Curriculum Overview

Whole School Curriculum Principles:

Personalised - The curriculum and learning is personalised to meet the needs of our students.
Challenging - Our curriculum is designed to challenge students to think hard, work hard and make excellent progress
Diverse - Students access a diverse and engaging curriculum. Learning is immersive and students' subjects provide both depth and breadth.

Science Curriculum Statement: The world is on the brink of irreversible destruction. A number of the problems we face can, and will, be solved through good science. At Ernesford Grange, we strive to develop a science curriculum which will enable all of our students to develop their enquiry skills, to be curious, and to appreciate their surroundings in a scientific way. The next generation of scientists will play the most important role for our existence. The curriculum will provide a spiral pathway to year-on-year improve subject knowledge, with deeper understanding of all the fundamental concepts that drive science.

Year 7

In year 7, we have used the AQA syllabus for KS3 to provide a breadth of scientific knowledge and disciplinary skills needed to thrive in upper school qualifications, building upon the science curriculum delivered in primary school.

	Topics / Units Studied	Core skills and knowledge students will learn	Assessed through
Autumn 1	Science Passport Particle Model	The disciplinary knowledge and skills required to thrive in a science lab. Building on primary school knowledge on solids, liquids and gases, focussing on how we can change from one state to	One Practical assessment of skills - to include collecting data in tables, drawing a graph accurately, and analysing the data.

		another	A GL Assessment in Science
Autumn 2	Cells Contact Forces	Studying the building blocks of life, and the organelles that they possess with their functions. Developing the knowledge of KS2 forces and contextualising their everyday experiences due to forces, such as tensions, compressions, turning forces and more.	An assessment on cells An holistic assessment looking at everything studied in year 7 up to that point. Practical assessment linked to forces
Spring 1	Movement Pressure Scientific Investigations	Develop understanding in the mechanics of how our body moves by studying the skeleton and muscular systems. Expanding on contact forces, students will be able to explain what happens when we apply forces across a surface, be that a solid, a liquid or a gas. Exploring the students recall of their science passport, students will spend some time developing their ability to plan scientific investigations appropriately.	A midpoint assessment focussing on movement and observations made during a dissection. One holistic assessment focussing on pressure and movement, but to include content from all of year 7.
Spring 2	Separating Mixtures Metals and Non-Metals Acids and Alkalis	How to extract substances from mixtures The differences between metallic and non-metallic materials The effect of acids and alkalis, and how to neutralise them	One holistic assessment. One midpoint assessment on mixture separation
Summer 1	Human Reproduction Plant Reproduction Units Energy Stores	The science of fertilisation, the growth of the foetus and how the body supports this Understanding how plants can reproduce and thrive The importance of measuring things, and what we measure them in The different forms of energy, and how it can transfer.	One holistic assessment Two midpoint assessments - human reproduction, and energy stores
Summer 2	Energy Costs Voltage, Current and Resistance	As fuel bills rise, we investigate why, and how costs can be reduced Electrical circuits are built, and we investigate the effect on current by varying potential difference, and also the effect of various components being added to a circuit.	One holistic assessment End of year assessment Practical assessment

Year 8

In year 8, we have designed a curriculum in line with the National Curriculum, supported by the AQA KS3 syllabus, to continue to develop the students' depth in scientific knowledge. There are dedicated lessons to enhance disciplinary learning, so all students, as they edge closer to beginning their GCSEs, will have all the requisite scientific tools to thrive. We continue to develop a deeper understanding in the fundamentals of science including covering life processes in Biology, reactions of metals in Chemistry and exploring the universe in Physics.

	Topics / Units Studied	Core skills and knowledge students will learn	Assessed through
Autumn 1	Photosynthesis Respiration Food Chains Variation	A focus on Biology, understanding how plants make their food, and how plants and animals utilise food to produce the energy needed to survive. Students will understand the life processes that provide the balance within our atmosphere. Students then understand how energy absorbed from the Sun, transfers to all living things.	Two midpoint assessments One holistic assessment focussing on year 7 content
Autumn 2	Inheritance Metals and Non-Metals Acids and Alkalis Climate	We continue exploring genetics, and identifying how there is variation within species. Then we move onto Chemistry, exploring specific reactions involving acids and alkalis, and characterising elements into metals and non-metals. Finally, we look at Earth's climate, and how this has evolved, and how precarious the balance is currently.	Two midpoint assessments - one of which will be in response to a class debate, and one holistic assessment.
Spring 1	Earth Structures Science Passport	Understanding the makeup of the Earth. The disciplinary knowledge and skills required to thrive in a science lab.	One midpoint assessment, and science passport assessment.
Spring 2	Speed	An introduction to kinematics and using an equation, along	Science passport assessment and

		with interpreting graphs	one holistic assessment
Summer 1	Universe Sound Light	An exploration of the vastness of the universe, appreciating our local stellar structures and more distant galaxies. Students then focus on two predominant examples of wave energy transfers, light and sound, exploring their properties and their uses.	One midpoint assessment on all the topics covered
Summer 2	Systems Global Resources	Students gain deeper understanding of breathing, before analysing the resources, or lack of, provided by the Earth, and what the next generation can do to prevent possible disaster.	Final midpoint assessment, and an end of year exam

Year 9

In year 9, we have designed a bespoke curriculum for 2023/24 which provides a contextualised bridge between KS3 and KS4. There is an unapologetic focus on disciplinary knowledge, enabling students to understand the incredible contribution to science and engineering that Coventry has provided. Students will develop mathematical skills, and artistic development too. The importance of the scientific method is communicated, before we move onto the fundamental concepts of cells, atoms and particles to offer an introduction to the AQA GCSE suite of science courses.

	Topics / Units Studied	Core skills and knowledge students will learn	Assessed through
Autumn 1	Disciplinary Knowledge Science Capital	Students will utilise their KS3 science knowledge and skills, and have the opportunity to explore different contexts, such as Coventry's huge impact on science and engineering. Exploring the habitats around the school, discovering how to observe the universe, along with correlating core Maths skills to science will be the main focus.	One midpoint assessment, a science passport assessment, and one practical holistic assessment.
Autumn 2	Disciplinary Knowledge	Students will continue to enhance their mathematical skill set in preparation for their GCSEs. Students will investigate the science involved in forensics, the science of mental health and wellbeing, and will learn about the historical lack of scientific representation and recognition of females and BAME scientists. By the end of this half term, students should be able to plan, carry out and analyse an experiment.	Science at home presentation, lab report and a midpoint assessment.
Spring 1	Cells	The fundamental building blocks of all living things. Students will study in detail many different cells, their functions and the organelles that cells are made up of. Microscopy will be studied before understanding how substances can transfer in and out of cells.	Biology midpoint assessment and a required practical.

Spring 2	Cells / Atomic Structure	Atoms are fundamental to all matter. Students will learn the constituent sub-atomic particles that make up atoms, their individual properties and how to differentiate between varying elements. There is a large focus on how atomic theory has evolved over the last 200 years.	Biology Midpoint, and required practical. One holistic Assessment. One chemistry midpoint assessment
Summer 1	Periodic Table / Particle Model of Matter	Once atomic structure is understood, the periodic table is studied, focussing especially on groups 1, 7 and 0. The students then move onto a Physics module looking at solids, liquids and gases, kinetic theory, and how we can change between these states. Density and Specific Heat capacity provide topics that feature two required practicals.	Two holistic assessments and a Physics midpoint assessment.
Summer 2	Radioactivity	Exploring Specific latent heat and gas particle behaviour, then leads onto the study of radioactivity. This builds upon atomic structure, but focuses on unstable nuclei. Students learn about alpha, beta and gamma radiation, observing demos with radioactive sources, before exploring half-life, and the possible issues with radiation and contamination.	Physics midpoint assessment and end-of-year mock exams in Biology, Chemistry and Physics

Year 10

In year 10, lessons are taught in specialism as students begin their GCSEs - Triple - AQA 8461, 8462, 8463, and 8464 Trilogy. We also offer an alternative route where we deliver the entry level course alongside combined science for suitable students. We have a planned weekly revision lesson for all students, to guarantee interleaving of knowledge and coverage of year 9 content. This year embeds the fundamentals before covering the main body of GCSE content. There is the equivalent of 65 lessons per subject in this year. A successful year 10 will enable students to be fully prepared for year 11 and final exams, as well be primed for a successful post-16 education.

	Topics / Units Studied	Core skills and knowledge students will learn	Assessed through
Biology	Organisation Infection and Response Bioenergetics	Knowledge developed around body organs and systems, disease and how we fight / prevent them, before studying in great depth photosynthesis and respiration. Required practicals in food tests, enzymes, and photosynthesis are completed, along with the opportunity for heart dissections	There will be one holistic assessment during the Biology rotation, along with a midpoint assessment and an end of year mock exam on all Biology content covered.
Chemistry	Bonding Chemical Changes Energy Changes Rates of Chemical Reactions Quantitative Chemistry	Students discover and compare different types of chemical bonding, before moving onto electrolysis. Students compare the two classifications of chemical reactions; exothermic and endothermic. Rates of reaction are calculated, which is followed by the higher end maths skills found in quantitative chemistry, such as balancing chemical equations, calculating mass changes and calculating relative formula mass and moles.	There are two midpoint assessments and one holistic assessment during the Chemistry rotation during year 10. There will also be an end of year mock exam on all Chemistry content covered.

Physics	Forces Electricity	The two largest topics in GCSE Physics are covered in Year 10. In forces, students focus on kinematics, work done, materials science, Newton's Laws and Momentum. There are two required practicals in Forces; Hooke's Law, and Newton's 2nd Law, which require the use of light gates and data loggers to gain results. In electricity, students work on the fundamentals of charge, current, potential difference and resistance. They explore the nature and behaviour of a variety of electrical components, before looking at the bigger picture of generation, the National Grid and the power of everyday appliances at home. Two further required practicals; length of wire vs resistance, and the I-V characteristic curves for a fixed resistor, lamp and diode are also completed.	During the Physics rotation, there are three midpoint assessments, two holistic assessments and a mock exam at the end of the year.

Year 11

In year 11, lessons are taught in specialism as students begin their GCSEs - Triple - AQA 8461, 8462, 8463, and 8464 Trilogy. We have a planned weekly revision lesson for all students, to guarantee interleaving of knowledge and coverage of year 9 and 10 content. Mock exams are planned in October and March, with Question Level Analysis guiding interventions provided. This year sees students complete their GCSE courses by the end of February, before bespoke revision is offered tohelp all students be best prepared for the examinations in May and June. There are six papers in total, 2 for Biology, two for Chemistry and two for Physics.

	Topics / Units Studied	Core skills and knowledge students will learn	Assessed through
Biology	Homeostasis and Response Inheritance, variation and Evolution	In the first topic, students build knowledge around how the human body regulates. They study the nervous system, before focussing on specific examples of homeostasis such as blood glucose levels. Students will develop their knowledge of hormones, applying it to various situations such as the menstrual cycle, reproduction and their use in contraception and treating infertility. Building upon lessons in year 8, students study genetics in greater depth, understanding the system of inheritance, how organisms within the same species can vary, and how they may evolve over a long period of time. The evidence provided by fossils to support such theories is investigated, before studying the effects of selectively using desirable characteristics in farming. Students will complete required practicals on reaction time.	There will be one holistic assessment during the Biology rotation, along with two midpoint assessments. There are two formal mock exams in October and March.
Chemistry	Chemical Analysis Organic Chemistry Qualitative Chemistry recap	Students use different practical techniques to analyse chemicals, such as chromatography and gas tests. In organic chemistry, students will develop their knowledge around hydrocarbons, which make up the crude oil we use for many functions, such as petrol. There is some interleaved revision of quantitative chemistry built into this	There are two midpoint assessments and one holistic assessment during the Chemistry rotation during year 10. There will also be an end of year mock exam.

	Chemistry of the Atmosphere Using Resources	year's curriculum, in response to identified student needs. The final part of GCSE Chemistry sees students understanding the evolution of and the current chemical composition of the Earth's atmosphere. The catastrophic effects of Global Warming will be investigated here. Finally, students will consider the use of resources from the Earth, such as water, metals from the crust and so on. The importance of recycling is studied, alongside the vital role Chemistry plays in extracting these resources effectively.	
Physics	Electricity Electromagnetism	In electricity, students work on the fundamentals of charge, current, potential difference and resistance. They explore the nature and behaviour of a variety of electrical components, before looking at the bigger picture of generation, the National Grid and the power of everyday appliances at home. Two further required practicals; length of wire vs resistance, and the I-V characteristic curves for a fixed resistor, lamp and diode are also completed. The students bring all their knowledge together from electricity, energy and forces to understand the physics of how electrical current can be generated, but also how we can use electrical currents and magnets to produce the Motor Effect. Applications covered include the microphone and speaker	This cohort studied waves in their year 10 rather than electricity During the Physics rotation, there are two midpoint assessments and one holistic assessment. There are two formal mock exams in october and March.

Year 12 and 13

In 16+, we currently offer three A-Levels in Biology, Chemistry and Physics. Biology study the AQA A-Level Biology course 7402. Chemistry study the OCR A Chemistry A-Level course H432. Physics study the OCR A Physics A-Level course H556.

All courses are taught with one triple morning session and one afternoon double session a week, to provide opportunity for students to complete in-depth practical work.

A PAG is a practical taken from the practical activity group - each student must complete twelve of these covering a predefined set of skills, for students to be able to achieve their practical endorsement

Year 12

Biology Year 12			
Autumn 1	3.1 Biological molecules 3.1.1 Monomers and Polymers 3.1.2 Carbohydrates 3.1.3 Lipids 3.1.6 ATP 3.1.7 Water 3.2 Cells 3.2.1 Cell structure 3.2.2 All cells arise from other cells (mitosis)	3.1 Despite the complexity of life, all life forms are made of 4 groups of carbon containing compounds. During this module students will explore the structure and properties of carbohydrates, lipids and ATP. Students will also explore the properties of water and will apply this knowledge to explain why it is fundamental to all life forms. 3.2 Students will learn about the structure and function of eukaryotic and prokaryotic cells and will apply this	Midpoint a : Biological molecules. MIdpoint b : The structure of cells. Holistic 1. Required practical 2: Preparation of stained squashes of cells from plant root tips; set-up and use of an optical microscope to identify

		knowledge to explain how specialised cells are adapted for their function. Students will then further develop their understanding of cells by learning about the stages of the cell cycle and cell division. Students will apply their knowledge of mitosis to understanding the causes and diagnosis of cancer.	the stages of mitosis in these stained squashes and calculation of a mitotic index.
Autumn 2	3.2.3 Transport across membranes 3.1.4 Proteins 3.1.5 Nucleic acids 3.1.8 Inorganic ions	3.2.3 Students will learn about the structure and function of the cell membrane and apply this to the fluid mosaic model. Students will also learn about the different ways in which cells transport substances across their membranes. Students will evaluate the different factors which affect membrane permeability in required practicals 3 and 4. 3.1 Students will learn about the structure and function of different types of proteins and will apply this knowledge to explain the specificity of enzymes in reactions. Students will then learn about the structure of nucleic acids and the role of ions in organisms.	Midpoint c: Proteins and enzymes Midpoint d: Transport across membranes. Holistic 2 PAG 1, 3 and 4.
Spring 1	3.2.4 Immune system. 3.3 Exchange with the environment 3.3.1 Surface area to volume ratios 3.3.2 Gas exchange 3.3.3 Digestion & Absorption	3.2.4 Students will learn about the specific markers on cells which allows the immune system to recognise cells as “self” and “non-self”. Students will further develop their understanding of cell signalling to describe the humoral and cell-mediated response. Students will learn the molecular structure of antibodies and will apply this to the context of monoclonal antibodies. 3.3 Building on their knowledge from 3.2.3 students will learn about the different ways in which multicellular organisms are adapted to exchange substances from the environment.	Midpoint e : Immune response Midpoint d : Exchange surfaces. Holistic 3. PAG 6

Spring 2	3.4 **Genetic information, variation and relationships between organisms** 3.4.1 DNA, genes and chromosomes 3.4.2 DNA and protein synthesis 3.3.4 Mass Transport	3.4 Students will extend their prior knowledge from GCSE about DNA, genes and chromosomes. To describe the universal genetic code of all living things. Students will then explain how the DNA code is used to form proteins. 3.3.4 Students will describe how substances are transported around organisms in both mammals and plants.	PAG 5
Summer 1	3.4.3 Genetic Diversity can arise from mutation and meiosis 3.4.4 genetic diversity and adaptation 3.4.5 Species and Taxonomy 3.4.6 Biodiversity within a community 3.4.7 Investigating biodiversity	3.4 Students will learn about the stages of meiosis and will describe how the arrangement and behaviour of chromosomes can lead to genetic diversity. Students will then, using examples such as the peppered moth, explain the variation that leads to natural selection. Organisms exist with each other independently within an ecosystem. Students will explore the many factors which threaten biodiversity in ecosystems and will explore the ways in which scientists monitor biodiversity.	PAG 12
Summer 2	Maths skills and maths assessment Practical skills Exam practice		

Chemistry	**Topics / Units Studied**	**Core skills and knowledge students will learn**	**Assessed through**

Year 12			
Autumn 1	Module 1 – Development of practical skills in chemistry Module 2 – Foundations in chemistry Atoms, compounds, molecules and equations, electron structure	Module 1 is developed throughout the 2 years - AS/A2. Learners carry out various practical skill including: using specialised apparatus; carrying out a range of techniques; recording/processing/analysing/interpreting/evaluating; various mathematical skills such as calculating uncertainties, using standard form and sig figs. Module 2: Learners learn about atoms, ions, compounds in more depth. Learners use the mole formulas to calculate unknowns in various chemical equations; Learners learn how to write electron configurations that include energy levels and sub shells..	Entry Exam (Level 3 questions covering: quantitative chemistry; bonding and structure; atomic structure). Practical endorsement: PAG 1.1: Moles determination
Autumn 2	Module 2 – Foundations in chemistry Acid–base and redox reactions Electrons, bonding and structure Module 4 – Core organic chemistry Basic concepts Hydrocarbons	Module 2: Learners will learn about shapes of molecules and bond angles. What determines the shape/structure of a molecule; and types of intermolecular forces. Learners learn the A level definition of acid and base; carry out titration calculations; prepare a standard solution. Learners apply the rules for assigning oxidation states to determine the oxidation state of atoms in compounds and in chemical equations. Learners must then determine whether a species has been oxidised/reduced, and write half equations. Module 4: Learners are introduced to organic chemistry and learn about; types of organic compounds specifically nomenclature; alkanes;alkenes;and reactions; preparation and isomerism	End of topic and holistic assessments. Topic Practical endorsement: PAG 2.1: Acid Base Titration
Spring 1	Module 3 – Periodic table and energy The periodic table and periodicity Group 2 Reactivity Trends. Qualitative Analysis. Halogens. Module 4 – Core Organic Chemistry Alcohols and haloalkanes	Module 3: Learners explore patterns in atomic structure, electron structure, atomic radii and ionisation energy across the periodic table. Pupis use this information as evidence for electron shells. Pupils carry out practical activities to find patterns in reactivity of group2 metals, metal oxides, metal hydroxides. Learners learn more about the physical and chemical properties of group 7 elements; trends in reactivity; reactions of chlorine with water; tests for halide ions.	End of topic and holistic assessments. Practical endorsement: PAG 3: Enthalpy Determination

		Pupils carry out qualitative analysis to identify the presence of various anions and cations. Module 4: Pupils learn how alcohols and halogen alkanes are prepared; their reactions and reaction mechanisms.	
Spring 2	Module 3 – Periodic table and energy Enthalpy changes Reaction rates and equilibrium (qualitative) Module 4 – Core organic chemistry Organic synthesis Analytical techniques (IR and MS)	Module 3: Learners are introduced to Hess's cycle and how it is used to calculate enthalpy of reaction using bond energies; enthalpy of combustion; enthalpy of formation. Learners use the Maxwell Boltzmann Distribution of energies to explain how temperature, pressure and catalysts affect the rate of reaction.Pupils carry out experimental, record results and use their graphs to determine the rate of reaction. Pupils learn how Le Chatelier's Principle is used to explain the effect of various factors on a reversible reaction. Learners learn how to compare reversible reactions quantitatively by calculating the equilibrium constant. Module 4: Pupils explore different pathways to obtain organic chemical given various reactants. Pupils must learn the reagents used, conditions required and mechanisms for each pathway. Learners are introduced to instrumental methods of identifying organic compounds such as: IR spectroscopy; Mass Spectroscopy; use instrumental methods to identify organic compounds.	End of topic and holistic assessments. Practical endorsement: PAG 4.1: Qualitative analysis of ions PAG 5.1: Synthesis of an organic liquid. PAG 9.1: Rates of reaction – continuous monitoring method
Summer 1	Exam practise, Practical skills continued, key skills in preparation for A2 and	Extra practise on exam questions and more opportunity to develop practical skills. Revise topics to prepare for end of year exams	End of topic and holistic assessment End of year mock exams: Complete AS Breadth Paper and AS Depth Paper. Practical endorsement: PAG 1.2: Moles determination

	final year exams: complete AS paper 1 and 2 Focus on application questions		PAG 2.2: Acid Base Titration PAG 3.2: Enthalpy Determination PAG 4.2: Qualitative analysis of ions PAG 5.2: Synthesis of an organic liquid.
Summer 2	Preparation for A2 content. Module 5: Physical Chemistry and Transition Elements; Rates of Reaction. Module 6: Organic Chemistry and Analysis; Aromatic Chemistry	Module 5: Learners learn how to determine the rate constant, order of reaction, rate of reaction; graphically and using experimental data. Module 6: learners are introduced to aromatic chemistry and learn about the structure of benzene and how it was derived; the physical and chemical properties of benzene. Learners learn about the mechanisms of the reactions of benzene.	End of Topic and Holistic Assessments. Pag 10.1: Rate Determination

Physics Year 12	**Topics / Units Studied**	**Core skills and knowledge students will learn**	**Assessed through**
Autumn 1	2.1 Physical quantities and units 2.2 Making measurements and analysing data 2.3 Nature of quantities 3.1 Motion 3.2 Forces in Action 4.1 Charge and current 4.3 Electrical circuits	Module 2 introduces important conventions and ideas that permeate the fabric of physics. Understanding of physical quantities, S.I. units, scalars and vectors help physicists to effectively communicate their ideas within the scientific community. In the first two sections of module 3, learners will learn how to model the motion of objects using mathematics and revisit key ideas surrounding forces. 4.1 and 4.3 have been brought together as the foundational topics of electrical circuits.	Entry exam (Level 3 GCSE questions - covering forces, waves and electricity) PAGs: 1.1 Acceleration of free fall 1.2 Terminal velocity 4.1 Investigating electrical circuits

		This half term thoroughly builds on and reinforces students' learning from GCSE, ensuring they have the foundations (both in knowledge and mathematical skills) to be successful in A Level Physics	
Autumn 2	3.3 Work, energy and power 4.2 Energy, power and resistance	Without an understanding of circuits, as established in 4.3, a discussion of energy, power and resistance in circuits is difficult. Hence why 4.3 follows.	Assessment: 3.1 & 3.2 PAGs: Efficiency of a motor (or similar electricity/mechanics practical) 3.1 Resistivity of a metal
Spring 1	3.4 Materials 4.4 Waves	In 3.4 learners examine the physical properties of springs and materials. Learners will take into consideration these properties in the context of engineering and other industrial settings for material selection. In 4.4 learners will build upon their GCSE knowledge of wave properties and electromagnetic waves, introducing superposition and stationary waves. Learners will be able to explain procedures for taking measurements of waves and describe uses for various wave types.	Assessment: 4.1-4.3 PAGs: 2.1 Determining Youngs modulus 2.2 Springs in series and parallel 5.1 Determining Wavelength with Diffraction Grating 6.2 Experiments with light
Spring 2	3.5 Newton's laws of motion and momentum 4.5 Quantum physics	In 3.5, learners revisit Newton's laws – fundamental laws that can be used to predict the motion of all colliding or interacting objects in applications such as sport. Learners will further develop their mathematical analysis skills as well as using the laws to explain features in cars, such as air bags, and to evaluate the benefits and risks of such features. Quantum physics, as introduced in 4.5, is arguably the one section of year 12 that may be brand new to learners. Photons, the photoelectric effect, wave-particle duality and De Broglie waves will be introduced to learners who will develop their knowledge in order to describe each.	Assessment: 3.3 and 3.4 PAGs: 6.1 Planck's constant

Summer 1	Revision and exam practice	All of the yr 12 content will have been completed. This half term allows for consolidation of all these topics, revisiting areas of weakness (identified through AfL and summative assessments) and revising for end of year exams.	Breadth paper
Summer 2	Begin Yr 13: 5.1 Thermal physics 5.2 Circular moton	5.1 provides knowledge and understanding of temperature, matter, specific heat capacity and specific latent heat with contexts involving heat transfer and changes of phase. Learners will be able to use Newton's Laws to analyse pressures in gases. 5.2 provides knowledge and understanding of circular motion and important concepts such as centripetal force and acceleration. The physics in all these cases can be described and analysed using the ideas developed by Newton. The concepts in this section have applications in many of the later sections within this course.	Breadth and Depth papers (unseen) PAG 12: Research work to be completed over the summer holidays

Year 13

Biology Year 13			
Autumn 1	3.5 Energy transfers in and between organisms.	Life depends on the continuous cycling of energy, in this module students will build upon their understanding of the structure and function of organelles to explain how photosynthesis and respiration occur. Students will also analyse the interactions between organisms in an ecosystem on a macro and microscopic level.	PAG 7,8 and 9 Entrance mock on paper 1. Midpoint A : photosynthesis. Midpoint B : respiration.
Autumn 2	3.6 Organisms respond to changes in their environment and maintain and constant internal environment. 3.7 Genetics, populations, ecosystems and evolution	3.6 In order to survive, organisms must be able to respond to changes in their environment. In this module students will apply their knowledge of biological molecules and transport in cells to explain the intricately designed systems the human body has adapted over time to maintain constant optimal internal conditions. 3.7 The theory of evolution underpins modern biology. In this module students will apply their knowledge of inheritance to predict the percentages of certain phenotypes in a population. They will also use statistical analysis to determine the accuracy of their predictions.	PAG 10 and 11. Midpoint C Homeostasis. Midpoint D inheritance. Holistic 2.
Spring 1	3.6 Organisms respond to changes in their environment and maintain and constant internal environment.	3.6 In order to survive, organisms must be able to respond to changes in their environment. In this module students will apply their knowledge of biological molecules and transport in cells to explain the intricately designed systems the human body has adapted over time to maintain constant optimal internal	Midpoint E homeostasis Midpoint D inheritance. January mocks.

	3.8 3.8 The control of gene expression.	conditions. 3.8 Each cell in the human body contains 46 chromosomes which all encode the instructions to make an organism. In this module students will explore the reasons why different cells express different traits in the same organisms and how a single zygote can develop into a foetus. The students will also explore the new technology arising in the genetics field from PCR to CRISPR CASPR.	
Spring 2	Essay prep and revision for exams.	Essay prep and revision for exams.	
Summer 1	Essay prep and revision for exams.	Essay prep and revision for exams.	

Chemistry Year 13	**Topics/Units Studied**	**Core skills and knowledge students will learn**	**Assessed through**
Autumn 1	Module 5:Physical Chemistry and Transition Elements Rate determining step and using the Arrhenius Equation graphically. Equilibrium Acids, Bases and pH. Moule 6:Organic Chemistry and Analysis Carbonyls and Carboxylic Acids	Module 5: Learners develop their understanding of the rate of a chemical reaction and link rate r=to mechanism od=f reactions and identify the rate determining step. Learners use the Arrhenius equation to calculate activation energy and use it graphically in the form y = mx + c to work out the activation energy. Learners learn how to calculate pH of strong and weak acids. Module 6: Learners learn how to name, prepare and the reactions of carbonyl compounds and reaction mechanisms. Learn how to test for the different carbonyl compounds.	End of Topic Mid Points Assessments and Holistic Assessments/Mock Exams PAG 6.1: Synthesis of an Organic Solid PAG 10.1: Rates of reaction – initial rates method

		The different derivatives and reactions of carboxylic acids.	
Autumn 2	Module 5: Physical Chemistry and Transition Elements; Buffers and Neutralisation; Enthalpy and Entropy. Module 6: Organic Chemistry and Analysis: Amines, amino acids and polymers. Organic Synthesis	Module 5: Learners learn how to prepare buffer solutions and how the pH changes when small amounts of acid/alkali is added. Learners must be able to calculate and explain the changes. Learners plot pH curves and types of acids/alkalis and suggest suitable indicators to determine the end points. Module 6: Learners learn about the functional groups called amines and amino acids and their reaction as well has how they are prepared. Learners learn how these compounds are use =d to make various useful polymers and compare/contrast the preparation/use/disposal of various polymers (addition and condensation polymers)	End of Topic Mid Points Assessments and Holistic Assessments/Mock Exams PAG 7.1: Qualitative Analysis of Organic Functional Groups. PAG 11.1: pH measurements PAG 12.1: Research Skills
Spring 1	Module 5: Physical Chemistry and Transition Elements: Redox and Electrode Potentials Transition Elements Module 6: Chromatography and Spectroscopy.	Module 5: Learners carry out redox titrations and observe specific colour changes during titrations to collect data and analyse and interpret results. Learners extend their knowledge of the reactivity series of metals and learn how elements reactivity is compared quantitatively in terms of the ability of a species to become reduced. Learners apply their knowledge of electrode potentials to storage and fuel cells. Module 6: Learners use more advanced techniques such as thin layer and gas chromatography to analyse organic functional groups - using retention times and peak integrations. Learners learn about Carbon-13 and Proton NMR; how it works, and how data is analysed and interpreted to identify organic compounds.	End of Topic Mid Points Assessments and Holistic Assessments/Mock Exams PAG 8.1: Electrochemical Cells

Spring 2	Revision for Exams	Exam practise, past papers; opportunity to carry out more practical skills.	Mock Exams
Summer 1	Revision for Exams		Final Exams

Physics Year 13	**Topics / Units Studied**	**Core skills and knowledge students will learn**	**Assessed through**
Autumn 1	5.1 Thermal physics 6.1 Capacitors 5.2 Circular motion 5.3 Oscillations	The aim of this module is to show the impact Newtonian mechanics has on physics. The microscopic motion of atoms can be modelled using Newton's laws and hence provide us with an understanding of macroscopic quantities such as pressure and temperature. Newton's law of gravitation can be used to predict the motion of planets and distant galaxies. In the final section we explore the intricacies of stars and the expansion of the Universe by analysing the electromagnetic radiation from space. As such, it lends itself to the consideration of how the development of the scientific model is improved based on the advances in the means of observation.	Assessments: AS Breadth paper PAGs: 9.2 Capacitors in series and parallel 9.1 Investigating charging and discharging a capacitor 10.1 Factors affecting SHM
Autumn 2	5.4 Gravitational fields 5.5 Astrophysics and cosmology 6.2 Electric fields 6.4.1 The nuclear atom 6.4.2 Fundamental particles	5.4 provides knowledge and understanding of Newton's law of gravitation, planetary motion and gravitational potential and energy 5.5 provides knowledge and understanding of stars, Wien's displacement law, Stefan's law, Hubble's law and the Big Bang. 6.2 provides knowledge and understanding of Coulomb's law, uniform electric felds, electric potential and energy. Students will use their knowledge	Assessment: 5.1-3

		from 5.4 to compare different types of fields. 6.4 provides knowledge and understanding of the atom, nucleus, fundamental particles, radioactivity, fission and fusion. These initial sections remind students of GCSE level content before introducing elements of the standard model.	
Spring 1	6.3 Electromagnetism 6.4.3 Radioactivity 6.4.4 Nuclear fission and fusion 6.5 Medical Imaging	Students collate all of their skills acquired over previous modules to assess how our current understanding of modern physics came to be as well as some of the main industrial and medical applications of physics, highlighting the vocational aspects of the subject. 6.3 provides knowledge and understanding of magnetic fields, motion of charged particles in magnetic fields, Lenz's law and Faraday's law. The application of Faraday's law may be used to demonstrate how science has benefited society with important devices such as generators and transformers. In 6.4.3 and 6.4.4 students can draw on their knowledge and skills from previous modules, logarithms and star lifecycles, to explore these topics further. 6.5 provides knowledge and understanding of X-rays, CAT scans, PET scans and ultrasound scans. This section shows how the developments in medical imaging have led to a number of valuable non-invasive techniques used in hospitals.	Assessment: Mock 5.4-5 PAGs: 11.2 Determining the specific heat capacity of a material 11.3 Determining the magnetic field strength of a magnet 11.1 Investigating transformers 7.2 Investigating the absorption of radioactive decay
Spring 2	Exam practice / revision / practical skills	This half term allows for revisiting any weaker topics (as identified throughout the year in assessments) and for catching up if any extra time is required. Exam technique is reinforced with exam-style questions forming a larger part of the lessons.	Assessment: 6.1-3
Summer 1	Exam practice / revision / practical skills	In the run up to students' final exams, past papers will form the bulk of the work.	Assessment: 6.4-5