Science (Combined) Curriculum Intent	
KS4	The aim of the science curriculum is to impart a huge range of scientific knowledge and skills and to ignite the curiosity of our students into how science shapes everything around them, from the functioning of their body to the movement of the planets. We use a range of materials produced by the department to engage students and try to develop lifelong learners. As a department we understand the importance of developing transferable practical skills and the ability to critically analyse data needed both for further careers or to make informed choices. We regularly use high quality teacher instruction to model how to approach questions to enhance learning and promote a positive working environment to allow learning from mistakes. We teach via a spiral learning model where topics covered early in KS4 and at KS3 are revisited to allow learners to make the vital intellectual steps needed to understand more complex topics. We link our course content to the potential careers in Science and the routes through A levels and higher education.

Curriculum Implementation						
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Year 10	**<u>Biological Response:</u>** In this topic we cover how cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. An important part of this topic is the impact of hormones in the control of the menstrual system both for IVF and contraception.		**<u>Forces:</u>** This fundamental topic of physics covers key applications of various formulae. We also look at how engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. (Anything mechanical can be analysed in this way.) Future uses cover the recent developments in artificial limbs and use the analysis of forces to make movement possible. **<u>Chemical Changes:</u>** In this topic we cover the understanding of chemical changes which began when people began experimenting with chemical reactions in a systematic way and organising their results logically. Knowing about these different chemical changes meant that scientists could		**<u>Particles model:</u>** In this topic we revisit the KS3 model of matter. The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of tea high up a mountain! **<u>Rates:</u>** In this topic we cover how chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in	

	Non communicable disease: In this section we will learn about the human digestive system which provides the body with nutrients. This includes the action of enzymes that enable large insoluble molecules to be turned into small soluble ones. We look at the effect of lifestyle choices and the potential risks of certain conditions such as heart disease and cancer. We review the heart and link this to damage which can be debilitating if not fatal. We stress that although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We look at potential treatments for each condition and look at the careers associated with this area of the course. **Hydrocarbons:** In this topic we cover the chemistry of carbon compounds which is so important that it forms a separate branch of chemistry. We look at the great variety of carbon compounds possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. We look to the future implications and innovations where chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.	begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'. **Energetics:** In this topic we look at how energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way.	order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Understanding energy changes that accompany chemical reactions is important for this process. In industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product. Whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way. **Ecology:** In this topic we cover the importance of ecosystems and how all systems are interlinked. The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development.

	<u>Quantitative Chemistry:</u> In this topic we look at the ways Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions. Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about the behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas. **<u>Atomic structure and Radiation (Phys):</u>** In this topic we review the structure of the atom and then go on to teach how Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability.We look at the experiments conducted by these historical figures which allowed us to understand how the structure of the atom and how radiation occurs. We also look at how early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently administration improved. We look at the current uses and the potential future uses of radioactive materials eg use in medicine, industry, agriculture and electrical power generation		

Year 11	**<u>Humans and the environment:</u>** Here we review our ideas about ecosystems and how all aspects of the abiotic and biotic environment are linked. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being. **<u>Reproduction:</u>** In this section we will discover how the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. **<u>Sustainable development (Chem)</u>** In this topic students study how Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that	**<u>Motion:</u>** Here we review the Forces topics and then move on to look at Motion. We include Newton's laws of motion and how these were formulated. We look at acceleration and ways of maximising the speed of vehicles. In this section we look at stopping distances and how these may be affected by weather etc. **<u>Variation:</u>** In this section we will discover how the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them in to the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.	**<u>Revision only.</u>**

	materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised. **Waves:** In this topic we look at wave behaviour and look for commonalities in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves. **Chemical Analysis:** This is a short section of the course focusing mainly on practical skills. Here we are able to revisit some of the required practicals completed in yr 9 and 10. We look at the tests for various gases and complete the Chromatography practical. **Electromagnetism:** Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this	**Atmosphere** This topic covers changes to the atmosphere over geological time. We include atmospheric changes due to natural phenomena in the past and the human led changes of our current atmosphere. The chemical reactions that have shaped the atmosphere are discussed in detail and possible future interactions with increased Carbon dioxide levels are included here.	

Science: Combined Curriculum Impact KS4

		FORMATIVE; *The instructional guidance that identifies central points of learning and plans for the progression of individual students.*	**SUMMATIVE;** *This describes individuals learning at the end of an instructional unit by comparing it against a standard or benchmark. (High Stakes Assessment)*	**EVALUATIVE;** *This is about institutional accountability and comes after terminal exams. External agencies.*
TIMESCAL0E	**Annually**		Exam papers are produced in house using past paper questions covering the areas of the course needed. The exams include topics from previous years to ensure students are recalling information ready for the real summer GCSE exams. Exams are marked by specialists where possible and moderated in house. Grade boundaries from the most recent exam series are used where possible. **Year 10:** - Spring exam -based upon topics taught in year 9 and 10. - End of Year assessment - based upon topics taught in year 9 and 10. **Year 11:** - Mock examinations (December and Easter) - based upon topics taught to this point in year 9, 10 and 11.	Nationally standardised summative assessment takes the form of GCSEs and vocational qualifications at the end of Key Stage 4. **GCSE exam board**: AQA Trilogy Combined science covering Biology, Chemistry and Physics **Exam structure:** - 2 exam papers per Science. - Each paper is 1h15 minutes - Each paper is marked out of 70

	Interim (Over the course of each term)		**<u>End of topic assessments:</u>** These papers are made in house using past paper questions. The tests are 45 minutes long to ensure extra time is available. Tests will occur at least twice a half term and will be preceded by a revision skills lesson ReACT tasks are given to students by their teachers using the information provided by the exam. Students also use the grade boundaries to identify the number of marks to the next grade and what areas of the topic they should focus on during ReView sessions. **<u>Workbooks</u>** Books are used as work books where students can take notes. These are not critically assessed by teachers; however the quality of presentation and content is monitored to ensure all students are coping with the rigours of the course. **<u>Practical Assessment</u>** The exam board has identified 21 practicals students will need to have a detailed knowledge of at the end of their three year GCSE in Separate science. These practicals will be used to make up 15% of each of the exam papers in the GCSE exams. We have produced practical booklets for each practical in house providing students with exam style questions while they perform the practical task. We use pink sheets when providing feedback on these practicals to identify their importance. Peer and self assessment of some practicals are used to help students understand the marking criteria. Most topics have at least 1 practical identified by the exam board as being a required practical. We will also do other practicals to enhance the teaching of certain phenomena. For topics with no practical work a written assignment is substituted for a practical write up. This may be an evaluation of a technique used in science and will require research. Grading will be standardised using a marking grid similar to that used on the longer style of exam questions.	

			Reading Assessment: To develop students ability to read and understand texts that are factual, we have implemented reading tasks. These are comprehension style activities on a range of topics linked to the specification or current events such as Vaping. Each half term a reading activity is shared and staff decide whether to complete this as part of a lesson. Work is usually peer assessed and then handed in for review.	
	Hourly	*'Every Lesson Every Day'* techniques are embedded in lessons. Formative assessment takes place using the following strategies: - Questioning - Low stakes testing - Spiral learning - Oral feedback - Whole-class feedback - Class and teaching modelling - Regular re-cap quizzes - Retrieval practice tasks		