains / webs and the abundance of organisms.</p> <p><b>Movement</b> Students will explore the key features and functions of the skeleton, identify key parts of joints, and understand how muscles and joints work together to allow movement of the body.</p> <p><b>Atoms, Elements, Compounds</b> Students further their understanding of matter and materials by learning about atoms, elements and compounds. Students</p>	<p><b>Gravity</b> Students develop their understanding of gravity as a force including the difference between mass and weight, how gravity varies across the solar system, and how to draw a force diagram.</p> <p><b>Energy transfers</b> Students will be introduced to the law of conservation of energy using an energy model where energy is transferred from one store at the start to another at the end.</p>	<p><b>Reproduction</b> Students will build on learning from KS2 of the different ways in which plants can disperse their seeds, the key structures of the plant reproductive system and the process of pollination. Students will build on their knowledge of human reproduction. They will learn the differences between sexual and asexual reproduction, identify the key structures and processes of the male and female reproductive system, (including menstruation), before exploring the process of fertilisation. Here, students will be encouraged to make links with the PSHE curriculum on contraception and fertility.</p>	<p><b>Earth Structure</b> Students will extend their knowledge of rocks and rock formation to explain how the rock layers inside the Earth have formed. Students will develop their scientific communication skills to represent the information in a comprehensive diagram.</p> <p><b>Speed</b> Students will be introduced to the idea that forces are needed to cause objects to stop, start, change speed or direction. Students develop their maths skills using the speed equation and introduction of standard units in science e.g. time is measured in seconds.</p>	<p>Students start the second summer term with revision for their end of year assessments. This will involve revisiting key concepts, consolidating learning, making further links between units and practicing the application of skills and knowledge. After their end of year assessment and reteach period, students will embark on teacher-led projects that enhance their practical and investigative skills as young scientists.</p>

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	<p><i>will have the opportunity to investigate changes of state, which may introduce them to variables and investigative techniques for the first time.</i></p> <p><b>Forces</b>  <i>Students explore how forces interact with objects to change their speed, shape or direction and represent these as force diagrams. They will investigate friction and measure forces in stretching and squashing.</i></p>	<p><i>are introduced to chemical symbols and formulae.</i></p>		<p><b>Mixtures</b>  <i>Students build on their knowledge of the states of matter to describe materials as pure and impure. In this topic, they will learn what makes a substance pure, what makes a mixture and simple methods that can be used to separate mixtures.</i></p>	<p><b>Electrical Circuits: Current and Potential Difference</b>  <i>Students will build upon prior knowledge to build and draw circuits with a range of symbols. They will develop an understanding of what electric current is, how to measure it and what affects the current in a circuit. They will also understand the term 'potential difference', how it is measured and what affects the potential difference in a circuit.</i></p>	
<b>Year 8</b>	<p><b>Breathing and Digestion</b>  <i>Students will understand the parts of the breathing system and how they</i></p>	<p><b>Respiration and Photosynthesis</b>  <i>Students will develop understanding of the importance of respiration in living</i></p>	<p><b>Acids and Alkali</b>  <i>Students will further their understanding of acids and alkalis to investigate neutralisation</i></p>	<p><b>Drugs</b>  <i>Students will be able to understand the term "drug" and classify drugs in different ways, including their legal</i></p>	<p><b>Variation and Inheritance</b>  <i>Students will discuss variation within and between species, as well as linking their</i></p>	<p><b>Earth Structure</b>  <i>Students will extend their knowledge of rocks and rock formation to explain how the rock layers</i></p>

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	<p>play a role during the processes of inhaling and exhaling. Students will describe how gas is exchanged in the lungs, the effect of exercise on breathing and how smoking can impact gas exchange. Students will also be able to describe the function of key structures of the digestive system and how they facilitate the digestion of food. Students will understand the importance of a healthy diet, the uses of nutrients found in food and consequences of poor diet. They will also understand how enzymes play a role in digestion.</p> <p><b>Periodic Table and Metals/Non-Metals</b> Students will further their knowledge of matter by sorting</p>	<p>organisms. Students will be able to describe the differences between aerobic and anaerobic respiration and how respiration links to fermentation and its uses in the food and drinks industry. Students will further develop knowledge of how plants survive and the key concepts of photosynthesis. They will be able to name, label and describe the functions of tissues within a leaf and their role in photosynthesis, developing practical skills while learning how to test a leaf for the presence of starch.</p> <p><b>Electrical Circuits: Resistance</b> Students will build upon knowledge of electrical circuits, current and potential difference. They will link this knowledge to a</p>	<p>reactions when an acid reacts with an alkali. They will be able to describe properties of acids and alkalis including their pH, give examples of each and safety precautions when handling them.</p> <p><b>Earth Resources</b> Students will relate their understanding of recycling to the limited nature of resources on Earth. They will learn about the different ways metals are found and the best methods to extract them. Students will be introduced to reactivity and electrolysis.</p>	<p>status and their effects on the body. With strong links to PSHE, students will learn why people choose to take recreational drugs and the effects these can have on their physical and mental wellbeing.</p> <p><b>Pressure</b> Students build upon their mathematical knowledge to calculate and explore the relationships between volume, area and pressure. They will look at how pressure changes with depth in a liquid and with height in air.</p>	<p>ideas of inheritance to the reproduction topic. Students will understand structures within the genome and the role of genes during inheritance. Students will be able to describe how variation occurs in a population and how this leads to differences in characteristics. They will also develop their skills of presenting scientific data.</p> <p><b>Waves: Light and Sound</b> Students will learn about wave properties and relate them to sound and light. Students will have some knowledge of sound and light from KS2, therefore the introduction of scientific vocabulary will be used to help them make more detailed links between the transfers of energy,</p>	<p>inside the Earth have formed. Students will develop their scientific communication skills to represent the information in a comprehensive diagram.</p>
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	<p><i>elements using chemical data and linking this to their position in the periodic table. Students learn about patterns in reactivity and the properties and uses of metals and non-metals. Students will learn how reactions with oxygen and acids can help determine the reactivity of a metal, applying this to explain displacement reactions.</i></p>	<p><i>new concept: resistance. Students will learn about the relationships between each concept and apply their knowledge using equations to calculate values for each. Students will have the opportunity to explore each concept with practical investigations.</i></p>			<p><i>waves and how we hear/see things. Students will be able to state the similarities and differences between light and sound waves. They will study and draw ray diagrams to explain what happens when light hits different surfaces and learn how lenses work, such as in the eye.</i></p>	
<b>Year 9</b>	<p><b>Evolution</b>  <i>Students will further develop understanding of variation and how this can give an organism a survival advantage to drive natural selection. They will understand the importance of biodiversity and</i></p>	<p><b>Chemical Energy</b>  <i>Students will build on their understanding of chemical reactions to determine whether energy is required or released when a reaction takes place. They will be able link this to whether bonds are broken or being formed and will be able to use the keywords</i></p>	<p><b>Human Interaction</b>  <i>Students will use their knowledge of variation, interdependence, respiration and photosynthesis in this unit. They will develop an understanding of the importance of sustainability to help pupils make responsible lifestyle choices. Pupils will go</i></p>	<p><b>Chemical Changes</b>  <i>Students will look at combustion and thermal decomposition reactions to deepen their understanding of chemical and physical changes. Students will be introduced to conservation of mass during a reaction, which will form the foundational</i></p>	<p><b>Cell Structure and Transport</b>  <i>Students revisit cells and build upon their fundamental KS3 knowledge as they enter their GCSE biology studies. Here, GCSE-level vocabulary will be explored and students will classify cells in more scientific ways, for example,</i></p>	<p><b>Cell Division</b>  <i>Students continue to explore how cells are the building blocks of life. Students will understand why cells divide and use their knowledge of the cell cycle to solve related problems, such as how a tumour forms or how long it may take a wound to heal.</i></p>

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	<p><i>factors that may affect it.</i></p> <p><b>Work</b> Students will be able to explain that work is done and energy is transferred when a force moves an object. They will investigate how simple machines such as levers and pulleys make work easier. The skills developed here will form the fundamental knowledge required to understand work done at GCSE level.</p>	<p><i>exothermic, endothermic and catalysts.</i></p> <p><b>Climate</b> Students will be introduced to the composition of Earth's atmosphere, the carbon cycle and the effect of human activity on both the carbon cycle and the climate. This feeds into the biology topic Human Interaction, which is taught in Spring 1.</p> <p><b>Heating and cooling</b> Students will further their understanding of energy and be able to explain that the thermal energy depends on the material, mass and temperature of an object. They will learn about different methods of heating and that energy transfers from hotter objects to cooler ones.</p>	<p><i>on to learn more about conservation and relationships in ecosystems, which will be further developed at GCSE level.</i></p> <p><b>Space &amp; Universe</b> Students will further their understanding of gravity and how it connects all things within the universe as well as the structure of the solar system, why we are held in orbit and have seasons and night and day.</p>	<p><i>knowledge required for GCSE quantitative chemistry, e.g., atom economy.</i></p> <p><b>Conservation and Dissipation of Energy</b> Students revisit energy and build upon their fundamental KS3 knowledge as they enter their GCSE physics studies. Students will make connections between energy stores, energy transfers and efficiency. Students will apply mathematical skills to real-life examples of energy transfers and understand how everyday products work in terms of energy.</p>	<p><i>eukaryotic and prokaryotic. Students will develop microscope techniques and apply mathematical skills to calculate magnification. Students will also explore the different ways in which substances are transported into/out of cells and investigate diffusion and osmosis using practical techniques.</i></p> <p><b>Energy Resources</b> Students will discover the ways we source energy in real-life. Students will be able to classify resources into renewable/non-renewable and evaluate the use of each. Students will be able to explain how each type of renewable energy is used to benefit humans.</p>	<p><i>Students will be able to fully explain the functions of specialised cells and the functions and uses of stem cells in real-life. Students will evaluate the use of stem cells in medicine.</i></p> <p><b>Organisation and the Digestive System</b> Students will relate their knowledge of organisation to the digestive system. Students will apply their KS3 knowledge of balanced diets and the structures and functions of the digestive system enhance their understanding of digestion. Students be able to describe and carry out food tests using chemical reagents and interpret the results to determine the composition of foods. Students will recap</p>
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*This topic has ample cross-curricular links with maths and will have opportunities to apply their mathematical skills during data analysis.*

### **Magnetism**

*Students will build upon their understanding of magnetism. They will learn to draw magnetic field lines including when magnets attract or repel each other. They will also integrate knowledge from the current and potential difference topics to design and test electromagnets.*

*Students will analyse data in tables and graphs to help them draw conclusions.*

### **Chemical Changes**

*Students will further their understanding of the reactivity series looking at metals, their reaction with oxygen to apply it to methods of extraction required.*

*They will become familiar with oxidation and reduction and link this to earlier learning of bonding and electrons.*

*prior learning on enzymes and learn the mechanics of enzyme action and the effect that changes in temperature and pH can have on it. Lastly, students will deepen their understanding of how the structures in the breathing and circulatory systems are adapted and their role in the transport of materials around the body.*

### **Atomic Structure**

*Students revisit atomic structure and are reminded that atoms are the building blocks of our world. Students will build upon their fundamental KS3 knowledge as they enter their GCSE chemistry studies. Students explore the history of the atom and consider different*

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*scientific theories, which will lead them to be able to explain why theories can change over time. Students will use their knowledge of compounds and mixtures to fully explain separating techniques.*

## KS4 Combined Science (Trilogy) Pathway

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Year 10 (Trilogy)</b>	<p><b>Respiration</b> Students will build on prior learning to understand the fundamentals of both aerobic and anaerobic respiration. They will explore graphical data to learn how the body's response to exercise facilitates an increase in the rate of respiration and the uses of the energy released from respiration in both animals and plants. Students are</p>	<p><b>Non-Communicable Disease</b> Students will develop understanding of correlation and cause by building on their KS3 knowledge of drugs. Students will discuss how drugs and other lifestyle factors like diet and exposure to radiation can impact on health and increase the risk of non-communicable diseases. They will understand the development of cancer and the differences between malignant and benign tumours.</p>	<p><b>Preventing and Treating Disease</b> Pupils explore how vaccination works and how vaccines are used to control the spread of a specific pathogen. Pupils gain an appreciation of the processes involved in drug discovery and development and will be able to explain the stages in this process. Finally, students will be able to explain how plants are useful in medicine, and the treatments available for plant diseases. Students</p>	<p><b>Reproduction</b> Students will apply their knowledge of the cell cycle and mitosis to a new type of cell division: meiosis. They will explore cellular reproduction in the formation of gametes and understand why the two processes differ. Students will be expected to use diagrams to support their explanations of meiosis and mitosis. Students will revisit fundamental key words from their KS3 genetics learning and link</p>	<p><b>Adaptations, Interdependence and Competition</b> Students look at the factors that can affect the distribution of organisms and adaptations to help them survive in an ecosystem. They will describe methods to measure the distribution of organisms and link their findings to adaptations of plants and animals.</p> <p><b>Rates and Equilibrium</b> Students be introduced to the collision theory and</p>	<p><b>Human Nervous System</b> Students will gain an understanding of why homeostasis and reflex arcs are so important. Students will recall the structures involved in a reflex arc and how nerves communicate at a synapse. Students will further develop practical skills while investigating reaction time.</p> <p><b>Motion</b> Students will integrate Newton's Laws of motion into their existing</p>

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	<p><i>introduced to metabolic reactions and will be able to describe what "metabolism" means.</i></p> <p><b>Periodic Table</b> <i>Students will expand their understanding of the periodic table, its historical development and arrangement. They will be able to explain the differences between metals and non-metals as well as identifying the properties of group 0, group 1, group 7 elements as well as transition metals and be able to compare them to group 1 elements.</i></p> <p><b>Chemical Changes</b> <i>Students will study reactions of metals with acid to further their understanding of how salts are formed</i></p>	<p><b>Communicable Disease</b> <i>Students will learn about viral, fungal, bacterial and a protist disease considering the methods of transfer, symptoms and treatments across a range of human examples. Students will explore why pathogens make us ill, the immune system's response to infection and how we can prevent infection.</i></p> <p><b>Chemical Calculations</b> <i>Students will apply their understanding of conservation to the mass in reactions to balance equations and determine the relative formula mass of products and reactants in an equation. Students should be able to explain why reactions producing gases appear to lose mass and make estimations of uncertainty with chemical measurements.</i></p> <p><b>Electrolysis</b> <i>Students will develop their understanding of what</i></p>	<p><i>will be able to extrapolate information from data surrounding vaccination.</i></p> <p><b>Energy Changes</b> <i>Students will further develop their understanding of exothermic and endothermic reactions including representing them graphically, explaining them in terms of particle collisions and giving examples of each. <b>Higher tier</b> students will be able to calculate the energy changes of reactions as bonds are broken and formed.</i></p> <p><b>Electricity in the Home</b> <i>Students will build on their understanding of energy and electricity by learning about electricity supply in the UK to understand the differences between direct and alternating currents. They will understand energy</i></p>	<p><i>these to cellular reproduction.</i></p> <p><b>Photosynthesis</b> <i>Students review and extend their understanding of photosynthesis, leaf structure and the transport of glucose and water through the plant between the soil, air, roots, and leaves. They will explore how factors can affect the rate of photosynthesis, focusing on the effect of light intensity on the rate of photosynthesis for a practical investigation. Lastly, they will be able to explain how glucose is used by the plant. Some pupils will be able to link photosynthesis to cost-effective crop growth.</i></p> <p><b>Radioactivity</b> <i>Students will learn about the development of scientific models and theories with the development of our understanding of the</i></p>	<p><i>will use this to explain rate of reaction. Students will investigate the factors that affect rate of reaction through various experimental techniques, and will apply their graph drawing skills to represent data collected. Students will also explore the term "reversible reaction" and, in some cases, factors affecting equilibrium.</i></p> <p><b>Crude Oil and Fuels</b> <i>Students will be introduced to the composition of crude oils, methods of separating into fractions and properties of hydrocarbons. Students will learn about the different structures and applications of alkanes and alkenes including methods of cracking to produce alkenes.</i></p> <p><b>Chemical Analysis</b> <i>Students will develop their understanding of pure substances, mixtures</i></p>	<p><i>knowledge to explain why objects act in specific and predictable ways when forces are exerted on them. Students will also will learn real world applications of force and motion by determining braking and stopping distances of vehicles.</i></p>
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<p><i>and named including a required practical investigation. In addition, pupils will also be made aware of how we can use titration as a practical method but will not be required to conduct this practical themselves.</i></p> <p><b>Structure and Bonding</b>  <i>Students will be introduced to the fundamental concepts of how atoms join to form different compounds by covalent, ionic and metallic bonding. They will be able to identify, describe and draw diagrams to represent each type of bond. They will extend their knowledge linking bonding and structure to properties such as melting and boiling points of substances including ionic</i></p>	<p><i>electrolysis is and its uses including investigating the electrolysis of aqueous solutions. Students will be able to use their practical knowledge and mathematical skills to predict observations at electrodes and, in some cases, produce half equations to represent the reactions happening at electrodes.</i></p> <p><b>Electrical Circuits</b>  <i>Students will build upon knowledge of electrical circuits, current, resistance and potential difference, learning about the relationships between them, equations to calculate them, and extending to static charges and electric fields. Students will investigate how different components and arrangements of circuits affect the resistance.</i></p> <p><b>Particles in Matter</b>  <i>Students will further their</i></p>	<p><i>transfers and wiring in everyday appliances as well as the significance of power ratings and how they can be used to determine the appropriate fuse.</i></p>	<p><i>atom, the subatomic particles and how changes in the nucleus of an atom causes radioactivity. Students will learn about the different types of radioactivity through alpha, beta and gamma radiation, and explore their uses and the dangers. Students will be able to represent radioactive decay using half equations. Students will be able to compare irradiation and contamination and give examples of each.</i></p> <p><b>Forces in Balance</b>  <i>Students will further develop their understanding of forces as scalars and vectors, looking at how forces affect a range of objects including more complex calculations of work done and applying Newton's Laws to explain what we observe when forces are at work. Students will apply their mathematical</i></p>	<p><i>and chromatography through a mixture of theory and a chromatography investigation to separate and differentiate between coloured substances. They will be able to describe how to test for hydrogen, oxygen, carbon dioxide and chlorine.</i></p> <p><b>Waves</b>  <i>Students will explore the properties of longitudinal and transverse waves. They will apply equations to calculate the period, speed, frequency, and length of a wave as well as how to measure the speed of waves in air, water and a solid. Students will investigate wave measurements using a ripple tank and be able to write a method for this.</i></p>	
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	<p><i>compounds, small molecules, polymers, giant covalent structures, metals and alloys.</i></p> <p><b>Energy Transfer by Heating</b>  <i>Students will extend their knowledge of conduction, convection and radiation to explain energy transfers by heating and calculate the energy involved using a range of equations. They continue to develop their working scientifically skills through practical investigations of conduction and insulation.</i></p>	<p><i>understanding of particles, how the state of a material affects its density. Students will explain the energy of particles in matter and be able to identify factors that affect the energy required to change states. Students will calculate the energy involved in state changes. This will extend to challenge pupils to consider pressure in gases: how to increase it and how to calculate it.</i></p>		<p><i>skills to calculate resultant forces and, in some cases, resolve vectors.</i></p>		
<p><b>Year 11 (Trilogy)</b></p>	<p><b>Hormonal Coordination</b>  <i>Students will understand what hormones are and how bodily responses are controlled by feedback mechanisms.</i></p>	<p><b>Genetics and Evolution</b>  <i>Having developed a deeper understanding of genetic inheritance and evolution from previous topics, students will explore further evidence to support the theory of</i></p>	<p><b>Biodiversity and Ecosystems</b>  <i>Students will build on prior learning of ecosystems and feeding relationships. Looking at the factors that can affect the distribution of</i></p>	<p><i>Students begin tailored revision plans, produced and delivered by their class teachers, for their final GCSE exams.</i></p>	<p><i>Revision/GCSE's.</i></p>	<p><i>GCSE's.</i></p>

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	<p><i>Specifically deepening their understanding of changes at puberty and how hormones control the menstrual cycle. They explore the role of the pancreas in controlling blood glucose, applying this to understand causes/ treatments of diabetes. Students may also learn how glucagon and insulin interact to control blood glucose levels.</i></p> <p><b>Variation and Evolution</b></p> <p><i>Students will develop their understanding of variation from KS3 and make scientific links between variation and evolution. Students will explore Darwin's theory of evolution by natural selection and explain the evidence to support this theory. Students will also learn about selective breeding techniques and use their</i></p>	<p><i>evolution. Students will make links between evolution and the uprise of antibiotic resistant bacteria, as well as relating this to real-life complications. Students will learn how organisms are classified and be able to explain the importance of classification.</i></p> <p><b>Earth's Atmosphere</b></p> <p><i>Students will learn how the Earth's atmosphere was formed, what it is made of, and how it has changed since the formation of the Earth. Students will broaden their understanding of carbon dioxide and methane as greenhouse gases, including human impacts, global climate change and methods of reducing carbon footprints. They will make cross-curricular links between physics and biology, as well as geography. Students will</i></p>	<p><i>organisms and adaptations to help them survive in an ecosystem. Students are required to describe two separate methods of practical techniques. They will describe methods to measure the distribution of organisms before learning how materials like carbon and water are recycled.</i></p> <p><b>Electromagnetism</b></p> <p><i>Students will revisit their KS3 knowledge of magnets and their KS4 knowledge of forces to extend their understanding. Students will explain how a magnetic field is produced when a current passes through a wire. Some students will learn about the motor effect and how to use Fleming's left hand rule in relation to this. Students' maths skills will be applied throughout this topic,</i></p>			
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	<p><i>knowledge to evaluate the use of GM crops in industry.</i></p> <p><b>Force and Motion</b>  <i>Students will apply their knowledge of forces to represent motion. Students will draw and interpret graphs to calculate displacement, velocity and time using related and sometimes multi-step equations.</i></p>	<p><i>be asked to analyse data about the changing atmosphere and draw conclusions from it.</i></p> <p><b>Earth's Resources</b>  <i>Students will develop their foundational knowledge and understanding of the limited resources available on Earth from KS3. They will be introduced to life cycle assessments to determine the environmental impact of products as well as methods of reducing waste. Some students will also evaluate the methods of extracting metals.</i></p>	<p><i>including rearranging equations.</i></p> <p><b>Electromagnetic Waves</b>  <i>Students will develop their understanding from KS3 light to look at the electromagnetic spectrum, the properties and uses of its component parts. Students will be able to describe the uses of the EM spectrum in real life and the dangers of certain parts of it. Students will apply their maths skills through use of standard form to represent very large and very small numbers. Some students will learn how different wavelengths refract differently, how to draw wave front diagrams and how radio waves and alternating currents are linked.</i></p>			
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