

Year 9: Curriculum Intent			
The intent of the Year 9 curriculum is to build on knowledge acquired in both Year 7 and Year 8 and prepare pupils for the final steps before undertaking GCSE science. They will increase the depth and breadth of their knowledge and build strong links in learning to consolidate prior learning and secure the foundations for GCS science. Pupils will continue to study the different areas of science: - in Biology - Variation and Inheritance. - in Chemistry - Chemical reactions. - in Physics - Forces and Motion and Energy. - and across all three sciences - how to Work Scientifically. Pupils will be taught key knowledge and skills in both theory and practical science. They will learn about the scientific method, how to keep safe and how to draw valid conclusions from data.			
Year 9 Biology Essential Knowledge Summary			
Schemata 1: Variation and Inheritance	Schemata 2: Cells and Systems B1 Cell Structure and Cell Division	Schemata 3: Cells and Systems B1 Cell Transport	Schemata 4: Plants and the Environment- B4 Bioenergetics
Composite Knowledge: Pupils will be able to describe how a species varies and the genetic involvement of this at a cellular level. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Recall the definition of variation (within a species). - Recall the two causes of variation within a species. - Recall the definition of inheritance. - Describe DNA. - Recall the 4 Scientists involved in the discovery of DNA. - Recall adaptations in animals. - Recall that variation in a species is important for the survival of a species, helping it to avoid extinction in an always changing environment. - Recall the definition of natural selection. - Recall the definition of biodiversity. - Recall where genetic material is found within a cell. - Recall what a chromosome is. - Recall the definition of a gamete. Procedural Knowledge: - Determine whether characteristics are inherited, environmental or both. - Plot bar charts or line graphs to show discontinuous or continuous variation data. - Research the work on the 4 Scientists involved in the discovery of DNA. - Explain how variation helps a particular species in a changing environment. - Explain how characteristics of a species are adapted to particular environmental conditions. - Use evidence to explain why a species has become extinct or changed over time. - Explain how a lack of biodiversity effects an ecosystem. Upper Hierarchical Knowledge - Use the ideas of variation to explain why one species may adapt better than another to environmental change. - Critique a claim that a particular characteristic is inherited or environmental. - Determine animal adaptations as structural, functional and behavioural. - Predict and explain the changes in a population over time due to natural selection.	Composite Knowledge: Pupils will gain a further understanding of cells and cell division and how cells can be visualised effectively under a microscope. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Define the term eukaryotes and prokaryotes. - Describe the structure and function of organelles found in animals and plant cells. - Describe the structure of a bacterial cell. - Identify parts of a light microscope. - Explain why a cell is specialised and give examples. - Recall the definition of a stem cell. - Recall where stem cells are found. - Recall the definition of cell differentiation. - Recall what undifferentiated cells are. - Describe what plant meristem are and where they are found. - Recall why cell division takes place. - Recall the definitions of the words: DNA, chromosomes, genes, mitosis. - Recall the definition of magnification and resolution. - Recall the magnification (IAM) formula. Procedural Knowledge: - Use knowledge of cells to arrange order of magnitude. - Compare the two types of microscopes in terms of resolution and magnification. - Describe what cell differentiation is. - Describe the differences between embryonic and adult stem cells and give their uses. - Compare eukaryotic and prokaryotic cells. - Describe the process of binary fission. - Calculate bacterial growth. - Describe the steps involved in mitosis. - Explain the process of therapeutic cloning. - Explain how surface area to volume ratio varies depending on the size of an organism. - Rearrange the IAM equation to find magnification or actual size of a cell. - Make a specimen slide safely, view a slide, draw accurate observations and calculate the	Composite Knowledge: Pupil will gain a further understanding of cell transport methods; diffusion, osmosis and active transport and apply these methods to unfamiliar situations. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Define osmosis - Define diffusion. - Define isotonic, hypertonic and hypertonic solutions. - Give examples of substances that diffuse into and out of cells. - Define active transport. Procedural Knowledge: - Explain the factors that effect the rate of diffusion. - Apply understanding of osmosis to movement of water in animal and plant cells. - Calculate and compare surface area: volume ratios. - Explain how the small intestine and roots and leaves in plants, are adapted for exchange of substances. - Describe and explain how an exchange surface is made more effective. - Apply knowledge of osmosis to unfamiliar situations and make predictions. Upper Hierarchical Knowledge - Use a microscope with graticule to measure cells and calculate their real size. - Interpret graphs to explain what the compensation point means. - Explain how particles move across the cell membrane by carrier proteins. Working Scientifically Building on knowledge from Year 7: Modelling diffusion: 1. Using skittles to model the movement of colour in water. 2. Agar Jelly and acid. WSAN 1 make and record observations and measurements and present data using appropriate methods including tables with repeat measurements. Investigate osmosis- calculating difference in mass and percentage difference in mass (including the calculation of a mean): WSAN 2 use basic data analysis to calculate means, plot graphs with line of best fit and use this data to draw conclusions.	Composite Knowledge: Pupils will gain an understanding of photosynthesis in plants, the process where they use light to make sugar from carbon dioxide and water. You will also look at respiration and how all living organisms use respiration to transfer the energy they need to carry out the reactions required for life. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Recall the part of the cell where photosynthesis takes place. - Recall the word equation for photosynthesis. - Explain the factors that effect photosynthesis. - Recall the 5 uses of glucose (CROPS). - Recall the word equation for aerobic and anaerobic respiration in animal and plants. - Understand how breathing rate and heart rate increase with exercise. - Define and give examples of metabolic reactions. Procedural Knowledge: - Explain where the energy for the cell reactions comes from, and how proteins and fats are made. - Explain the gases released from a plant at different times of the day. - Explain graphs describing limiting factors and how these factors effect photosynthesis. - Understand the importance of fermentation in baking. - Calculate cardiac output. Upper Hierarchical Knowledge - Recall the balanced symbol equation for photosynthesis. - How humans can manipulate the environments of which plants can grow. - Describe oxygen debt and recovery time. - Understand how the liver is involved in repaying oxygen debt. - Calculate inverse square law. Working Scientifically Testing a leaf for starch WSAT 2 identify hazards and risks and suggest appropriate ways to reduce the risks. Investigate the rate of photosynthesis using pondweed (required practical).

- Suggest an explanation, based on data, for how a particular evolutionary change occurred. - Evaluate ways of preserving plant or animal material for future generations. - Explain how a change in the DNA (mutation) may affect an organism and its future offspring. - Explain why offspring from the same parents look similar but are not usually identical. Working Scientifically Height vs. Foot size (graph skills): WS11 present observations and data using appropriate methods, including tables and graphs. DNA Extraction: The extraction of DNA from a kiwi: WSAT 2 identify hazards and risks and suggest appropriate ways to reduce the risks. Fossil making- Making trace fossils looking at the quality of evidence: WSAT 2 identify hazards and risks and suggest appropriate ways to reduce the risks.	magnification used. Upper Hierarchical Knowledge - Describe in detail the functions of cell organelles. - Argue the advantages of medical uses of stem cell. Working Scientifically Making an onion slide- Make a specimen slide safely, view a slide, draw accurate observations and calculate the magnification used: WSME 1 apply mathematical concepts to use and rearrange equations in order to calculate results, using appropriate SI units RSE Link The science relating to blood, organ and stem cell donation.		WSSK 2 identify independent, dependent and control variables and use these to plan and carry out a range of investigations to test a prediction, considering repeatability and reproducibility within their plan ○
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Year 9 (biology) Final Composite Knowledge End Point			
KS3 (Term 1) - Define the definition of variation (within a species). - Define the two causes of variation within a species. - Define variation in a species and why it is important for the survival of a species, helping it to avoid extinction in an always changing environment. - Define the definition of natural selection. - Define the definition of biodiversity. - Explain where genetic material is found within a cell. - Define what a chromosome is. - Define the definition of a gamete. KS4 (Term 2 & 3) - Explain the difference between a eukaryotic and prokaryotic cell. - Recall the parts of an animal cell and explain what each part does. - Recall the parts of a plant cell and explain what each part does. - Recall the parts of a bacterial cell and explain what the part does. - Describe the steps in the cell cycle. - Compare magnification and resolution, in a light and electron microscope. - Define diffusion - Define osmosis - Define active transport. - Recall the word equation for photosynthesis. - Recall the uses of glucose (CROPS). - Recall the word equation for respiration. - Recall the word equation for anaerobic respiration. - Define metabolism - Recall examples of metabolic reactions.			

Year 9 Chemistry Essential Knowledge Summary	
Schemata 1: Chemical Reactions	Schemata 2: C1 Atomic Structure & Periodic Table
Composite Knowledge: Pupils will learn the differences between exothermic and endothermic reactions in terms of energy changes and then bond energy. They will calculate overall energy change and describe a reaction as endothermic or exothermic. Pupils will also describe the factors that affect the rate of reaction Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Define exothermic reactions - Define endothermic reactions - Define rate of reaction	Composite Knowledge: Pupils will learn fundamentals of atomic structure including the structure of an atom and where subatomic particles are found and how electrons are arranged on shells. Pupils will be able to define materials as elements, compound, mixtures and will be able to describe separation techniques Component Knowledge: Foundational Knowledge: Declarative Knowledge: - The names and properties of subatomic particle and working out numbers of subatomic particles - Electron structure and how shells are filled up

- Name the factors which affect rate Procedural Knowledge: - Draw and label reaction profiles graphs for exothermic and endothermic reactions including overall energy change and activation energy - Know that bond breaking is endothermic - Know that bond forming is exothermic - Write sentences to explain how different factors affect rate of reaction - Complete and analyse required practical on energy changes Upper Hierarchical Knowledge - Explain reactions in terms of bond breaking and bond forming - Use bond energies to calculate overall energy change - Draw rate graphs from given data - Calculate rate from data - Use collision theory to explain why factors affect rate of reaction Working Scientifically WSSK 1 develop a line of enquiry based on observations of the real world, and make predictions based on their prior knowledge and scientific understanding WSAN 2 use basic data analysis to calculate means, plot graphs with line of best fit and use this data to draw conclusions	- Separation methods and techniques - Know what a group is. - Know what a period is. - Know the separation between metals and nonmetals on the periodic table Procedural Knowledge: - Draw diagrams with correctly labelled parts of atom - Draw diagrams with correctly filled shells for atoms and ions - Write clear descriptions of how mixtures are separated - Describe the properties of groups of elements, group 1, 7 and 0 - Demo of alkali metals in water and descriptions of reactions Upper Hierarchical Knowledge - Explain why elements are grouped - Explain why we have isotopes - Calculate RAM from isotopic abundance - Explain the properties of group 1 and 7 by linking to electronic structure. - Explain evolution of atomic models and periodic table Working Scientifically Alkali Metals demo WSAN 1 make and record observations and measurements and present data using appropriate methods including tables with repeat measurements
Year 9 (chemistry) Final Composite Knowledge End Point	
- Be able to label a diagram of the atom - Be able to work out the number of protons, neutrons and electrons in a given atom - Know how to draw and work out the electron structure for the first 20 elements - Know the properties and reactivity of group 1 and 7 elements. - Evaluate atomic models - Evaluate periodic tables suggested in history - Define exothermic and endothermic reactions - Draw and label reaction profiles graphs for exothermic and endothermic reactions including overall energy change and activation energy - Know that bond breaking is endothermic - Know that bond forming is exothermic - Define rate of reaction - Name the factors which affect rate	

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Year 9 Physics Essential Knowledge Summary		
Schemata 1: Energy	Schemata 2: Forces & Motion	Schemate 3: P1 Energy
Composite Knowledge: Pupils will be able to describe the pros and cons of a variety of energy resources. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Can name the eleven different energy resources used to generate electricity. - Can simply describe how the energy resources can be used to provide electricity. - Can state pros and cons of each energy resource. Procedural Knowledge: - How to write an evaluation of energy resources. Upper Hierarchical Knowledge - Compare different energy resources. - Evaluate the use of energy resources in different contexts. Working Scientifically Solar panels: WSSK 2 identify independent, dependent and control variables and use these to plan and carry out a range of investigations to test a prediction, considering repeatability and reproducibility within their plan Wind turbines::	Composite Knowledge: Pupils will gain knowledge on the links between energy and forces. Pupils will understand how forces can cause rotation motion or extension of an object. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - State the equation that links: force, distance and work done, - Define the term centre of mass. - Find the centre of mass of a regularly shaped 2D object. - Define the term moment. - State how a force affects the extension of a spring. Procedural Knowledge: - Calculate the extension of a spring after a force is applied. - Describe how to find the centre of mass of an irregularly shaped 2D object. - Estimate and explain the location of mass in a 3D object. - Use primary data to find the link between force applied and extension.	Composite Knowledge: Pupils will understand the different forms of energy and how energy can be transferred between them. They will be able to give examples of energy transfers. Pupils will gain knowledge of both renewable and non-renewable energy resources and understand their advantages and disadvantages. They will be able to evaluate the use of different energy resources and understand the trends in usage of various energy resources. Pupils will gain knowledge of the concept of efficiency. They will be able to describe the methods of heat transfer and explain how energy losses can be reduced in buildings. Pupils will be able to calculate changes in multiple energy stores. Component Knowledge: Foundational Knowledge: Declarative Knowledge: - Name the 5 energy stores - Name the 4 energy pathways / transfers - Recall the kinetic energy equation - Recall the units for energy, mass, velocity, spring constant, extension, height, specific heat capacity, temperature, power, & time. - Recall the equation for gravitational potential - Define specific heat capacity

● WSAN 1 make and record observations and measurements and present data using appropriate methods including tables with repeat measurements	<u>Upper Hierarchical Knowledge</u> ● Apply the principle of conservation of energy to work done. ● Manipulate equations. <u>Working Scientifically</u> Moments: ● WSSK 1 develop a line of enquiry based on observations of the real world, and make predictions based on their prior knowledge and scientific understanding Hooke’s law: ● WSAN 2 use basic data analysis to calculate means, plot graphs with line of best fit and use this data to draw conclusions	● Recall the equation $P=E/t$ ● Define power ● State that work done = energy transferred ● Recall the law of conservation of energy ● Define closed system ● State how energy can be dissipated ● State how unwanted energy transfers can be reduced ● Define thermal conductivity ● Recall the equations for efficiency ● Name the main energy resources available to use on Earth ● Define renewable resource ● State the uses of energy resources ● Recognise the main energy source available in a given situation ● Name renewable and non-renewable energy resources ● State the environmental impacts of energy resources Procedural Knowledge: ● Use an equation to find an unknown variable ● Apply the principle of conservation of energy to qualitative descriptions of energy transfers ● Write methods for experiments. ● Accurately plot axes & graphs ● Draw lines of best fit and use them to find tangents and gradients. ● Describe how to experimentally find the specific heat capacity of a substance (RP1) <u>Upper Hierarchical Knowledge</u> ● Describe how to experimentally find the specific heat capacity of a substance (RP1) ● Describe an experiment to investigate the effectiveness of thermal insulators (RP2) ● Manipulate and use the equations for: ○ kinetic energy ○ elastic potential energy ○ gravitational potential energy ○ specific heat capacity ○ power ○ efficiency ● Compare and evaluate different energy resources <u>Working Scientifically</u> Bungee jump ● WS 2.6 Make and record observations and measurements using a range of apparatus and methods. ○ Read measurements off a scale in a practical context and record appropriately. Specific Heat Capacity (w. joule metres) (RP1) ● WS 3.3 Carrying out and represent mathematical and statistical analysis. ○ use an appropriate number of significant figures ○ change the subject of an equation substitute numerical values into algebraic ○ equations using appropriate units for physical quantities ○ determine the slope and intercept of a linear graph Insulation (RP2) ● WS 2.2 Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. ○ Describe a practical procedure for a specified purpose. ○ Identify in a given context: ■ the independent variable as the one that is changed or selected by the investigator ■ the dependent variable that is measured for each change in the independent variable ■ control variables and be able to explain why they are kept the same.
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		Investigating the absorption & radiation of infrared radiation (RP 10) ● WS 3.5 Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. ○ Use data to make predictions. ○ Recognise or describe patterns and trends in data presented in a variety of tabular, graphical and other forms. ○ Draw conclusions from given observations.
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Year 9 (physics) Final Composite Knowledge End Point

KS3 (Term 1) ● Discuss the advantages and disadvantages of the energy resources we use to generate electricity. ● Understand how force and energy are linked. ● Describe how to find the centre of mass of various objects. ● Calculate moment, force or distance using the appropriate equation. ● Calculate force, work done or distance using the appropriate equation. KS4 (Term 2 & 3) ● Understand the different forms of energy and how energy can be transferred between them. ● Give examples of energy transfers. ● Knowledge of both renewable and non-renewable energy resources and understand their advantages and disadvantages. ● Evaluate the use of different energy resources and understand the trends in usage of various energy resources. ● Knowledge of the concept of efficiency. ● Describe the methods of heat transfer and explain how energy losses can be reduced in buildings. ● Calculate changes in multiple energy stores.
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