Curriculum Plan Science

Year 7 (Key Stage 3)

	Autumn	Spring	Summer
Unit/Topics	**Introduction to Science** **Particles** **Cells** **Sound**	**Separating mixtures** **Interdependence** **Speed** **Earth Structure and Rocks**	**Electrical Voltage** **Variation and Evolution** **Energy**
Assessments	**Exam 1** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Particle and Cell topics). 2. Scientific skills (Data analysis, experimental design, variable identification and graph skills). **Multiple Choice Assessment Quizzes** Completed after each topic is completed (except Introduction to Science topic).	**Exam 2** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Particle, Cell, Sound and Separating Mixtures topics). 2. Scientific skills (Data analysis, experimental design, variable identification and graph skills). **Multiple Choice Assessment Quizzes** Completed after each topic is completed.	**Exam 3** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Particles, Cells, Sound, Separating Mixtures, Speed, Earth Structure and Rocks and Interdependence topics). 2. Scientific skills (Data analysis, experimental design, variable identification, rearranging formulas, graph skills and calculations). **Multiple Choice Assessment Quizzes** Completed after each topic is completed.
Why is it studied?	**Introduction to Science** Students are taught safety skills and safety rules to ensure they can work safely in a school laboratory. They learn the names of some important pieces of equipment, their functions and safe usage. Students learn how data can be collected, recorded and used to produce different types of graphs. These skills are fundamental to scientific investigations. **KS3 Particles** This topic explores a core principle of Chemistry, that all matter is made up of particles. Students learn about the arrangement of particles in different states and how changes of state occur. Diffusion, atmospheric pressure and the	**KS3 Separating Mixtures** Students are introduced to the Periodic Table and are taught some key terms used in Chemistry: element; compound; mixture; pure and impure. Students then move onto practical work to study how different methods are used to separate different types of mixtures, we cover filtration, evaporation, distillation and chromatography. **KS3 Interdependence** Survival of organisms is another fundamental principle of Biology, which student learn by studying feeding relationships in this topic. Students analyse food webs, food chains and pyramids of number. They study the relationships	**KS3 Electrical Voltage** Electricity is an essential part of Physics, and this topic first introduces students to it. Students learn about series and parallel circuits, how to draw them and the correct symbols to use. Students build circuits and investigate voltage and resistance. They learn what these terms mean, how they are measured and their units. **KS3 Variation and Evolution** Students revisit the concept of survival and are introduced to the key biological concept of inheritance. Student study how organisms are different and the causes of these differences. They then move

	basic structure of an atom is also covered. Students study the density of different materials and how this is measured and calculated from practical data. Students use the density formula and are introduced to formula rearrangement. **KS3 Cells** A fundamental principle of Biology is that all living organisms are made from cells. Students learn about this and the structure of cells so they can explain the role of the different cell parts. They look at how cells are used to build large multicellular organisms or exist as single cells, like bacteria. Students examine the structure of some specialised cells and are introduced to the idea that function and structure are related. Students use microscopes to exam cells and make drawings of them. **KS3 Sound** Students are taught an essential principle of Physics, that sound travels in waves. They study the effect of frequency and amplitude on sound and how echoes occur. Students study the structure of the human ear. They then relate its structure to its function of detecting sound waves. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught at primary school, where students would have followed the Science KS2 National Curriculum.**	between predators and prey and explore the relationship between the structure of the organism and its survival method. Students then look at the effect of changing numbers of organisms within an ecosystem, to fully appreciate how they are interdependent on each other. **KS3 Speed** Students learn what speed is and how it is calculated, looking at measurements and units. They learn the speed formula, and revisit formula re-arrangement, first introduced in the Particle topic. Students build graph skills by drawing and explaining distance-time graphs. Students gain practical investigation skills by examining the factors that affect the speed of a ball. **KS3 Earth Structure and Rocks** Students learn about the structure of the Earth and its three main types of rocks. They use observation skills to examine rocks and categorise them. Students then describe the rock cycle and explain the time scales used in geology. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught at primary school, where students would have followed the Science KS2 National Curriculum.**	onto to look at how variation drives the process of evolution, linking previous knowledge of structure and function. **KS3 Energy** Energy is a fundamental topic of Physics, and this topic introduces students to it. Students study the energy stores in food and fuels. They then move onto studying renewable and non-renewable energy sources. Students develop calculation skills by studying the cost of electricity. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught at primary school, where students would have followed the Science KS2 National Curriculum.**

Year 8 (Key Stage 3)

	Autumn	Spring	Summer
Unit/Topics	**Acids and Alkalis** **Light** **Breathing** **Metals and Non-Metals** **Universe and Gravity**	**Respiration** **Chemical Energy** **Electrical Current** **Human Reproduction**	**Periodic Table** **Energy** **Plant Reproduction** **Forces** **Movement**
Key Assessments	**Exam 1** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Acids and Alkalis and Light topics). 2. Scientific skills (Data analysis, experimental design, variable identification, re-arranging formulas and graph skills). **Multiple Choice Quizzes** Completed after each topic is.	**Exam 2** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Acid and Alkali, Light, Breathing, Metals and Non-Metals, Universe and Gravity, Respiration and Chemical Energy topics). 2. Scientific skills (Data analysis, experimental design, variable identification, re-arranging formulas and graph skills). **Multiple Choice Quizzes** Completed after each topic is.	**Exam 2** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Acid and Alkali, Light, Breathing, Metals and Non-Metals, Universe and Gravity, Respiration and Chemical Energy, Electrical Current and Human Reproduction topics). 2. Scientific skills (Data analysis, experimental design, variable identification, re-arranging formulas and graph skills). **Multiple Choice Quizzes** Completed after each topic is.
Why is it studied?	**KS3 Acids and Alkali** Students are introduced to the important topic in Chemistry of chemical reactions and how they are represented as chemical equations. Students are taught about the properties of acids and alkalis and how they are identified using the pH scale and indicators. Students go on to study neutralisation reactions, looking at the products produced. Students complete practical work by making an indicator solution and a metal salt. **KS3 Light** Students start this topic by looking at how light travels in waves and make links to their previous knowledge of sound waves. The students look at how light is absorbed, reflected or transmitted through different types of materials and how shadows are created.	**KS3 Respiration** Students learn about aerobic and anaerobic respiration, using their chemical equation skills to represent these processes. They develop practical skills by completing a practical investigation. Links are made to the breathing topic, studied earlier in year 8, specifically to show the relationship between respiration and breathing but to also highlight that these are different processes. **KS3 Chemical Energy** Students link together knowledge of energy from their Year 7 topic and their knowledge of chemical reactions learnt in Year 8. They are taught the meaning of endothermic and exothermic and how diagrams are used to	**KS3 Periodic Table** The periodic table is revisited again and builds knowledge from the Year 7 Separating Mixtures and the year 8 Metal and Non-metal topics. Knowledge of atomic structure is recapped from the Year 7 Particle topic. This topic extends knowledge by studying the overall lay-out of the periodic table, making links to atomic structure. Elements in Group 1, 7 and O are studied, and trends identified. The development of the periodic table is taught, and we look again at how scientific ideas have changed throughout history, which is a concept students first met during the year 8 Universe and Gravity topic.

	Students complete practical work to investigate reflection and refraction, learning how to use protractors to measure angles. Students then learn about dispersion and colour theory. **KS3 Breathing** Students are introduced to their first human body system and look at the link between function and structure. Students learn about the structure and function of the respiratory system and how these are linked together. They then study some disorders of the respiratory system. They develop practical investigation skills by planning and completing an investigation into factors affecting the rate of breathing. **KS3 Metals and Non-Metals** Students revisit the Periodic Table, which they first encountered in Year 7. They also build on chemical reaction knowledge from the Acid and Alkali topic, particularly on how chemical reactions are represented with chemical equations. Students learn about the position of metals and non-metals on the periodic table and their properties. They then study the chemical reactions of metals and non-metal oxides with water and acids. They watch these reactions and learn how to make accurate observations of them. Students are then taught about displacement reactions. **Universe and Gravity** Students are taught about the solar system and the universe that we all live in. They are introduced to the idea that scientific ideas and models change and evolve throughout time. Students study how days, night and seasons occur. Students then	represent them. They make temperature measurements of reactions to classify them during a practical. Students then learn about combustion reactions and complete a practical investigation to determine which of the chemicals they test would be the best fuel. **KS3 Electrical Current** Knowledge from Year 7 electrical circuits and resistance is revisited. This topic then teaches students what current is and the effect that a series and parallel circuit has. They then study the effect of resistance on the flow of current. Students complete many practical activities during this topic to make observations and measurements. **KS3 Human Reproduction** Students study a further human body system. Students study the male and female reproductive systems and look at the function of the different parts. They are then taught about fertilization, pregnancy, birth and the menstrual cycle. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Year 7 and at primary school, where students would have followed the Science KS2 National Curriculum.**	**KS3 Energy** The concept of energy is revisited, after being introduced in Year 7. This topic teaches students that energy is stored in eight different energy stores. When work is done, energy is transferred between stores. Students then look at the efficiency of this transfer process in different objects, they draw diagrams to represent the efficiency and perform calculations. **KS3 Plant Reproduction** This topic revisits the fundamental ideas about the importance of reproduction but focuses on how plant reproduce. Students learn about the structure of flowers; they name and explain the function of the different parts. Students then study pollination, looking at self and cross pollination, linking knowledge from the Year 8 Variation and Evolution topic. Students are then taught about seed dispersal, linking the structure of seeds and their dispersal method. **KS3 Forces** Students are introduced to another fundamental area of Physics, forces. The topic starts with students studying contact forces. They move on to look at stretching and squashing, friction and drag, then balanced and unbalanced forces. Students investigate Hooke's Law, where they make measurements and observations. **Movement** Students are introduced to another body system. They learn about the structure of the skeleton, the structure of

	move on to learn the difference between mass and weight, how these are calculated and their units. The rearrangement of mathematical formula is revisited. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Year 7 and at primary school, where students would have followed the Science KS2 National Curriculum.**		bones and joints and the functions of them. They then learn about how the body moves using muscles, working in antagonist pairs. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Year 7 and at primary school, where students would have followed the Science KS2 National Curriculum.**

Year 9 Biology (Key Stage 3 and Key Stage 4)

	Autumn (Key Stage 3)	Spring (Key Stage 4)	Summer (Key Stage 4)
Unit/Topics	**Evolution and Inheritance** **Photosynthesis**	**Cell Biology**	**Organisation – Digestion**
Key Assessments	**Exam 1** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Evolution and Inheritance and Photosynthesis topics). 2. Scientific skills (Data analysis, experimental design, variable identification and graph skills). **Multiple Choice Assessment Quizzes** Completed after each topic is completed.	**Interim Assessment** - Scientific knowledge and skills covered in Cells topic covering cells, microscopes and stem cells.	**Exam 2** Scientific knowledge and skills covered in all the Cells topic. **Exam 3** Scientific knowledge and skills covered in the Digestion topic.
Why is it studied?	**KS3 Evolution and Inheritance** This topic builds onto knowledge obtained in the Year 7 Variation and Evolution and Interdependence topics. Students learn that variation is the idea that traits are inherited or obtained from the environment that an organism lives in. They learn about the structure of DNA and how genetic traits are passed onto the next generation. They then explore the idea of inheritance. Students then learn about natural selection and biodiversity and link their genetics knowledge to these processes. **KS3 Photosynthesis** Students are introduced to the process of photosynthesis and the factors that affect its rate. They study the important role of glucose, linking their knowledge of respiration obtained in Year 8. Students are then taught about the structure of plants and leaves, linking structure and function together. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in**	**GCSE Cell Biology** This topic recaps and builds knowledge from the Year 7 Cell topic. Students are taught about the differences between different types of cells. They name the cells parts, describe their functions and observe cells using a light microscope during a required practical. Students then move on to study specialised cells and the cell differentiation process. Students are taught about Stem cells and discuss the ethical considerations surrounding their use for therapeutic purposes. Students learn how cells replicate in the process of mitosis. Students then learn about how substances are transported by studying the processes of diffusion, active transport and osmosis. They look at the structure of the lungs, the small intestine and fish gills to discover how these structures maximise the movement of molecules and this re-enforces	**GCSE Organisation: Digestion** Students are introduced to the digestive system. They study the structure of the digestive system and describe the roles of the different parts in the system that helps aid the digestion of food. This again links the structure with function. Students complete a required practical where they perform chemical tests to determine the types of molecules present in different foods. They must carefully follow methods and make observations. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science.**

	Year 7 and Year 8 and at primary school, where students would have followed the Science KS2 National Curriculum.	the idea that function and structure are linked. <u>Triple Science Only:</u> Students are taught about how microorganisms are grown inside a laboratory and complete a required practical which requires culturing bacteria. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science.**	

Year 9 Chemistry (Key Stage 3 and Key Stage 4)

	Autumn (Key Stage 3)	Spring (Key Stage 4)	Summer (Key Stage 4)
Unit/Topics	**Climate** **Types of Chemical Reactions** **Earth's Resources**	**Atomic Structure**	**Periodic Table**
Key Assessments	**Exam 1** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Climate, Types of Chemical Reactions and Earths Resources topics). 2. Scientific skills (Data analysis, experimental design, variable identification, and graph skills). **Multiple Choice Assessment Quizzes** Completed after each topic is completed.	**Interim open book assessment** Completed on Atomic Structure topic approximately halfway through the topic.	**Exam 2** Scientific knowledge and skills covered in the Atomic Structure topic. **End of Topic Assessment** Scientific knowledge and skills covered in the Periodic topic.
Why is it studied?	**KS3 Climate** Students begin the topic by studying the carbon cycle. They move on to look at greenhouse gases, linking their previous knowledge of combustion reactions taught in year 8. They then make links between these to explain the cause of Global Warming and the Greenhouse Effect and describe some of its consequences. Students are taught about carbon footprints and explore ways that they can reduce their own. **KS3 Types of Chemical Reactions** This topic revisits knowledge taught in Year 8 on chemical reactions and chemical equations. Students start the topic by studying physical and chemical changes and the difference between these processes. They then conduct practical investigations into combustion and thermal decomposition reactions. They are introduced to the idea of conservation of mass and specific examples where mass appears to change.	**GCSE Atomic Structure** This topic recaps and builds knowledge from Key Stage 3 science lessons on particles, chemical reactions and the Periodic Table. Student recap the key terms element, compound and mixtures and extend this to incorporate chemical formulas. Students are introduced to balancing chemical equations before moving on to study separating methods: filtration; evaporation; distillation; chromatography. Students are taught about the structure of the atom and how the atomic model was developed. They look at sub-atomic particles and learn how to calculate their numbers using information from the periodic table. Students then move onto draw and write electron configurations. Students are prepared for future topics, by learning the basics of bonding and ion formation.	**GCSE Periodic Table** This topic recaps and builds knowledge from Key Stage 3 science lessons on particles, chemical reactions and the Periodic Table and the GCSE Atomic Structure topic. Student first study the development of the Periodic Table and link their atomic structure knowledge to the structure of the modern table. Students then study specific areas of the periodic table, including Groups 1, 7 and 0. They learn the chemical and physical trends of these groups, and then move onto to look at their chemical reactions. Triple Science Only: Students are taught about the properties of the transition elements. **The skills and knowledge taught in these topics' revisits, builds and reinforces**

	KS3 Earths Resources Students recap the concept of resources being renewable and non-renewable, previously introduced in Year 7, but this time the focus is on all resources obtained from the Earth, rather than just energy resources. Students then study where metals are obtained from and how a reduction reaction is used inside the Blast Furnace. The topic ends with students exploring methods of recycling and its importance in helping to preserve the worlds resources. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Year 7 and Year 8 and at primary school, where students would have followed the Science KS2 National Curriculum.**	**The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science.**	**those taught in Key Stage 3 Science.**

Year 9 Physics (Key Stage 3 and Key Stage 4)

	Autumn (Key Stage 3)	Spring (Key Stage 4)	Summer (Key Stage 4)
Unit/Topics	**Pressure** **Heating and Cooling** **Magnetism**	**Particle Model of Matter**	**Atomic Structure in Physics**
Key Assessments	**Exam 1** **The exam comprises of two sections, which tests:** 1. Scientific knowledge (Pressure, Heating and Cooling and Magnetism topics). 2. Scientific skills (Data analysis, experimental design, variable identification, formula re-arrangement, calculations and graph skills). **Multiple Choice Assessment Quizzes** Completed after each topic is completed.	**Exam 2** Scientific knowledge and skills covered in the Particle Model of Matter topic.	**Exam 3** Scientific knowledge and skills covered in the Atomic Structure in Physics topic.
Why is it studied?	**KS3 Pressure** Students were first introduced to the idea of pressure in Year 7. This topic builds on this knowledge and students learn about pressure in solids, liquids and gases. Students learn pressure formulas, their rearrangement, measurements and units. Students complete an investigation into how the surface area of objects affects pressure. **KS3 Heating and Cooling** Students are taught two key concepts heat and temperature and the difference between them. They then study the transfer of heat, through conduction, convection and radiation processes. Students conduct a practical investigation to look at the effect that double glazing has on the rate of heat transfer.	**GCSE Particle Model of Physics** This topic revisits knowledge taught in the Year 7 particles topic, on the arrangement of particles in different states and density. Students complete a required practical where they measure the density of different materials. Students then go on to study the internal energy of materials and specific heat capacity. They learn what these concepts mean and how they are calculated. They complete another required practical, where they measure the specific heat capacity of different materials. Students then study changes of state and how these changes can be plotted on heating and cooling hraphs. Students are taught about specific latent heat. Student are taught throughout to perform calculations and to use the correct units. The re-arrangement of formula is revisited.	**GCSE Atomic Structure in Physics** This topic starts by recapping atomic structure knowledge covered in the Chemistry Atomic Structure topic. It then builds and links this to explain why some elements are radioactive. Students then move on to study different types of ionising radiation, their characteristics and write nuclear equations to represent these processes. Students are then taught about the half-life of radioactive isotopes and how these can be calculated from graphs and data. Students look at the risks associated with contamination and irradiation, and link this to half-life. Triple Science Only: Students study background radiation and its measurement. They then are taught about nuclear fission and nuclear fusion processes. **The skills and knowledge taught in these topics'**

	KS3 Magnets and Electromagnets Magnetism is a fundamental topic of Physics, and this topic introduces students to it. Students study what magnetism is and learn about magnetic fields. They look at the Earth's magnetic field and how these are used for navigation. Students then move onto electromagnets, looking at the effect of the number of turns of coil and current on their strength. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Year 7 and Year 8 and at primary school, where students would have followed the Science KS2 National Curriculum.**	<u>Triple Science Only:</u> Students learn about the pressure in gases and how pressure is changed. Students are taught how calculate pressure and its units; revisiting information covered in the Key Stage 3 Pressure topic. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science.**	**revisits, builds and reinforces those taught in Key Stage 3 Science.**

Year 10 Biology (Key Stage 4)

	Autumn	Spring	Summer
Unit/Topics	**Biology** **Organisation: Enzymes, Circulatory System, Lungs and Plant Transport**	**Biology** **Infection and Response**	**Biology** **Bioenergetics**
Key Assessments	**Interim Assessment 1** Scientific knowledge and skills covered in the enzyme's topic. **End of Topic Assessment 1** Scientific knowledge and skills covered in the Organisation topic taught in year 10.	**Interim Assessment 2** Scientific knowledge and skills covered in the Infection topic. **End of Topic Assessment 2** Scientific knowledge and skills covered in the Infection and Disease topic.	**End of Topic Assessment 3** Scientific knowledge and skills covered in the Bioenergetics topic. **End of Year PPE Examination** **This exam will test all scientific knowledge and skills from all GCSE topics taught in Year 9 and 10.** (Cells, Organisation, Infection and Response, Bioenergetics).
Why is it studied?	**Biology** **GCSE Organisation: Enzymes, Circulatory System, Lungs and Plant Transport** Students begin the year learning about the structure and function of enzymes, and the conditions which they operate in. Students link this to their previous knowledge of the digestive system and look at the important role that enzymes play. Students complete a required practical where they investigate the effect of pH on the activity of enzymes. Students are then taught about the circulatory system. They learn about the structure of it and explain the roles that each part plays, again linking function and structure together. Students move on to look at non-communicable diseases specifically studying coronary heart disease and evaluating the effectiveness of different treatments. Students complete this topic by studying of the structure of plants. They are taught the names of the different parts of plants and their function. They	**Biology** **GCSE Infection and Response** Disease is revisited, students study communicable disease in this topic and are taught about specific examples of bacteria, viral, fungi and protist diseases. Students move on to study how the human defence system protect us against pathogens. They study the role played by non-specific systems and the white blood cells. Students are taught about how disease is treated using antibiotics, painkillers and vaccinations, then look at how new drugs are developed. Students then move on to have a deeper understanding of non-communicable diseases by looking at risk factors for these types of diseases. They then have a focus on cancer and explain the different types of tumours as well as treatment for cancer. In this sub section of the topic, they get the opportunity to develop mathematical skills by calculating BMI. Triple Science Only: Students are taught about monoclonal antibodies and	**Biology** **GCSE Bioenergetics** The topic begins with a recap of the process of photosynthesis. Students are then taught about limiting factors that affect its rate and what the products of photosynthesis are used for. Students complete a required practical, where they measure the effect of light on the rate of photosynthesis in pond weed. Students must make accurate measurements and observations. Students then recap knowledge of aerobic and anaerobic respiration and extend this knowledge. They then link these processes to the effect of exercise on the body and the metabolic rate. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**

	are taught the role of transpiration and translocation. They link together structure and function. They also link in their knowledge of photosynthesis from year 9. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**	their uses in diagnostic tests. Students also learn about the signs of plant disease and the defence systems used by plants. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**	

Year 10 Chemistry (Key Stage 4)

	Autumn	Spring	Summer
Unit/Topics	**Bonding and Structure** **Chemical Changes**	**Electrolysis** **Energy Changes**	**Quantitative Chemistry** **Chemical Analysis**
Key Assessments	**<u>Bonding Interim Assessment</u>** Open book assessment covering the first half of the bonding topic. **<u>End of Topic Assessment 1</u>** Scientific knowledge and skills covered in the Bonding topic. **<u>End of Topic Assessment 2</u>** Scientific knowledge and skills covered in the Chemical Changes topic.	**<u>End of Topic Assessment 3</u>** Scientific knowledge and skills covered in the Electrolysis topic. **<u>End of Topic Assessment 4</u>** Scientific knowledge and skills covered in the Energy Changes topic.	**<u>End of Topic Assessment 5</u>** Scientific knowledge and skills covered in the Quantitative Chemistry topic. **<u>End of Year PPE Examination</u>** **This exam will test all scientific knowledge and skills from all GCSE topics taught in Year 9 and 10.** **(**Atomic Structure, Periodic Table, Bonding, Chemical Changes, Electrolysis, Energy Changes, Quantitative Chemistry).
Why is it studied?	**GCSE Bonding** Student recap and build on knowledge from the Atomic Structure and Periodic Table topics taught in Year 9. Students study the three types of chemical bonding that occur: ionic; covalent; metallic. They learn about how bonds form and how the material properties are linked to their bonding. Students also revisit the three states of matter, building upon their KS3 knowledge of particle models. They use melting and boiling point data to predict the state that the of material would be in. *<u>Triple Science Only:</u>* Students are introduced to the world of nanotechnology. They learn about different particle sizes and describe uses of nanomaterials. **GCSE Chemical Changes** Student will recap and then build knowledge of different types of chemical reactions, including oxidation, reduction, displacement and neutralisation. They learn to represent these	**GCSE Electrolysis** Students are introduced to the electrolysis process; they are taught what it is used for electrolysis and how it works, linking in their previous knowledge of reactivity. They study the chemical reactions occurring and predict the products made. Students are taught to write equations to represent these processes, including half equations. Students complete a required practical, where they electrolyse different solutions and test the products made. **GCSE Energy Changes** Students recap information previously taught in the year 9 energy in chemical reactions topic on exothermic and endothermic reactions. Students then build on this knowledge to perform bond energy calculations and explain why reactions are exothermic and endothermic. Students measure energy changes in a neutralisation reaction, during a required practical.	**GCSE Quantitative Chemistry** Students recap the law of conservation of mass, previously taught in year 9 and specific examples where the law doesn't appear to hold. They then move on to perform formula mass and percentage mass calculations. Students than study the concept of the mole and apply this to reacting mass, limiting reactant and concentration calculations (g/dm^{-3} only). Students learn about uncertainty in measurements, what this means and how this is calculated. <u>Triple Science Only:</u> Students are taught to perform more Chemistry calculations, they are taught to calculate concentration in mol dm^{-3}, percentage yield, atom economy and gas volumes. **GCSE Chemical Analysis** Students are taught about pure and impure substances and how these can be

	processes using chemical equations and then extend these skills to write half equations. Students will make salt crystals during a required practical and learn how to carefully follow a scientific method. Student revisit acid and alkali knowledge from Year 8 and build on this to explain what strong and weak acids and bases are. They are also taught how to calculate hydrogen ion concentrations. <u>Triple Science Only:</u> Students learn about titrations. They then perform a titration in a required practical and make accurate measurements to calculate the concentration of an unknown solution. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**	<u>Triple Science Only:</u> Student study batteries and fuel cells. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**	identified from experimental data. Students then move on to study chemical tests that are used identify specific substances. Students complete this topic, by building on their Year 9 chromatography knowledge, to calculate and interpret Rf values. They perform a chromatography experiment in a required practical. <u>Triple Science Only:</u> Student study further tests used to identify ions. During a required practical students perform flame tests to identify positive metal ions, and chemical tests to identify sulphates, carbonates, halide and hydroxide ions. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**

Year 10 Physics (Key Stage 4)

	Autumn	Spring	Summer
Unit/Topics	**Energy**	**Electricity**	**Magnetism and Electromagnets**
Key Assessments	**<u>Exam 1</u>** Scientific knowledge and skills covered in the Energy.	**<u>Interim Assessment 1</u>** Scientific knowledge and skills covered in the Circuit Electricity topic. **<u>Exam 2</u>** Scientific knowledge and skills covered in electricity topic.	**<u>Exam 3</u>** Scientific knowledge and skills covered in the magnetism and electromagnetism topic **<u>End of Year PPE Examination</u>** **This exam will test all scientific knowledge and skills from all GCSE topics taught in Year 9 and 10.** **(**Energy, Particle Model of Matter, Atomic Structure, Electricity).
Why is it studied?	**GCSE Energy** This topic recaps and builds knowledge from the Year 7 and Year 8 Energy topics. Students builds on their knowledge of energy stores and the transfer of energy between stores when work is done. Students are then introduced to energy calculations and calculate Kinetic, Elastic, Gravitational Potential Energy and revisit Specific Heat Capacity (from the Particle Model of Matter topic). They recap formula rearrangement and learn units. Students then learn how to calculate power and explain what this means. Students learn about the efficiency of energy transfers; they calculate efficiency and then explore ways for efficiency savings. Student are taught about the different types of global energy resources, describing advantages and disadvantages, their impact on the environment and trends of use. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**	**GCSE Electricity** This topic starts by recapping and re-enforcing circuit electricity knowledge taught in year 7 and 8. Students then extend their knowledge and are taught about charge, resistors, IV graphs and power. Students measure resistance in electrical circuits during two required practical sessions. They also investigate how current and potential difference vary for different circuit components (IV characteristics), and how temperature and light intensity impact the resistance of thermistors and light dependent resistors, respectively. Students learn about mains electricity and the National Grid. <u>Triple Science Only:</u> Students are taught about static electricity and electric fields. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**	**GCSE Magnetism and Electromagnetism** Knowledge builds from that taught on magnets in year 9. Students are taught about magnetic fields and electromagnetism. Knowledge is then extended to Flemmings Right-Hand and Left-Hand rules, the motor effect and how loudspeakers work. <u>Triple Science Only:</u> Students are taught about induced potential, the generator effect, microphones and transformers. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 GCSE topics.**

HAGLEY CATHOLIC HIGH SCHOOL
SEMPER FIDELIS

Semper Fidelis – "Always Faithful"
Called as God's family
we strive to achieve our personal best,
by living and learning in Christ

EMMAUS
CATHOLIC MAC
Our journey with Christ

Year 11 Biology (Key Stage 4)

	Autumn	Spring	Summer
Unit/Topics	**Ecology** **Homeostasis and response**	**Inheritance, Variation and Evolution.**	**Revision**
Key Assessments	**Interim assessment - ecology** Pupils will sit an interim assessment which will cover half the content covered in Ecology. **Interim assessment - Homeostasis** Pupils will sit an interim assessment which will cover half the content covered in Homeostasis. **End of topic assessment - Ecology** This exam will test all scientific knowledge covered in ecology. **End of topic assessment - Homeostasis** This exam will test all scientific knowledge covered in Homeostasis. **Year 11 PPE Examination 1** This exam will test all scientific knowledge and skills from all GCSE topics taught in Year 9, 10 and 11 so far. (Cells, Organisation, Infection and Response, Bioenergetics, Ecology).	**Interim assessment** Pupils will sit an interim assessment which will cover half the content covered in Inheritance, Variation and Evolution. **End of topic assessment** This exam will test all scientific knowledge covered in Inheritance, Variation and Evolution.	**Year 11 PPE Examinations 2** These exams will test all scientific knowledge and skills from the following topics: Ecology, Homeostasis and inheritance **Public GCSE Combined Science Examinations** Biology Paper 1 Biology Paper 2
Why is it studied?	**GCSE Ecology** Food webs, chains and interdependence is re-visited at the beginning of this topic. Students are then taught about the biotic and abiotic factors that affect survival and how species adapt to survive. Students study the recycling of materials in the environment. Students investigate how population sizes are affected by the environment during a required practical.	**GCSE Inheritance, Evolution and Inheritance** Students recap reproduction, previously studied in Year 8 and move on to look at the role meiosis plays in the production of the gametes. Students recap knowledge of DNA and the genome, which leads to students being taught about how characteristics are inherited. They study the effect that dominant and recessive traits have on the genotype and phenotype of an organism. Students learn about some	

	Students then learn about waste management, deforestation, land usage and global warming. They are taught about biodiversity and the effect that these factors are having on it. <u>Triple Science Only:</u> Students are taught about decomposition, food security, farming techniques, sustainable fishing and how biotechnology is helping food production processes. Students study food pyramids, their trophic levels and transfer of biomass between levels. Students investigate the effect of temperature on the rate of decay of milk, using pH changes in a required practical. **- GCSE Homeostasis** Students learn what homeostasis is, why it's important and how it is maintained. Students study the nervous system; they learn the names of the different parts and explain what each part does. Students then go on to study the endocrine system and the role of negative feedback. They learn about the organs and glands involved, the names of the hormones they secrete and the role these hormones play in the body. Student study how blood glucose levels are controlled and the causes of diabetes and its treatment. Students look at the role of hormones in the human reproductive system. They study how these hormones link with contraception.	specific genetic disorders and how sex is determined. Students then build on Key Stage 3 knowledge of variation and evolution and learn about selective breeding and genetic engineering. Students study the evidence of evolution, fossils, extinction and antibiotic resistance in bacteria. Students learn about how different organisms can be grouped and classified. <u>Triple Science Only:</u> Students are taught in more detail about the structure of DNA and the theory of evolution and speciation. Students are also taught about cloning. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 and 10 GCSE topics.**	

	<u>Triple Science Only:</u> Students learn about the function of the brain and the eye. They learn about the different parts and explain what they do. They are taught about sight problems and how these are treated. Students also learn about how water levels are maintained in the body and how temperature is controlled. Students study the role that plant hormones play in their development. They also look at how plant hormones are used in agriculture and horticulture. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 and 10 GCSE topics.**		

Year 11 Chemistry (Key Stage 4)

	Autumn	Spring	Summer
Unit/Topics	**Organic Chemistry** **Chemistry of the Atmosphere**	**Rates of Reaction** **Using Resources**	**Revision**
Key Assessments	**Year 11 PPE Examination 1** **This exam will test all scientific knowledge and skills from all GCSE topics taught in Year 9, 10 and 11 so far.** **(**Atomic Structure, Periodic Table, Bonding, Chemical Reactions, Electrolysis, Energy Changes, Quantitative Chemistry, Organic Chemistry, Chemistry of the Atmosphere).	**End of Topic Assessment 1** Scientific knowledge and skills covered in the Rates of Reaction topic.	**Year 11 PPE Examinations 2** **This exam will test all scientific knowledge and skills from the following topics.** Chemical Analysis Organic Chemistry, Chemistry of the Atmosphere, Rates of Reaction, Using Resources. **Public GCSE Combined Science Examinations** Chemistry Paper 1 Chemistry Paper 2
Why is it studied?	**GCSE Organic Chemistry** Students are introduced to organic chemistry. They are taught about the formation and use of crude oil and its separation during the fractional distillation process. They study alkane molecules and their uses. Students are then taught about cracking and are introduced to the alkenes. Triple Science Only: Students study the alkenes further, studying more molecules and their reactions. Students are also taught about the alcohols and carboxylic acids. Students learn about condensation, addition and naturally occurring polymers. **GCSE Chemistry of the Atmosphere** Students learn about how the atmosphere first formed and how its changed over time. They learn about the data used to create this	**GCSE Rates of Reaction** Students begin the topic by studying rates of reaction, they learn what this means and how it is calculated from data and from graphs. Students then learn about collision theory and use this to explain why some factors change the rate of reaction. Students investigate the effect that temperature and concentration have on the rate of reaction in two required practical lessons. Students are then taught about reversible reactions and the idea of a chemical equilibria. They learn about Le Chatelier's Principle and use this to make predictions on the position of equilibrium when conditions are changed. **GCSE Using Resources** Students revisit the concept of using the Earths finite	

	timeline, its limitations and why there are uncertainties. Students then revisit knowledge from year 9 Chemistry and study how the atmosphere is still changing and how humans are driving these processes. They study the Greenhouse Effect, Acid Rain and Carbon Footprints. They look at what these problems are, their effects and ways they can be made better. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 and 10 GCSE topics.**	resources and the need for sustainability. Two alternative sources of copper extraction are explored and the need for them discussed. Students then learn about life cycle assessments and recycling. Students are then taught about how potable water is produced and how wastewater is treated. Students complete a required practical where they analyse water samples. <u>Triple Science Only:</u> Students study alloys, corrosion and its prevention and the different properties of different types of materials. They are taught about the Haber process, the production of fertilizer and its uses. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 and 10 GCSE topics.**	

Year 11 Physics (Key Stage 4)

	Autumn	Spring	Summer
Unit/Topics	**Forces**	**Waves** **Space Physics (Triple Science Only)**	**Revision**
Key Assessments	**<u>Year 11 PPE Examinations 1</u>** **This exam will test all scientific knowledge and skills from all GCSE topics taught in Year 9, 10 and 11 so far.** **(**Energy, Particle Model of Matter, Atomic Structure, Electricity, Magnets and Electromagnets, Forces)	**<u>Exam 1</u>** This exam will test all scientific knowledge covered in the Forces and Waves topic.	**<u>Year 11 PPE Examinations 2</u>** **This exam will test all scientific knowledge and skills from all topics taught this year.** **<u>Public GCSE Combined Science Examinations</u>** Physics Paper 1 Physics Paper 2
Why is it studied? *(Why are these topics taught here? Why is it important? How does it link with prior or future knowledge? What skills are taught which build on previous or link to future?)*	**GCSE Forces** Students re-visit Key Stage 3 knowledge from the Forces, Speed and Gravity topics. Students learn about contact and non-contact forces. They are taught how to calculate mass and weight and how to work out a resultant force. Students then apply their energy knowledge and study the forces in springs and work done by these forces. Students investigate the relationship between force and the extension of a spring in a required practical. Students then move onto study speed and velocity. They study graphs and perform calculations. Newtons Laws of Motion are taught. Students then look at the stopping distance of cars and the many factors that have an effect on it. Students are introduced to the concept of momentum, how to calculate it, and the principle of conservation of momentum.	**GCSE Waves** Students study the different types of waves, incorporating their knowledge of Key Stage 3 light and sound. They learn about the characteristics of transverse and longitudinal waves and calculate periods and frequency. Students measure the speed of waves in a liquid and in the air during a required practical. Students move on to study the electromagnetic spectrum, they learn about the types of waves present, their properties, hazards, and their applications. <u>Triple Science Only:</u> Students revisit Key Stage 3 light knowledge and study reflection and refraction of light. They investigate the reflection and refraction of light in different mediums in the required practical. Students then study sound and ultrasound, and how these waves are used for detection and exploration purposes.	

	<u>Triple Science Only:</u> Students are taught about moments, levers, and gears. Students are then taught about pressure in fluids and gases in the atmosphere, including some calculations. Students are taught about momentum, what it is, how it is conserved and how it is calculated. Students build upon their understanding of the conservation of momentum and use this to describe collisions and explosions. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 and 10 GCSE topics.**	Students learn about lenses, visible light, and black body radiation. **GCSE Space Physics (Triple Science Only)** Students learn about the solar system and the galaxy that Earth is part of. They learn about the life cycles of stars. They use their knowledge of gravity and apply it to the orbits of planets. Students study the red-shift and how it is used by scientists. **The skills and knowledge taught in these topics' revisits, builds and reinforces those taught in Key Stage 3 Science and Year 9 and 10 GCSE topics.**	

Year 12 Biology (Key Stage 5)

	Autumn	Spring	Summer
Unit/Topics	**Biological Molecules** Carbohydrates Lipids Proteins Nucleic acids ATP Water and Inorganic Ions **Cells** Cell Structure Cell Division Transport across cell membranes Cell recognition and immune system	**Organisms exchange substances with their environment** Surface area to volume ratio Gas Exchange Digestion and Absorption Mass Transport **Genetic information, variation and relationships between organisms** DNA, genes and Chromosomes DNA and Protein Synthesis Meiosis Genetic diversity and adaptation Species and taxonomy Biodiversity within a community Investigating diversity	**Genetics, populations, evolution and ecosystems** Populations in ecosystem Sampling **Maths Skills** Standard Deviation Paired T Test Spearmans Rank Chi Squared **Essay Writing Skills**
Key Assessments	**Interim Assessments** Scientific knowledge and skills will be tested halfway through a module to identify any gaps in understanding or skill. **End of topic assessments** Scientific skills and knowledge will be tested at the end of each topic. **Required Practicals** Pupils will complete a range of practicals and be assessed according to competencies.	**Interim Assessments** Scientific knowledge and skills will be tested halfway through a module to identify any gaps in understanding or skill. **End of topic assessments** Scientific skills and knowledge will be tested at the end of each topic **Mixed Topic assessment** This assessment covers content and skills covered in Cells and Biological Molecules while also providing experience in sitting a mixed topic assessment to support understanding **Required Practicals** Pupils will complete a range of practicals and be assessed according to competencies	**Interim Assessments** Scientific knowledge and skills will be tested halfway through a module to identify any gaps in understanding or skill. **End of topic assessments** Scientific skills and knowledge will be tested at the end of each topic. **Year 12 PPE Examinations** This exam will test all scientific knowledge and skills from content covered in Biological Molecules, Cells, Organisms exchange substances with their environment and genetic information, variation and relationships between organisms. **Required Practicals** Pupils will complete a range of practicals and be assessed according to competencies

Why is it studied?	**Biological Molecules** This is one of the first modules taught as students require a strong understanding of the chemical properties of molecules to understand further Biology topics. Students will cover the structure, function and bonding of various biological molecules including carbohydrates, lipids and proteins. While also looking at how we can test for the presence of these molecules. This will build on knowledge of digestion and food tests from GCSE Biology as well as polymers and bonding covered in GCSE Chemistry. Students will build on knowledge covered in GCSE Biology of DNA to deepen their understanding of the structure of nucleic acids and how this forms a polymer. This is then revisited in year 12 and 13 modules. Students will explore the role of enzymes and enzyme activity revisiting their GCSE knowledge. They will then look at this at a deeper level with the disruption of bonds on a biochemical level causing denaturing and the use of competitive and non-competitive inhibitors. This knowledge will then be developed further throughout the course e.g. in the homeostasis module. Pupils will be first introduced to the idea of ATP, water and mineral ions within this module. Looking at the role of each element and how they are utilised in an organism. This is a key idea in biology and will be revisited in many of the modules. Pupils will undertake one required practical in this module which will focus on the following skills: following methods and selecting correct apparatus. This is a key skill for students to be successful in their practical work	**Organisms exchange substances with their environment** Pupils will have covered the structure of the heart, circulatory system and lungs at GCSE. They will have also looked at exchange surfaces at a basic level. They will also have covered the structure and role of the Xylem and Phloem. Pupils will then go on to look at these topics in more detail and expand their knowledge by looking at gas exchange in insects and fish. While also looking at complex ideas like oxygen dissociation curve and Bohr effect. Plant transport is explored in more detail with the mechanism of transpiration and translation being taught. These ideas will be revisited in year 13 in different modules e.g. control of heart rate in organisms' response to change and photosynthesis in energy transfers between organisms. Pupils will have the opportunity to complete a heart and fish head dissection in this module which will focus on safely using equipment and revisiting the idea of correctly drawn scientific drawings. **Genetic information, variation and relationships between organisms** Pupils begin this module by reviewing knowledge of the structure of DNA and chromosomes in eukaryotic cells which has been covered in GCSE and the Biological Molecules topic. They will then look at how this structure compares to RNA. Pupils will then be introduced to the idea of genetic code, protein synthesis and learn how to transcribe and translate DNA.	**Genetics, populations, evolution and ecosystems** Pupils will recap their knowledge on sampling and quadrating covered at GCSE. They will build upon their knowledge and skill by learning different sampling techniques e.g. mark capture, release and having the opportunity to develop their own method to consider how to control different variables. This a skill which will have been supported by accurately following a method in the earlier required practicals. **Maths Skills** Strong maths skills are required for the course. Within the Autumn and spring modules pupils will be exposed to different mathematical question. Any areas of weakness in their knowledge will be identified and support lessons provided. Pupils will learn how to conduct and interpret statistical tests alongside writing hypothesises. These skills will be revisited in year 13, with a specific focus on conducting these after predicting inheritance. **Essay writing skills** Pupils are expected to write competently around a biological theme in their public examination at the end of year 13. Pupils are introduced to the essay questions and begin to plan a response to these. For some students this is a new skill that they need to develop. This is introduced towards the end of year 12 as students have sufficient scientific knowledge

	and needs to be developed early on. **Cells** Pupils begin with this module as it underpins all content taught in Biology. Students recap the basic structure of a cell and then delve into the further detail by looking at the role of Golgi apparatus and endoplasmic reticulum amongst other organelles. Students then look in more detail at prokaryotic cells. Pupils are then provided the opportunity to develop their microscopy skills by producing microscope slides and practicing scientific drawing. They will explore their knowledge on light and electron microscopes. Pupils will also develop their maths skills by calculating complex magnification questions. The knowledge and skills developed will be assessed throughout the biology course. Pupils will then move on to looking at cell division with a recap of cell cycle and mitosis from GCSE. They will then look at the details of each stage of the cell cycle including a deeper understanding of mitosis. This will be revisited in Genetic information, variation and relationships between organism's module when it is compared with meiosis. Further into this module, students will look at transport across cell membranes. This will link with GCSE content as well as the work done with lipids in the Biological Molecules module. Pupils will also revisit the idea of diffusion, osmosis and active transport but identify through practical work how these processes can be affected by a	Pupils who have taken triple science will have a basic understanding of protein synthesis, but further detail is introduced for example the idea of splicing. Pupils will revisit these themes in Year 13 when completing the gene expression module. Pupils then move onto Meiosis with this being mentioned at GCSE and the idea of cell division being covered in the cell's module at AS level. Pupils will look at the stages of meiosis and then how this leads to genetic diversity. Pupils will then look at directional and stabilising selection which involves further developing graph skills. Pupils will remember from GCSE the idea of classification and the binomial naming system. At A level they will look at this further with how classification links to identifying evolutionary relationships. Using the knowledge developed from this module, pupils will look at species diversity and the impact of human activities on an ecosystem. Pupils will learn about different ways in which diversity can be investigated and calculated. This provides an opportunity for pupils to develop mathematical skills by calculating the index of diversity alongside calculating mean, mode, median, range and standard deviation. This will be support their studies in year 13. Pupils will undertake a required practical which will show antibiotic resistance. They will learn aseptic technique and understand the importance of	to be able to successfully answer a question while also providing plenty of opportunity for feedback. In year 13, pupils are set a range of essay questions to upscale their essay writing skills. This will be an invaluable skill for students who go on to higher education.

	range of different factors. This further allows them to develop their practical skills including successfully following a method and using specialist equipment. The last part of the module will cover immunology. Pupils have a basic understanding of the role of lymphocytes from GCSE but the role of B and T lymphocytes is introduced in further detail and the specific impact this has on vaccination is explored further. These two modules provide the building blocks of knowledge for Biology, which is then built upon in subsequent modules. They begin to improve their practical and maths skills through a range of practical opportunities and maths questions.	this. This will support students if they decide to take a biological course at university.	

Year 12 A Level Chemistry (Key Stage 5)

	Autumn	Spring	Summer
Unit/Topics	**AS Level Physical Chemistry** Atomic Structure Amount of Substance Bonding Energetics **AS Level Inorganic Chemistry** Periodicity Group 2 Elements **AS Level Organic Chemistry** Introduction to Organic Chemistry Alkanes	**AS Level Physical Chemistry** Kinetics Chemical Equilibria Redox **AS Level Organic Chemistry** Alkenes Halogenoalkanes Alcohols	**AS Level Physical Chemistry** Thermodynamics **AS Level Inorganic Chemistry** Group 7 Period 3 Periodicity **AS Level Organic Chemistry** Chemical Analysis **A Level Organic Chemistry** Optical Isomerism Aldehyde and Ketones
Key Assessments	**End of Topic Assessments** Scientific skills and knowledge will be assessed at the end of each topic.		**End of Topic Assessments** Scientific skills and knowledge will be tested at the end of each topic. **Year 12 PPE Examinations** This exam will test all scientific knowledge and skills from the AS level topics studied during the year.
Why is it studied?	**- AS Level Physical Chemistry: Atomic Structure** Students build on their GCSE knowledge of atomic structure. They explore orbitals and sub-shells in electron configurations, and then link this to ionisation energies and patterns seen in the Periodic Table. Students are taught about how the Time of Flight Mass Spectrometer works and the data obtained from it. They are taught how this data is interpreted and perform calculations with it. **- AS Level Physical Chemistry: Amount of Substance** Students begin this topic by recapping their Quantitative Chemistry knowledge from GCSE on relative formula mass, the mole, reacting masses, limiting reactants, atom economy and yield calculations. Students are	**AS Level Physical Chemistry: Kinetics** Students again use GCSE knowledge at the beginning of this topic, to study rates of reaction. They study what rate of reaction is, how it is calculated from data and graphs and the factors that affect the rate. This knowledge is expanded, and students learn about the Maxwell-Boltzmann Distribution curve. They look at the effect of changes to gases on the distribution curve. Students investigate the effect of temperature on the rate of reaction in a required practical. They must plan this experiment and research the different methods to carry it out. Students are taught to assess	**- AS Level Inorganic Chemistry: Group 7** Knowledge of atomic structure, electron configurations and bonding is applied to group 7 of the Periodic Table. Patterns are identified and explained. Students then study displacement reactions, how bleach is made and the use of chlorine to treat water. Students perform chemical tests to identify halide ions in a required practical. They also perform further chemical tests to identify sulphate, carbonate, ammonium and hydroxide ions. **A Level Physical Chemistry: Thermodynamics** This follows on from the information taught in the Year

	then taught to perform more complex calculations using these techniques. Students that learn about the ideal gas equation, and how to calculate an empirical formula. Students take part in two required practicals' where they make a volumetric solution and then use it in a titration. Accurate measurements are needed and they use their results to calculate the concentration of an unknown solution. **- AS Level Physical Chemistry: Bonding** Students study the three types of chemical bonds and the physical properties of substances, using their GCSE knowledge. They then go on to study the shapes of molecules, and intermolecular forces in greater detail. **AS Level Physical Chemistry: Energetics** Students start the topic by recapping GCSE knowledge on exothermic and endothermic reactions and bond energy calculations. Students then go on to study Hess's Law and apply this to perform Enthalpy of Formation and Enthalpy of Combustion calculations. Students are taught about enthalpy changes in chemical reactions and how data is obtained and how it is used to calculate energy changes. Students complete a required practical where they measure the energy change in a chemical reaction. They need to record their accurate measurements and then calculate the energy change from their data. **AS Level Inorganic Chemistry: Periodicity** Knowledge of electron configurations, ionisation energies and bonding is applied to the periodic tables. Patterns are identified and explained.	risk and how to write risk assessments. **AS Level Physical Chemistry: Chemical Equilibria** Students start the topic by recapping their GCSE knowledge of reversible reactions, le Chatelier's principle and how its used to predict the effect that changes have on the position of equilibria. Students expand this knowledge by studying industrial processes and explain why compromise conditions are often used. Students then are taught about the Equilibrium Constant, Kc. They are taught how to write Kc expressions, how to calculate Kc values and units and also how to calculate concentrations in an equilibria system. Finally, they study the effect on Kc when the conditions of the system are changed. **AS Level Physical Chemistry: Redox** Students start the topic with a re-cap of half equations. They are then taught to write more complex ones. They learn the meaning of oxidation, reduction, oxidising agent and reducing agent. They then learn to calculate oxidation numbers and work out what has been oxidised and reduced in chemical reactions. **AS Level Organic Chemistry: Alkenes** Students recap the IUPAC naming rules to name alkene molecules and the different types of isomers that can exist. They then study the reactivity of these molecules and look at the electrophilic addition reaction. They draw mechanisms, write equations and predict products.	12 Energetics topic. Students learn about the definitions of enthalpy changes and write equations to represent these processes. Students then are taught to draw Born-Haber Cycles and apply knowledge of Hess's Law to calculate enthalpy changes. Students learn about enthalpy of solution and how this can be calculated. Students complete the topic by learning about entropy. They learn what this is and how it can be calculated. This is used to calculate Free-Energy and determine if a chemical reaction is feasible or not. Numerical and graphical data is used for this type of calculation. **AS Level Organic Chemistry: Chemical Analysis** Students learn about the chemical tests that are used to identify different organic molecules, including alkenes, alcohols, aldehyde, ketones and carboxylic acids. Students then recap their knowledge of mass spectrometry and then apply this further to high resolution spectrometry. Students learn about Infra-Red Spectroscopy, to understand how the technique works, the spectra produced and how these are interpreted. **A Level Organic Chemistry: Optical Isomers** Isomerism is re-capped and knowledge is extend to optical isomers. Students are taught how optical isomers exist, how they are detected and what happens when there is a mixture of optical isomers.

	AS Level Inorganic Chemistry: Group 2 Knowledge of atomic structure, electron configurations and bonding is applied to group 2 of the Periodic Table. Patterns are identified and explained. Students then study the chemical reactions of group 2 metals with water and the look at the solubility of group 2 compounds. They then study some use of the group 2 metals. **AS Level Organic Chemistry: Introduction** Students are introduced to organic compounds, looking at different types of molecules and functional groups. They are taught about the different ways that organic compounds are represented and how IUPAC rules are used to name them. Students are taught about isomerism and the different types of isomers that exist. **AS Level Organic Chemistry: Alkanes** GCSE knowledge is recapped, looking at alkane molecules, crude oil and fractional distillation. Cracking is explored in more detail. The pollution problems associated with the combustion of alkane molecules is recapped from GCSE and then taught with more detail to include chemical equations and some solutions to these problems. Students learn about free radical substation reactions and the production of halogenoalkanes. They are taught about the problems with the ozone layer that occur has a result of this process.	Student then go on to study addition polymerisation. They study the properties of polymers and look at how monomers, repeating units and polymers are represented in diagrams. **AS Level Organic Chemistry: Halogenoalkanes** Students recap IUPAC naming rules and how the halogenoalkanes are named and the isomers that exist. Students are then taught about the chemical reactivity of these molecules. They study nucleophilic substitution and the elimination reactions, where they draw mechanisms, write equations and predict products. Students learn how to name the nitrile and amine molecules that are produced from these reactions. **AS Level Organic Chemistry: Alcohols** Students recap naming rules and how the alcohols are named and the isomers they have. They then move on to classify alcohol molecules. Students are taught about the chemical reactions of alcohol molecules, the dehydration and oxidation reactions. Students learn to draw mechanisms and write chemical equations. Students learn how to apply IUPAC rules to name the aldehyde, ketone and carboxylic molecules produced. Students learn about the different methods of producing alcohols, by fermentation and hydrating alkenes. Biofuels are taught and the advantages and	

		disadvantages of their use discussed. Students complete required practical work by oxidising alcohols and then using chemical tests to identify the products made.	

Year 12 Physics (Key Stage 5)

	Autumn	Spring	Summer
Unit/Topics	**AS Unit 2 Particles and radiation** **-Particles** (Atom constituents- NB no electron shell-, stability, particles and anti-particles and their interactions, classification, quarks, and conservation laws **-Electromagnetic radiation and quantum effect.** (photoelectric effect, energy levels and photon emission – NB Chemistry will have covered orbitals by now) **-Wave particle duality** **AS Unit 3 Waves** **-Progressive and Stationary Waves** (longitudinal and transverse waves, superposition and standing waves) **-Refraction, diffraction, and interference.** (Interference, diffraction, refraction)	**AS Unit 5 Electricity** **-Current electricity** (IV characteristics, Resistivity, Circuits, Potential Divider, EMF and Internal Resistance **NB Alternating currents from Magnetic Fields in A2 is taught here.** **AS Unit 4 Mechanics and Materials** **-Forces, energy, and momentum** (Scalars, Vectors, Moments, 1-d motion, Projectile motion, Newton's Laws, Momentum, Work and Power, Conservation) **-Materials- properties and Young Modulus**	**A Level Unit 6 Further Mechanics and thermal physics** **-Periodic Motion** (Circular motion Simple Harmonic Motion Resonance) **-Thermal Physics** (energy transfer, ideal gases and kinetic theory)
Key Assessment	**End of Topic Assessments** Scientific skills and knowledge will also be tested and embedded withing questions.	**End of Topic Assessments** Scientific skills and knowledge will also be tested and embedded withing questions.	**End of Topic Assessments** Scientific skills and knowledge will also be tested and embedded withing questions. **Year 12 PPE Examinations** This exam will test all scientific knowledge and skills from the AS level topics studied during the year.
Why is it studied? *(Why are these topics taught here? Why is it important? How does it link with prior or future knowledge? What skills are taught which build on previous or link to future?)*	**A Level: Unit 1 Measurements and their errors.** This topic is taught and developed throughout the A level course rather than a separate stand-alone unit. the following skills are covered: **SI units and prefixes** Students will start the course using units from 1 million down to 1 millioneth. e.g. M, k, c, m, µ.	**Unit 5 Electricity** This section builds on and develops earlier GCSE study of electricity. It provides opportunities for the development of practical skills at an early stage in the course and lays the groundwork for later study of the many electrical applications that are important to society.	**Unit 5 Further Mechanics** Mechanics is a natural follow on topic after material. (Some aspects of Further Mechanics are covered in the Summer Term of AS Maths e.g. radians and circle theory. The earlier study of mechanics is further advanced through a consideration of circular

	However, during some topics, for example, the nuclear size topic, even smaller units are used such as n, p, f, **Limitations of physical measurements.** Students will be used to using the following terms at GCSE: Random and systematic errors. Precision, repeatability, reproducibility, resolution, and accuracy. Experiments completed in Unit 5 will develop the ideas of uncertainties and students will be able to express these uncertainties as both Absolute and Percentage. This leads on to learning how to express uncertainties in graphs as error bars and maximum and minimum gradients. **Use of apparatus and techniques.** Equipment's of increasing complexity are used throughout the course in the Required Practicals. GCSE equipment is used at the start, with then moving on to use more advanced pieces of equipment such as dataloggers and vernier microscopes. **Mathematical skills** Students have used algebra with increasing complexity throughout GCSE (also in Maths). In Mechanics they will need to use quadratic equations. In various situations throughout the Further Mechanics topic and other topics at A- Level students will need to solve and rearrange exponential and logarithmic relationships. **Graph Skills** Students plot Y=mx and Y=mx+C type linear relationships from Year 9 onwards. Tangent to curves will have occasionally been used at GCSE (motion) and these will be used more frequently in Mechanics. Natural and logarithmic plots will be used in Year 13 for exponential decay in Fields and Resonance. **Geometry**	Electricity has two Required Practicals and many practicals that will develop their skills and understanding of uncertainties. **<u>Unit 4 Materials and Mechanics</u>** Vectors and their treatment are introduced, followed by development of the student's knowledge and understanding of forces, energy, and momentum. The section continues with a study of materials considered in terms of their bulk properties and tensile strength. Similar experimental techniques are used in the Required Practicals (e.g. the use of micrometres and vernier scales) so that students can truly consolidate their mastery of these skills.	motion and simple harmonic motion (the harmonic oscillator). A further section allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in-depth.

	Small angle approximation will be used in the Circular Motion section of the Further Mechanics topic. **A Level Required Practicals:** The skills taught during these practicals are worth 15% of marks on the three A level papers. **AS Level Physics - Unit 2 Particles and Radiation.** This topic helps to develop a sense of intrigue within students and encourages them to ask big questions. The topic begins with a brief review of the structure of the atom and builds upon their prior knowledge. Students are then introduced to the fundamental building blocks of matter and the fundamental interactions between particles. These cannot be broken down into anything smaller or more basic, so can be thought of as responsible for everything in the observable universe. This section also introduces students to the nature of electromagnetic radiation and quantum phenomena. Through a study of these topics, students become aware of the way ideas develop and evolve in Physics. They will appreciate the importance of international collaboration in the development of new experiments and theories in this area of fundamental research. **AS Level Physics: Unit 3 Waves** GCSE studies of wave phenomena are extended through a development of knowledge of the characteristics, properties, and applications of progressive and stationary waves. Topics include refraction, diffraction, superposition, and interference. Students conduct their first		

	required practical as they investigate the impact of frequency on mode of vibration in stationary waves.		

Year 13 Biology (Key Stage 5)

	Autumn	Spring	Summer
Unit/Topics	**Energy Transfers in and between organisms** Photosynthesis Respiration Energy and Ecosystems Nutrient Cycles **Organisms responses to changes in their internal and external environments** Survival and response Receptors Control of heart rate Nerve impulses Synaptic transmission Skeletal muscles Control of blood glucose concentration Osmoregulation	**Genetics, populations, evolution and ecosystems** Inheritance Populations Evolution **The Control of gene expression** Gene mutations Gene expression Regulation of transcription and translation Cancer Using genome projects Gene technologies **Revision**	**Revision**
Key Assessment	**Interim Assessments** Scientific knowledge and skills will be tested halfway through a module to identify any gaps in understanding or skill. **End of topic assessments** Scientific skills and knowledge will be tested at the end of each topic **Year 13 PPE Examinations** This exam will test all scientific knowledge and skills from all the AS level topics alongside topics taught in Autumn 1 in Year 13.	**Interim Assessments** Scientific knowledge and skills will be tested halfway through a module to identify any gaps in understanding or skill. **End of topic assessments** Scientific skills and knowledge will be tested at the end of each topic	**Year 13 PPE Examinations** This exam will test all scientific knowledge and skills from all the topics taught in year 12 and year 13. **Public examinations** **Final Course Examinations** A Level Biology – Paper 1 A Level Biology – Paper 2 A Level Biology – Paper 3
Why is it studied? *(Why are these topics taught here? Why is it important? How does it link with prior or future knowledge? What skills are taught which build on previous or link to future?)*	**A Level Biology: Energy Transfers in and between organisms** Pupils will have covered photosynthesis at GCSE looking at the products and reactants of the process and limiting factors of photosynthesis. At A level students will look at the process of photosynthesis in greater detail covering the light independent and light dependant reactions. Students will explore the factors affecting photosynthesis in more detail by discussing compensation points	**A Level Biology: Genetics, populations, evolution and ecosystems** Pupils will start this module looking at inheritance which will build on from work done in year 12. They will recap genetic keywords including dominant, recessive, homozygous and heterozygous. They will also look at monohybrid inheritance which was introduced at GCSE. Pupils will learn how to predict inheritance when it is being influenced by different	

	and exploring how rate can be affected by many factors simultaneously. Pupils will complete a range of required practicals within this subtopic including isolating pigments in chlorophyll and investigating the light Independant reaction of photosynthesis. These build on the skills taught in year 12. Pupils will have covered respiration at GCSE by comparing the different types of respiration. At A level pupils build on that knowledge by studying the various reactions of respiration including glycolysis, link reaction and Krebs cycle and then moving on to oxidative phosphorylation. Finally, they will compare the energy yields of aerobic and anaerobic respiration. Following on from this, pupils study food chains including energy transfers which will have been introduced at GCSE. They then go on to study various nutrient cycles including the nitrogen and phosphorous cycle. This may be a new idea to some students if they did not take Triple Science. Pupils will then put this learning into practice and explain the use of fertilisers and the environmental impact of the use of these fertilisers. **A Level Biology: Organisms respond to changes in their environment** Pupils recap their knowledge on the nervous system from GCSE and build on this by introducing the ideas of action potentials and how they are generated while also looking at the structure and function of synapses. Following this, pupils will then look at various receptors within	situations including codominance, multiple alleles, sex and autosomal linkage and epistasis. Pupils will then revisit chi squared to apply their learning to a new situation. Pupils will then go on to learn about and apply the Hardy-Weinberg principle which will support their mathematical skills. Pupils will recap their previous knowledge of natural selection and expand this to identify how natural selection is applied in different situations. This knowledge will then help support students understanding of speciation and allow them to explain the two different types of speciation. Finally in this module, pupils look at populations in the ecosystem which includes a recap of terminology used at GCSE and then looks at how predation and competition affects population sizes. This subtopic allows pupils to apply their knowledge to an unfamiliar situation. **A Level Biology: The Control of gene expression** Pupils will build on the content taught in year 12 on gene mutations by recapping the different types of gene mutations and then exploring the causes for these mutations. They will then learn about the different types of stem cells and how they can be used to treat various diseases which is knowledge developed from GCSE. Following on from covering protein synthesis in year 12, pupils will then go on to look at how this is regulated by transcription factors and epigenetics. This knowledge is then applied when learning about how gene expression can	

	organisms including cones and rods and the Pacinian corpuscle. Pupils will recap their knowledge on the heart from year 12 and GCSE. They will then begin to look at how the nervous system controls heart rate and how this can be changed in different situations. This then leads into looking at chemoreceptors and pressure receptors. This links many different topics covered within the course. Pupils are then introduced to a new idea on taxes, kinesis and trophism and how this relates to plant growth factors. This topic links in with photosynthesis so is introduced after this has been taught. Pupils then move onto muscles and look at the types, structure and contraction of muscles. This links with many topics within the course e.g. inorganic ions, cell structure and synapses. Pupils will then look at Homeostasis, which is studied at GCSE when covering negative feedback. Pupils will go on to look at how homeostasis is controlled in more detail including how to regulate body temperature and regulating blood glucose concentration. Some pupils will have covered osmoregulation in triple science, so a recap or introduction of the kidney is taught. Students will then look in more detail about the structure of the kidney and the roles of the different parts of the nephron. This knowledge links in with organic ions and transport across membrane subtopics taught in year 12.	cause the rise of tumours to form in the body. This will then provide students with an appreciation of how genes are controlled and expressed. Lastly, pupils will look at a range of different gene technologies which will build on the content learnt in year 12 and earlier on in the module. Pupils will study how to produce DNA fragments, clone genes and copy fragments of DNA (PCR) which will support their understanding of how to locate and screen genes to support forensic science and medical diagnosis.	

	This module includes analysing and interpreting a range of different graphs and develops further practical skills from the two required practicals within this module. The required practicals have a specific focus on appropriately referencing resources. This is something we develop in year 13 after students have done their EPQ.		

Year 13 Chemistry (Key Stage 5)

	Autumn	Spring	Summer
Unit/Topics	**<u>Physical Chemistry</u>** Rate Equations Gaseous Equilibria Electrochemistry **<u>Organic Chemistry</u>** Aldehydes and Ketones Carboxylic Acids and Derivatives Aromatic Chemistry Amines and Amides	**<u>Physical Chemistry</u>** Acids and Bases **<u>Inorganic Chemistry</u>** Transitional Metals **<u>Organic Chemistry</u>** Polymers Amino acids, protein and DNA Organic Synthesis and Analysis Chromatography	**<u>Revision</u>**
Key Assessment	**End of Topic Assessments** Scientific skills and knowledge are tested at the end of each topic. **Year 13 PPE Examinations** This exam will test all scientific knowledge and skills from all the AS level topics and the A level topics taught during year 12 and 13.	**End of Topic Assessments** Scientific skills and knowledge are tested at the end of each topic.	**Year 13 PPE Examinations** This exam will test all scientific knowledge and skills from the AS and A Level topics taught in year 12 and 13. **Public examinations** **Final Course Examinations** A Level Chemistry – Paper 1 A Level Chemistry – Paper 2 A Level Chemistry – Paper 3
Why is it studied? *(Why are these topics taught here? Why is it important? How does it link with prior or future knowledge? What skills are taught which build on previous or link to future?)*	**A Level Physical Chemistry: Rate Equations** Students recap knowledge from the Kinetics topic in Year 12 on rates of reaction and how this are calculated from data and from graphs. They then learn about rate equations, how to write them and how to calculate the rate constant. Students are taught how to work out the rate order from data and graphs. They learn about the rate determining step and then the Arrhenius Equation. Students investigate rate of reactions using an initial and a clock method during required practicals. **A Level Physical Chemistry: Gas Equilibria** Student recap their knowledge of chemical equilibria from Year 12 and move on to learn about equilibria in gaseous systems.	**A Level Physical Chemistry: Acids and Bases** Students quickly recap GCSE knowledge of acids and bases. Students are taught about reactions in water, the equilibria formed and the Ionic Product of Water (Kw). Students then learn about the pH scale; how pH and hydrogen ions concentrations are calculated. Students move on to learn about weak acids and how to calculate Ka and pKa values. Students use their titration skills from Year 12 to perform more acid and base titrations and calculations. They study pH curves when different combinations of strong and weak acid and bases are used, and the suitable indicators employed. Students use a pH probe to monitor pH changes	

	They learn about mole fractions, Kp and perform calculations. They study the effect of changing the conditions of the equilibria on the value of Kp. **A Level Physical Chemistry: Electrochemistry** Students begin by recapping their knowledge of half equations and oxidation and reduction processes. They are taught about the cells, electrode potentials and the chemical reactions that occur. Students learn about batteries and fuel cells. They learn about how these work, the chemical reactions that occur and the advantages and disadvantages of using them. Students measure the EMF of electrochemical cells during a required practical. **A Level Organic Chemistry: Aldehydes and Ketones** The topic begins with a recap of the IUPAC naming rules for aldehydes and ketones, their functional groups and chemical tests that are used to identify them. Students then learn about the chemical reactions of these molecules; reduction and nucleophilic addition reactions. Students learn to draw mechanisms, write equations and predict products. Students are then taught about the hydroxynitrile molecules, how they are produced, how they are named and their isomeric nature. Students learn how to assess risk and about the risks associated with these specific molecules. **A Level Organic Chemistry: Carboxylic Acids and Derivatives** The topic begins with a recap of the IUPAC naming rules for carboxylic acids, their functional group, chemical properties and the chemical test that is used to identify them.	during a required practical titration. Finally, students learn about buffers, they are taught what they do, how they work and how to perform pH and concentration calculations with them. **A Level Physical Chemistry: Transitional Metals** Students are introduced to transitional metals. They look at the characteristics these elements have that classifies them has being transition metals, along with their other chemical and physical properties. Students move on to study complex ions; their shapes, ligands, oxidation states, and isomerism exhibited. They then learn why they appear has coloured compounds and how this can be used to determine concentrations, using a colorimeter. Students are then taught about ligand substation reactions, looking at stability, variable oxidation numbers and haemoglobin in greater detail. Students use their titration skills to calculate concentrations of transitional elements and then learn about the different types of catalysts used in Chemistry. Finally, students are taught about the chemical reactions of complex ions and the colours produced, that can be used to identify them. Students use chemical tests, to identify transitional metal compounds in solutions, in a required practical. **A Level Organic Chemistry: Polymers** Students extend their polymers knowledge from Year 12 to cover condensation	

	Students then learn about the esterification reaction. They are taught how to name ester molecules and what they are used for. Students then move on to look at the hydrolysis reactions of esters. Ester knowledge is then applied to fats, oils and biofuels. Students then are introduced to the acyl chloride and acid anhydride molecules. They learn about their properties, how IUPAC rules are used to name them and their chemical reactions. Students complete two required practicals' during this topic to produce aspirin and an ester. They must carefully and safely follow a method and understand the steps involved. **A Level Organic Chemistry: Aromatic Chemistry** Students are introduced to benzene. They are taught about its structure, stability and how to name molecules containing benzene rings. Students then learn about the chemical reactions of benzene, the electrophilic substitution reaction, nitration and Fiedel-Crafts Acylation. **A Level Organic Chemistry: Amines** The topic begins with a recap of the amines and how these molecules are named. Students then learn about their structure, their basic nature and how they are used has cationic surfactants. Students recap the nucleophilic substitution reaction which produces amines from halogenoalkane molecule, then extend this to study how this reaction continues because of the	polymerisation. They recap how monomers, repeating units and polymers are represented in diagrams. Students study polyamide and polyester polymers, their chemical make-up, properties and hydrolysis reactions. Students complete the topic by studying the biodegradability of polymers and methods that are used to disposed of them. **A Level Organic Chemistry: Amino acids, protein and DNA** Students use GCSE knowledge to recap the structure of amino acids. They study the amphoteric nature of the molecules, how they are named and zwitterions. They learn how amino acids are used to assemble proteins, looking at the different levels of their structure and the bonding holding them together. Students study enzymes, their function and the role of inhibitors. Students then learn about the structure of DNA and the chemical bonds present. They learn about Cisplatin and how it is used has an anti-cancer drug. **A Level Organic Chemistry: Organic Synthesis and Analysis** Organic synthesis pulls together all the students organic chemistry knowledge to design pathways to convert molecules into different types. Students must create pathways of multiple reactions to create a desired molecule. They will need to know reagents and conditions needed.	

	nucleophilic nature of amines. Students also study the how amines are produced from nitriles and how aromatic amines are produced. Students are also taught about the amides and their structure.	C-12 and H-1 NMR spectroscopy is introduced to students. They learn how these techniques work, the spectra produced and how they are interpreted. **A Level Organic Chemistry: Chromatography** Students recap the basics of chromatography. They student Thin-Layer Chromatography; how its performed, how it works, results obtained and their interpretation. Students perform Thin Layer Chromatography (TLC) to separate and identify amino acids during a required practical. Students then move on to study the theory behind column chromatography and gas chromatography. They are taught how to interpret the results obtained from these techniques.	

Year 13 Physics (Key Stage 5)

	Autumn	Spring	Summer
Unit/Topics	**A Level Physics: Fields and their consequences** Gravitational Fields Electric Fields Capacitance Magnetic Fields	**A Level Physics: Nuclear Physics** Rutherford Scattering Types of radiation Decay and Instability Nuclear radius Fission and Fusion Safety **A Level Physics: Turning Points in Physics.** Electrons Wave particle duality- revisiting AS content EM waves Special Relativity	**Revision**
Key Assessments	**End of Topic Assessments** Scientific skills and knowledge are embedded within each assessment. Synoptic questions will increasingly be used so that	**End of Topic Assessments** Scientific skills and knowledge are embedded within each assessment. Synoptic questions will increasingly be used so that knowledge and	**Year 13 PPE Examination 2** This exam will test all scientific knowledge and skills from the AS and A Level topic taught in year 12 and 13.

	knowledge and application of AS content is mastered. **Year 13 PPE Examination 1** This exam will test all scientific knowledge and skills from all the AS level topics and the A level topics taught during year 12 and 13.	application of AS content is mastered.	**Public examinations** **Final Course Examinations** A Level Physics – Paper 1 A Level Physics – Paper 2 A Level Physics – Paper 3
Why is it studied?	**A Level Physics: Fields and their consequences** The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications include planetary and satellite orbits. Circular motion is applied and revisited from further mechanics, Through the study of capacitance, exponential decay is introduced, along with Natural logarithms, their charge and discharge through resistors, and electromagnetic induction. Students are taught about how these have considerable impact on modern society.	**A Level Physics: Nuclear Physics** Students build on the work of from the Particles and Radiation topics, as well as GCSE content, to link the properties of the nucleus in the production of nuclear power. Students are taught about the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass (mass-energy equivalence). Students learn that physics underpins nuclear energy production and about the impact this can have on society. **A Level Physics Option: Turning point in physics.** This option gives students the opportunity to learn about key concepts and developments in Physics in much greater depth and detail than what would be delivered with just the core content. Students are taught to appreciate, from historical and conceptual viewpoints, the significance of major paradigm shifts for the subject in the perspectives of experimentation and understanding. Students can appreciate that many present-day technological industries are the consequence of these key developments.	