Science Years 7- 9 Curriculum Intent	
Years 7 and 8	Our Key Stage 3 (KS3) course follows AQA Science Syllabus. Our aim is to develop students into scientists and promote a love for science by providing students with opportunities to access many experiences with potential for embarking upon STEM-based careers. We support all pupils to have a broad and deep understanding of the sciences through immersion in our engaging spiral curriculum. Using the big ideas principle, the generalisations, principles and models which connect concepts are at the heart of our KS3 curriculum. We believe this is how students learn to see the world analytically, to explain phenomena and make predictions – all skills they need for their next stage of scientific learning. Our KS3 curriculum Content is divided under 10 big idea headings for Y7 and 8: Forces, Electromagnetism, Energy, Waves, Matter, Reactions, Earth, Organisms, Ecosystems and Genes & Variation. Each big idea topic contains four smaller topics that build in complexity. For example 'Waves', topics are ordered from simpler, more concrete topics 'Light' and 'Sound', to more abstract ones 'Wave properties' and 'Wave effects'. These have been created to avoid repetition, draw on various scientific skills and use different contexts. By connecting smaller ideas to more abstract ideas, students will be better prepared to apply these concepts when approaching an unfamiliar topic. The department has constructed a new unit for 'Becoming A Scientist' to develop all year 7 pupils practical and enquiry skills, critical understanding of evidence and communication. We link our Big Ideas to the potential careers in Science and the routes through A levels and higher education. We have embedded the Cognitive Acceleration through Science Education (CASE) in our Curriculum. The CASE is delivered over two years (year 7 and 8) to challenge students' thinking, develop their metacognitive skills, and encourage cooperative learning. We believe that the CASE materials are effective in raising achievement because they are built around a strong model of how children learn.
Year 9	All students in Year 9 study this subject. Students continue to study National Curriculum content and develop transferable skills and foundation knowledge in order to support the transition to KS4 and GCSE study. Some appropriate GCSE content will be covered from the autumn term of Year 9.

Curriculum Implementation						
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Year 7	**Being a Scientist** Calculate a mean from a set of data. Spot a data point that does not fit the pattern.	**Cells** Be able to use light microscope to observe and draw cell.	**Ecosystem** Identify parts of the flower and link their structure to their function.	**Reactions** Describe an oxidation, displacement, or metal acid reaction with a word equation.	**Electricity** Calculate resistance using the formula: resistance (Ω) =	**Waves** Explain observations where sound is reflected, transmitted or

	Identify a pattern in data from a results table or bar chart. Express a linear relationship between variables in the form 'When... doubles then... also doubles' Identify variables that you could not control properly. Suggest better ways to control variables. Suggest ways to improve the method. Suggest ways to reduce measurement errors. Suggest a scientific reason for your findings. Prepare a table with space to record all measurement. Identify features of an investigation which are hazardous. Identify ways of reducing the risk. Carry out the method carefully and consistently. Decide the type of chart or graph to draw based on its purpose or type of data. Draw a straight line or a curve of best fit through the points. Explain logically how each piece of evidence supports your opinion.	Identify the principal features of a cheek/leaf cell and describe their functions Explore how the skeletal system and muscular system in a chicken wing work together to cause movement Explain how antagonistic muscles produce movement around a joint. **Forces** Investigate variables that affect the speed of a toy car rolling down a slope. Illustrate a journey with changing speed on a distance-time graph, and label changes in motion. Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object. Predict changes in an object's speed when the forces on it change. Explain the way in which an astronaut's weight varies on a journey to the moon.	Describe the main steps that take place when a plant reproduces successfully. Suggest how a plant carried out seed dispersal based on the features of its fruit or seed. Explain why seed dispersal is important to survival of the parent plant and its offspring Describe how a species' population changes as its predator or prey population changes. Explain the effects of environmental changes and toxic materials on a species' population.	Use particle diagrams to represent oxidation, displacement and metal-acid reactions. Identify an unknown element from its physical and chemical properties. Place an unfamiliar metal into the reactivity series based on information about its reactions. Deduce a rule from data about which reactions will occur or not, based on the reactivity series Identify the best indicator to distinguish between solutions of different pH, using data provided. Explain how neutralisation reactions are used in a range of situations. **Genes** Describe the different types of variations. Explain whether characteristics are inherited, environmental or both. Explain how variation helps a particular	potential difference (V) ÷ current (A). Draw a circuit diagram to show how voltage or current can be measured in a simple circuit. Describe how current changes in series and parallel circuits when components are changed. Use the idea of energy to explain how voltage and resistance affect the way components work. Predict the effect of changing the rating of a battery or a bulb on other components in a series or parallel circuit. Describe what happens when charged objects are placed near to each other or touching. Use a sketch to describe how an object charged positively or negatively became charged up. **Energy** Calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh).	absorbed by different media. Explain observations of how sound travels using the idea of a longitudinal wave. Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture. Use drawings of waves to describe how sound waves change with volume or pitch. Use ray diagrams of eclipses to describe what is seen by observers in different places. Explain observations where coloured lights are mixed or objects are viewed in different lights. Use ray diagrams to describe how light passes through lenses and transparent materials. **Matter** Describe and explain the properties of solids, liquids and gases based on the arrangement and movement of their particles.

	Explain why each piece of evidence does not support other opinions. **Earth** Explain why a rock has a particular property based on how it was formed. Identify the causes of weathering and erosion and describe how they occur. Construct a labelled diagram to identify the processes of the rock cycle. Identify circumstances that indicate fast processes of change on Earth and those that indicate slower processes. Describe the appearance of planets or moons from diagrams showing their position in relation to the Earth and Sun. Explain why places on the Earth experience different daylight hours and amounts of sunlight during the year. Describe how space exploration and observations of stars	Investigate factors that affect the size of frictional or drag forces Investigate how pressure from your foot onto the ground varies with different footwear Describe the difference between contact and non-contact force.		species in a changing environment. Explain how characteristics of a species are adapted to particular environmental conditions. Explain whether substances are passed from the mother to the foetus or not. Use a diagram to show stages in development of a foetus from the production of sex cells to birth. Identify key events on a diagram of the menstrual cycle.	Compare the amounts of energy transferred by different foods and activities. Explain the advantages and disadvantages of different energy resources. Represent the energy transfers from a renewable or non-renewable resource to an electrical device in the home. Compare the running costs of fluorescent and filament light bulbs Show how energy is transferred between energy stores in a range of real-life examples. Calculate the useful energy and the amount dissipated, given values of input and output energy. Describe how electricity is generated using renewable and non-renewable energy sources. Explain how energy is dissipated in a range of situations.	Explain changes in states in terms of changes to the energy of particles. Draw before and after diagrams of particles to explain observations about changes of state, gas pressure and diffusion. Explain how substances dissolve using the particle model. Understand how substances dissolve and the factors that affect solubility and be able to interpret solubility curves. Differentiate between compounds and mixtures and start looking at different separation techniques. Choose the most suitable technique to separate out a mixture of substances.

	are affected by the scale of the universe. Explain the choice of particular units for measuring distance. Predict patterns in day length, the Sun's intensity or an object's shadow at different latitudes.					
Year 8	**Genes** Describe the theories of evolutions Evaluate whether evidence for a species changing over time supports natural selection. Explain how a lack of biodiversity can affect an ecosystem. Evaluate ways of preserving plant or animal material for future generations. Use a diagram to show the relationship between DNA, chromosomes and genes. Use a diagram to show how genes are inherited. Explain how a change in the DNA (mutation) may affect an organism and its future offspring.	**Forces** Describe how materials behave as they are stretched or squashed. Describe what happens to the length of a spring when the force on it changes. Explain whether an object in an unfamiliar situation is in equilibrium. Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality. Explain why objects either sink or float depending upon their weight and the upthrust acting on them. Given unfamiliar situations, use the	**Earth** Use a diagram to show how carbon is recycled in the environment and through living things. Describe how human activities affect the carbon cycle. Describe how global warming can impact on climate and local weather patterns. Evaluate the implications of a proposal to reduce carbon emissions. Evaluate claims that human activity is causing global warming or climate change. Explain why recycling of some materials is particularly important. Describe how Earth's resources are turned	**Ecosystem** Use word equations to describe aerobic and anaerobic respiration. Explain how specific activities involve aerobic or anaerobic respiration. Describe ways in which plants obtain resources for photosynthesis. Explain why other organisms are dependent on photosynthesis. Use lab tests on variegated leaves to show that chlorophyll is essential for photosynthesis. **Energy** Draw a diagram to explain how a lever makes a job easier.	**Electromagnetism** Use a diagram to explain how an electromagnet can be made and how to change its strength. Explain the choice of electromagnets or permanent magnets for a device in terms of their properties. Suggest how bells, circuit breakers and loudspeakers work, from diagrams. Use the idea of field lines to show how the direction or strength of the field around a magnet varies. Explain observations about navigation using Earth's magnetic field. Predict how an object made of a magnetic material will behave if	

	Explain why offspring from the same parents look similar but are not usually identical. Suggest arguments for and against genetic modification. **Matter** Be able to read periodic in periods and groups. Describe the reaction of an unfamiliar Group 1 or 7 element. Use observations of a pattern in chemical reactions to predict the behaviour of an element in a group. Name compounds using their chemical formulae. Given chemical formulae, name the elements present and their relative proportions. Represent atoms, molecules and elements, mixtures and compounds using particle diagrams. Use observations from chemical reactions to decide if an unknown substance is an element or a compound.	formula to calculate fluid pressure or stress on a surface. **Organisms** Describe how organs and tissues involved in digestion are adapted for their role Describe the events that take place in order to turn a meal into simple food molecules inside a cell. Describe the respiratory system Explain how the parts of the gas exchange system are adapted to their function. Explain how changes in volume and pressure inside the chest move gases in and out of the lungs.	into useful materials or recycled. Justify the choice of extraction method for a metal, given data about reactivity. **Reactions** Use experimental observations to distinguish exothermic and endothermic reactions. Use a diagram of relative energy levels of particles to explain energy changes observed during a change of state. Predict whether a chemical reaction will be exothermic or endothermic given data on bond strengths. Use energy data to select a reaction for a chemical hand warmer or cool pack. Predict the products of the combustion or thermal decomposition of a given reactant and show the reaction as a word equation. Explain observations about mass in a chemical or physical change.	Use the formula: work done (J) = force (N) x distance moved (m) Compare and contrast the advantages of different levers in terms of the forces need and distance moved. Explain how an electric motor raising a weight is doing work Explain observations about changing temperature in terms of energy transfer. Describe how an object's temperature changes over time when heated or cooled. Explain how a method of thermal insulation works in terms of conduction, convection and radiation. Sketch diagrams to show convection currents in unfamiliar situations. Compare and contrast the three ways that energy can be moved from one place to another by heating.	placed in or rolled through a magnetic field. **Waves** Describe the longitudinal and transverse waves Be able to use wave equation v=fλ Use ray diagrams to model how light passes through lenses and transparent materials Understand that light, like all waves can be reflected. Explain what is meant by refraction. Identify the difference between refraction and reflection. Draw a simple diagram to show how light is refracted when travelling from air to glass to air. Describe the path of light from its source through your eye. Describe how refraction leads to the formation of a focused image.	

	Compare and contrast the properties of elements and compounds and give a reason for their differences. Describe and explain the properties of ceramics and composites		Use particle diagrams to show what happens in a reaction.		Explain the effect of convex and concave lenses on a light ray. Explain how lenses can be used to correct problems with vision.	
Year 9	**<u>Cells</u>**: In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. We also cover this new branch of medicine which may allow doctors to repair damaged organs by growing new tissue from stem cells. **<u>Atomic Structure</u>**: In this topic we cover the periodic table which provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. We also cover the historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. Also the arrangement of elements in the modern periodic table can be		**<u>Bonding</u>**: In this topic we look at the work of Chemists who use theories of structure and bonding to explain the physical and chemical properties of materials. We also analyse the structures that atoms can be arranged in, some of which are molecular while others are giant structures. We cover the theories of bonding to explain how atoms are held together in these structures. We look to the future where scientists use this knowledge of structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies. **<u>Electricity</u>**: In this physics topic we cover the idea that electric charge is a fundamental property of matter everywhere. We try to ensure students understand the difference in the microstructure of conductors, semiconductors and insulators which makes it possible to design components and build electric circuits. We also cover the idea that many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. This is an essential topic as electrical power fills the modern world		Completion of whichever of the three topics from the spring term. **<u>Infection</u>**: In this topic we cover the ideas that pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. We also look at historical development of medicines for example since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. We also look to an uncertain future as unfortunately many groups of bacteria have now become resistant to these antibiotics. The	

	explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels. **Energy**: In this topic we cover the concept of energy which emerged in the 19th century. We cover the idea that was used to explain the work output of steam engines and then generalised to understand other heat engines. This also became a key tool for understanding chemical reactions and biological systems. We also cover the limits to the use of fossil fuels and global warming are critical problems for this century. Interestingly we also look to the future where Physicists and engineers are working hard to identify ways to reduce our energy usage	with artificial light and sound, information and entertainment, remote sensing and control. Importantly we look to the future and include power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future? **Transport**: We begin with looking at the movement of molecules in and out of cells. We include practicals and models to explain what students experience in practicals to cover Diffusion, Osmosis and Active transport. In this section we will learn about the human ventilation and circulatory systems which provides the body with oxygen and removes carbon dioxide. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.	race is now on to develop a new set of antibiotics.