Science Curriculum Intent:

1. To inspire a love of Science to enable students to **thrive** in science lessons.
2. To foster curiosity for 'The Way it Works' so that students **aspire** to understand the world around them.
3. To allow students to understand scientific issues that they are likely to encounter so they **thrive** in their everyday lives.
4. To enable students to **achieve** so they have the capability to progress onto scientific careers.

Science Curriculum Implementation:

1. A spiral curriculum in order to allow students to **achieve** and progress in manageable steps.
2. A focus on tier two and three vocabulary so students can **thrive** and **achieve** with proficient scientific literacy.
3. To provide regular opportunities for scientific enquiry so students **thrive** to know 'The Way It Works'.
4. To provide opportunities for students to **aspire** to careers in science by engaging with science careers education.

Science		Biology	Chemistry	Physics	Enrichment
Year 7	Cycle 1	Cell structure: plant, animal and bacterial cells. The organelles inside them and their functions. Students are assessed on their ability to compare different types of cells.	Atoms, compounds and mixtures: learning about the differences between them as well as the properties of some materials (metals/non-metals) Students are assessed on the structure of the atom.	Motion: Students look at fundamental ideas such as speed and acceleration. They practice essential physics skills such as calculating using formula and start to develop their investigative skills by looking at how speed changes with the height of a ramp. Students are assessed on their ability to draw conclusions from experimental results.	STEAM event - make your own robot
Why?		**This work underpins all other work on cells throughout their science career.**	**This work underpins all other work on chemical reactions and atoms throughout their science career.**	**This work is the foundation for all future investigative and calculation work.**	
Year 7	Cycle 2	Cell division: building on cell structure from cycle 1. Students will look at how cells grow and be assessed on their knowledge of stem cells and their uses.	Ionic bonding: Building on atomic structure, students will learn about how electrons are arranged in atoms and what happens when electrons are transferred between atoms. Students are assessed on their ability to draw and label electronic configuration.	Forces: Building on the investigation in cycle 1 the idea of forces is introduced. Students learn about balanced and unbalanced forces. Students are assessed on their ability to calculate and describe resultant forces.	Science roadshow at UoP
Why?		**To deepen their understanding of cells from cycle 1 and expose them to a greater variety of cell types**	**To be able to apply their understanding of the atom to new scenarios.**	**To deepen their understanding of why speed changes occur from cycle 1.**	

Year 7	Cycle 3	Nervous system: Students use what they know about cells to learn about different types of nerve cells and their roles. They will also look at the system as a whole. Students use the skills of comparison from cycle 1 when they are assessed on their ability to compare structure and function of neurones.	Covalent bonding: Students move on from ionic bonding and utilise their understanding of electron configuration to learn about electron pair sharing. Students are assessed on their ability to describe the properties of covalent substances.	Energy: Students learn about energy and energy efficiency utilising their skills in calculations from cycle 1. Students are assessed on their ability to calculate energy efficiency using the equation.	Wizz, Pop, Bang show. Science week
Why?		**To apply their knowledge of cells to more complex systems. To practice comparative skills from Cycle 1.**	**To be able to apply their understanding of the atom to new scenarios.**	**To practice skills learned in Cycle 1 and understand how energy allows systems to work.**	
Year 7	Cycle 4	Inheritance: Students learn about DNA and how it is inherited. Students use their knowledge of cell structure to explain how DNA can be extracted from a cell in fruit	Metallic bonding: Students learn about how metals are bonded, building on the work on properties of metals in cycle 1. Students investigate the density of different metals and apply their skills from physics of calculations and conclusions for their assessment.	Energy sources: Students apply their knowledge of energy to different sources of energy. They learn the difference between renewable and non-renewable energy sources and apply their skills of comparison from Biology to their assessment.	
Why?		**To prepare themselves for further work on genetics, to develop an understanding of why cells look and act a certain way.**	**To apply skills from Physics and Biology in new contexts. To develop essential practical skills for the Y8 SOL.**	**To understand the impact of their energy consumption at a point where they will be using increasing amounts of technology. Social awareness. Application of Cycle 3 understanding to new contexts.**	

Year 8	Cycle 1	Respiration: Students link into cell structure from Y7 to look specifically at the process of respiration in cells. They then build on this to link in the circulatory system and structure of blood vessels. Students are assessed on the structure of the heart. This topic is the foundation for the work they complete on the circulatory system and the core practical on respiration during their GCSE.	States of matter: Students learn about the different states of matter and their link with physical changes. This builds upon their knowledge gained from year 7 atoms topic. Separating substances is also discovered which will form the basis of knowledge leading into GCSE level work	Waves: Students are introduced to the basics of waves including the types of waves. Students spend a large amount of this cycle investigating reflection and refraction applying what they learn about waves to these investigations. Students are assessed on their ability to investigate the law of reflection, reaching a valid conclusion.	
Why?		**This builds on from their work on cells and mitochondria in Y7 cycle 1. It allows them to link from cells up to whole body systems in the circulatory system.**	**Students apply their understanding of atoms from last year to look at atoms in different contexts. This builds directly on from work in cycle 1 last year.**	**This work revisists the calculations from Y7 cycle 1 and applies the speed equation to an unfamiliar scenario. It also prepares them to learn more deeply about waves in cycle 2.**	
Year 8	Cycle 2	Communicable disease: Students look at this topic in light of how it may impact on them. This also has a link with SMSC as we cover sexually transmitted diseases. The topic builds on bacterial cells from year 7 and provides the foundation for the more complex case studies in their GCSE. They are assessed on the body's defenses against pathogens.	Acids and bases: Students will understand what hazards are and their place with acids and alkalis Students will develop a basic knowledge of neutralisation and reactions of acids with metals and alkalis. Word equations will be developed which builds upon year 7s symbol knowledge.	Electromagnetic spectrum: Students use their knowledge of wave structure from cycle 1 to learn about the electromagnetic spectrum with a focus on its properties, uses and dangers. Students also investigate radiation to demonstrate how different materials emit different amounts of thermal energy. This forms the basis of their assessment.	
Why?		**Builds on from bacterial cell work in year 7 cycle 1, it also includes a lesson on preventing the spread of STIs to coincide with their development.**	**Introduces some essential safety and practical skills they have not utilised until now to prepare them for GCSE experiments.**	**Develops depth of understanding of waves from cycle 1 and introduces more equations utilising some of the skills from Y7.**	

Year 8	Cycle 3	Non-communicable disease: Students compare non-communicable diseases to those from cycle 2, looking at the lifestyle factors that contribute to poor health. There is an SMSC link here, we learn about the effects of diet, smoking and alcohol. Students are assessed on their ability to interpret results from an experiment and apply this to diabetes.	Chemical reactivity: Students will discover the reactions of metals. They will develop further knowledge of word equations. Discover the role of metals within industry and how metals are extracted and used. Students are also introduced to the reactivity series of metals.	Electric circuits: Students are introduced to the idea of series and parallel circuits. They learn about the key components of circuits and their functions. The knowledge they gain here will underpin their GCSE electricity work. Students are assessed on their ability to investigate how bulbs act in series and parallel circuits.	Whizz, pop bang show. Science week.
Why?		**Develop knowledge introduced in cycle 2. Also cover key ideas on smoking and lifestyle to coincide with their development.**	**Students build on fundamental ideas from Year 7 on bonding as well as the word equations from cycle 2. Opportunity to introduce career ideas.**	**Key idea and skills required for further progression in science. Allows students to explore the equipment and ideas in more depth.**	
Year 8	Cycle 4	Enzymes: Students are introduced in more depth to enzymes after learning about some of their applications Y7. Students learn to describe the role of enzymes, how they function and factors that affect them. This links to their core practical in GCSE. The assessment is an explanation of how factors affect enzymes following an investigation.	Earth, atmosphere and gases : Students are introduced to the structure of the earth which builds upon knowledge gained from Geography as well as using chemical symbols gained from year 7 and year 8 SOW. Students will use real world scenarios such as global warming and climate change. Students will also be introduced to the gas tests which are further investigated in their GCSE topics.	Electrical safety and statics: Students use their new knowledge of electrical circuits and apply it to new scenarios including safety in the home. Students also learn about the idea of static electricity and how it is generated by friction. Students are assessed on their ability to recall the uses and dangers of static electricity.	Curriculum enrichment days
Why?		**Build on from the idea of enzymes introduced when looking at specialised cells and develop this. Development of fundamental biological skills required for progression.**	**Instill an understanding of human impact on the environment while students develop lifestyle habits that could persist. Allow them to make informed choices. Further practical skills practiced.**	**Application of skills and knowledge from cycle 2 to real world scenarios. Introduce the idea of static electricity and its applications which is missing from the combined GCSE specification.**	

Year 9	Cycle 1	Cells and microscopes: Students look in more depth at prokaryotic and eukaryotic cells as well as introducing the ideas of different types of microscopes. Students are expected to calculate magnification using the equation and be able to convert between units. The assessment here is a core practical on preparing microscope slides.	Atomic structure: Students build upon their knowledge from year 7 and 8, including the development of the idea of the structure of the atom. Using the atomic model students will understand the arrangement of electrons for different atoms.	Forces and motion: Students build on their work on motion and forces from KS3, looking in more detail at the motion graphs as well as introducing Newton's 1st Law. There is a bigger mathematical focus requiring rearranging equations, analysing graphs and using standard form. Students are assessed on their ability to apply Newton's first law to different scenarios.	MoD engineering careers talk
Why?		**Directly builds on work from Y7 cycle 1, using the existing knowledge as the scaffold for GCSE level understanding of cells and microscopes.**	**Directly builds on work from Y7 cycle 1, using the existing knowledge as the scaffold for GCSE level understanding of atoms.**	**Directly builds on work from Y7 cycle 1, using the existing knowledge as the scaffold for GCSE level understanding of motion including more complex calculations.**	
Year 9	Cycle 2	Transport of materials, enzymes: Students are introduced to the fundamental ideas of diffusion, active transport and osmosis and complete an investigation into osmosis for the assessment. Students build on Ks3 work on enzymes introducing more complex ideas on substrate concentration.	Groups and bonding: Students will use their knowledge from year 7 about the periodic table and build upon this with further knowledge of the different groups of the periodic table. Students will link properties of different groups with their atomic structure and position in the periodic table.	Newton's Laws: Students use their knowledge from cycle 1 of Newton's 1st law to learn about his second and third laws. Students also look at momentum in collisions. There is a high mathematical demand in this topic. Students will investigate forces in springs. This will form the basis of their assessment.	
Why?		**Builds on from cells and work in KS3 on enzymes to round off the GCSE level fundamental ideas for Biology.**	**Builds directly on from the work completed in Y7 and the work in Y8. Application of GCSE principles form cycle 1 to new scenarios.**	**More able students now mature enough to cope with the increased mathematical demand. Application of cycle 1 and ks3 knowledge to new scenarios.**	

Year 9	Cycle 3	Ecosystems: Students are introduced to this idea earlier than is traditional in the course. The knowledge builds nicely on work at Ks2 and is accessible in Y9. This allows more complex ideas to be studied later in the course. Students are assessed on the core practical of investigating distribution of organisms in an ecosystem. There are links in this topic to future work on evolution which will provide some scenarios to build from.	Properties of materials: Students will incorporate their prior knowledge of the particle model and the states of matter. This will be linked to the way in which materials bond and why they bond the way they do. Students will link the materials to formulas as well as an introduction to ions. The development of Covalent bonding leads into real world uses and scenarios including nanotechnology	Energy: Students will build on their work from Y7 on the types of energy. They will build on their foundation while adding in additional calculations and being expected to explain conversions of energy from one form to another. The assessment for this cycle will be based on the calculations of energy and power that they learn.	
Why?		**Time of year allows for practical work to be completed in the field. Taught earlier than the specification suggests due to links with KS2 work and limited challenge of ideas.**	**Builds on from properties of groups. Application of practical skills gained in Ks3. Understanding of technology as they are interacting with it more frequently as they age.**	**Builds on work from KS3 on energy and develops this to GCSE level understanding. Increased level of mathematical demand to match their increased experience in mathematics.**	
Year 9	Cycle 4	Diseases: Students build on Ks3 looking in more detail at the pathogens and how they affect us. We limit the exposure to the primary and secondary immune response as this is a more suitable topic for later on in the course. Students are assessed on their ability to describe the types of pathogen, how they spread and how they can be prevented.	Hydrocarbons: Students are introduced to Hydrocarbons through the formation of crude oil. Using previous formula knowledge students are introduced to alkanes, alkenes and their structures. How these fuels are produced and how hydrocarbons are used is developed with real life applications	Electricity: Students will tackle this topic first covered in Y8 in much more detail. They will investigate different types of resistors and be expected to explain how current and potential difference act in different circuits. They will also look again at electrical safety now that they have a better understanding of the world at home.	
Why?		**Develop form their work in Ks3 on communicable and non-communicable diseases. Aspects of this topic with higher demand left for Y10 when they have matured and have a broader understanding of the world.**	**Building on from Year 7 work on covalent substances and Year 8 work on separating mixtures and the atmosphere to learn about hydrocarbons and their impact on the environment at GCSE level.**	**Build on from Y8 work on circuits, looking in more depth at the calculations required and deepening the understanding of why things happen rather than what happens.**	

Year 10	Cycle 1	Respiration and photosynthesis: Students build on their Ks3 work on cells and respiration as well as the work from Y9 on the carbon cycle to look at respiration and photosynthesis in more detail. They investigate both processes which forms the basis of their assessment as a core practical element of the course. This leads into cycle 2 where students look at more complex plant processes.	Resources, exo and endothermic reactions: Students will investigate the different types of reaction, looking at the energy changes. They will also learn about the resources hydrocarbons and how they are sourced. The assessment will look at the properties of different types of materials such as metals, alloys and polymers.	Energy in circuits: Students will build on their knowledge of circuits from cycle 1 and Y8 to add in the concept of energy and how energy is transmitted in circuits. Students will be expected to calculate power and compare power ratings. Students will also look at the sustainability of our current energy practices. The assessment in this topic is centred on their knowledge of circuits as a whole and builds on from last cycle.	
Why?		**Build on work from Ks3 and Y9 adding depth and challenge with more complex and demanding ideas. Application of practical skills.**	**More demanding content left until Y10, build on from what hydrocarbons are and where they come from to look at their complex utilisations and evaluation of this.**	**Develop on from further work on electricity and energy from Y8. Links with chemistry work on fossil fuels taught in Y9 cycle 4 and being taught in cycle 1 Y10.**	
Year 10	Cycle 2	Plant processes, immune system: Students learn about more complex plant processes and are expected to explain the adaptations of plants for these processes which forms their assessment. Students then move onto the more complex aspects of immunity, looking at the primary and secondary immune responses linked to their work in Year 9.	Extraction of metals, metals with acids: Students will use their knowledge of metallic properties from Ks3 to build upon. They will also use ideas from their work on acids and bases to investigate the reactions of different metals with acids. Their assessment will be on chemical equations, word equations and the balancing of those equations.	Waves: Students build on what they learned about wave structure in year 8 and look in more detail at the properties of waves including calculations of wave speed and rearranging equations. Students are assessed on their ability to explain how to calculate using the wave equations and explain their use - including to calculate depth.	
Why?		**More demanding look at disease and immunity building on the work in Y8 and Y9.**	**Building on work from KS3 but adding depth and GCSE level challenge. Also builds on from work on reactivity when evaluating the best ways to extract metals.**	**Build on calculation work done in Ks3 introducing more mathematical demand now they are more experienced. Increase in conceptual ideas from Ks3 to GCSE level.**	

Year 10	Cycle 3	Homeostasis: Students learn about the different systems that control the human body and compare them to work on the nervous system from Ks3. The assessment in this topic is to look at explaining the role of hormones in different body systems.	Electrolysis: students will use their prior knowledge on ions to look at a new way of separating substances. They will investigate the different products of electrolysis with different electrolytes. This will form the basis of their assessment.	Electromagnetic waves: Students expand upon their knowledge of waves applying this to the electromagnetic spectrum including the principles of reflection and refraction. Students are assessed on their ability to investigate refraction.	
Why?		**Build on previous Ks3 systems work on nervous system. Comparing nervous and hormonal control.**	**More demanding content left until Y10 due to the nature of complex ideas. Practical requires discipline and control of fine motor skills that lower school students do not have.**	**Developing practical skills from Y8 and building into these a deeper understanding of how reflection and refraction occur.**	
Year 10	Cycle 4	Reproduction and Genetics: Students move on from hormones in homeostasis and look at the hormonal control of the menstrual cycle. Students will also learn about the different types of reproduction and how these link to the types of cell division. Students will be assessed on their ability to compare mitosis and meiosis.	Calculations in chemistry: Students will use their greater mathematical ability to tackle the most difficult examples of calculations in chemistry at the end of this topic. They will be required to rearrange equations and use the periodic table to calculate masses, moles and concentrations as well as working out rates of reaction.	Particle model: Students are required to use their knowledge from chemistry in ks3 and 4 to apply it to a new scenario. Students look at density and the properties of materials in different states. Students are assessed on their ability to explain how state changes occur.	
Why?		**Complex idea left until later in school, also requires a level of maturity for the students to learn about such topics. Builds on work on hormones in cycle 3.**	**Much higher mathematical demand so left until later in the course. Use skills developed across biology, chemistry and physics when looking at calculations earlier in the course.**	**Revisiting work from KS3 at a much higher level of demand, some concepts here require HOTS and abstract thinking that is more suited to older students (absolute zero)**	

Year 11	Cycle 1	Evolution and genetic engineering: Students will apply ideas from Y10 on genetics to the evolution of species and how humans manipulate this process. They will learn about the advantages and disadvantages of genetic engineering and be assessed on their ability to evaluate these processes.	Factors affecting the rate of reaction: students will build on their work on rate calculations to investigate different factors affecting the rate of reaction.As well as reactions at equilibrium. They will be assessed on their ability to explain the outcomes of this experiment.	Radioactivity: Students are challenged to link together their work on atoms, the particle model, graphs and calculations to learn about radioactive substances, their properties and their uses. Students are assessed on their ability to explain the properties of each type of radioactive decay and link it to its uses.	
Why?		**More complex ideas saved until students mature enough to deal with them. Final aspects of the course draw on multiple topics from lower down the school.**			
Year 11	Cycle 2	Revision and exam practice: Application of skills and knowledge	Revision and exam practice: Application of skills and knowledge	Revision and exam practice: Application of skills and knowledge	Science roadshow at UoP
Why?		**Embedding knowledge and understanding. Practicing exam technique through mocks to prepare students for their terminal assessments.**			
Year 11	Cycle 3	Revision and exam practice: Application of skills and knowledge	Revision and exam practice: Application of skills and knowledge	Revision and exam practice: Application of skills and knowledge	
Why?		**Embedding knowledge and understanding. Practicing exam technique through mocks to prepare students for their terminal assessments.**			
Year 11	Cycle 4	Revision and exam practice: Application of skills and knowledge	Revision and exam practice: Application of skills and knowledge	Revision and exam practice: Application of skills and knowledge	
Why?		**Embedding knowledge and understanding. Practicing exam technique through mocks to prepare students for their terminal assessments.**			

Year 12	Cycle 1	Microscopy; Prokaryotic and eukaryotic cells and their components; biological molecules and their roles within living systems; the fluid-mosaic model of the plasma membrane. Students will also be assessed on their practical skills at predetermined points throughout the course.	Deep understanding of the structure of the atom. Mastery when calculating the number of particles developing upon the moles from GCSE. Examine mass spectra and relate these to isotopes. Students will be proficient in electronic configurations developing the GCSE model and delving further into the orbitals and suborbitals concept. Students will gain fluency with bonding and the ideas of VSEPR and its relationship to shapes and intermolecular forces.Mastery of linking properties with different structures. Moles will be secured as well its linking to concentrations and ideal gas equations.	Review of Si Units, prefixes, units and standard notation. Simple kinematic equations leading to in depth problem solving approach to projectile motion. Deeper understanding of the conservation of energy and the interaction of kinetic energy and gravitational potential energy. The students will become proficient in the knowledge, understanding and application of Newton's three laws of motion. Students will also be assessed on their practical skills at predetermined points throughout the cycle.	
Why?		**An understanding of cells, basic cellular processes and cell theory is fundamental to underpinning students' later understanding of biological concepts; therefore it is placed in the opening weeks of the course.**			
	Cycle 2	Enzyme structure and function; The cell cycle; mitosis; meiosis. All these topics require students to draw on their knowledge of GCSE Biology.	Understanding of oxidation and reduction including the ways it can be expressed and identified. Proficiency in calculating oxidation numbers. Mastery of balancing and combining half and ionic equations To learn about the reactions of Group 2 elements with oxygen,	The students will build on previous knowledge of electrical circuits and gain a fuller understanding of Ohm's law and its application in various diodes..	Online lectures. Visit to electron microscope

		Students will also be assessed on their practical skills at predetermined points throughout the course.	water and acids to identify trends and patterns in their chemistry. Students will investigate the reactions and properties of some of the oxides, carbonates, sulfates, hydroxides and nitrates of Group 1 + 2 elements to identify patterns in chemical behaviour Technical proficiency is carrying out and identifying unknown substances from flame tests. Students will link their relative reactivities and bond energies with the formation of hydrides and identify common reactions of Group 17 elements with silver ions and sulphuric acid to aid inorganic quantitative analysis Students will learn about how chlorine is used in society to understand why it is such an important element Mastery of qualitative analysis in inorganic chemistry Fluency in observing and identifying common reactions	The students will investigate the resistivity of materials and be able to manipulate formulae dealing with small numbers. Students will be introduced to new skills such as the use of micrometer screw gauges.Students will learn about electromotive force, potentiometers and simple sensing circuits. Students will also be assessed on their practical skills at predetermined points throughout the cycle.	at UoP.
Why?		**This work builds on the knowledge of cells acquired in the earliest stages of the course, both in terms of breadth and depth. Students begin to look within the cellular structures they have previously studied to discover more about the reactions that occur within them.**			
	Cycle 3	Students will build on their KS4 knowledge of: Exchange surfaces and breathing; transport systems in animals; transport in plants. Students will also be assessed on their practical skills at predetermined points throughout the course.	Develop understanding of the different ways organic molecules can be drawn so that they can correctly identify different functional groups. Students will become proficient at analysing, drawing and converting between molecular, structural, displayed and skeletal formulae Master nomenclature so that they can name any simple organic compound Develop understanding of isomerism so that they can analyse compounds more effectively Develop an understanding of the reactions of halogenoalkanes to create reaction pathways for the formation of alcohols,	The students will be introduced to new concepts in fluid dynamics such as turbulent and laminar flow. They will understand the application and limitations of Stokes law. They will then move on to the mechanics of stress and strain in materials and be able to gain a simple understanding of how structures cope with	Chemistry in action lectures in London

			amines, nitriles and alkenes Developing their learning about the relative reactivities of halogenoalkanes so that you can predict the likelihood and speed of related reactions Understand the chemistry of alcohols so that you can predict the products of different reactions Master naming of carbonyl groups and carboxylic acids so that you can identify a wider range of organic molecules Develop understanding of the reactions of aldehydes and ketones so that you can understand how they relate to the chemistry of alcohols and carboxylic acids	compressive and tensile. They will work on their graphical skills being able to create stress/strain graphs. Students will also be assessed on their practical skills at predetermined points throughout the cycle..	
Why?		**Knowledge and understanding of cells and cellular processes is a prerequisite for this part of the course. Students' viewpoint will 'zoom out' in this learning cycle as they take their earlier learning and apply it in the context of a whole organism.**			
	Cycle 4	Students will build on their KS4 knowledge of:Classification and evolution; biodiversity and its maintenance; communicable diseases and the immune response. Students will also be assessed on their practical skills at predetermined points throughout the course.	Students will examine organic practical techniques so that they can create their own procedures Understanding of how the energy stored in chemical bonds affects reaction and become Proficient in constructing Hess' Law diagrams and calculating energy changes for various reactions. Fluency in using all of the different standard enthalpies for heat changes and an understanding of how the kinetic model can be used to explain rate of reactions A deeper understanding of activation energy builds on their GCSE ideas as well as gaining a mastery of analysing Boltzmann distribution graphs. Develop understanding of how temperature, concentration, pressure and catalysts affect equilibria so that it can applied to Le Chatelier's Principle Mastery of simple Kc equations and qualitatively evaluate equilibria.	Students will build on their knowledge of the behaviour of light. Investigating and reproducing some of the milestone investigations of physics such as Young's Double Slit experiment. They will study advanced features of waves such as superposition, coherence and phase. Their mathematical skills will be advanced with the introduction of the use of radians. Students will also be assessed on their practical skills at predetermined	

			A technical understanding of an industrial process is developed and understanding how equilibria affects real life situations.	points throughout the cycle.	
Year 13	Cycle 1	Students will build on their KS4 knowledge of:Plant responses; homeostasis, the mammalian nervous system. Students will also be assessed on their practical skills at predetermined points throughout the course.	Use equilibrium partial pressures to deduce expressions for K_p in homogeneous and heterogeneous systems Build upon year 12 Kc to Solve K_c and K_p expressions so you can quantitatively evaluate equilibria Examine the results of changing temperature on the equilibrium constant in order to predict the effect for both exothermic and endothermic reactions Explain the link between the position of an equilibrium and the value of the equilibrium constant in order to appreciate the effect temperature, concentration and/or pressure have on an equilibrium Students will develop their understanding of the Brønsted-Lowry theory of acids and bases to refine your understanding of acid-base equilibria and become proficient in calculating the pH of strong and weak acids, strong bases, and buffer solutions and more accurately determine and monitor the pH of a solution Analyse data from experiments in order to measure the pH of a variety of substances and compare the pH of a strong acid and a weak acid after dilution Master the preparation of, and changes which occur in, a buffer solution in order to calculate pH changes and understand how buffers work and their importance in our blood	Students will be introduced to the concepts of gravitational, electrical and magnetic fields. They will understand the similarities and differences between them. They will apply this knowledge to real world applications such as capacitors, transformers and electric motors. Students will learn about Lenz's law and how it is an example of the conservation of energy. They will learn about Faraday's law of electromagnetic induction and be able to manipulate the formula.Students will also be assessed on their practical skills at predetermined points throughout the cycle.	
Why?		**Knowledge and understanding of cells and cellular processes is a prerequisite for this part of the course. Students' viewpoint will 'zoom out' in this learning cycle as they take their earlier learning and apply it in the context of a whole organism.**			
	Cycle 2	Students will build on their KS4 knowledge of:	Extend knowledge of Hess' Law from year 12 and draw Born-Haber cycles to calculate values for lattice enthalpies and	Students will build upon their knowledge of atoms to study	

		Microbiology and pathogens; Ecosystems and human influences on the environment. Students will also be assessed on their practical skills at predetermined points throughout the course.	other unknowns Develop an understanding of the relationship between ionic radius and ionic charge with the size of lattice enthalpy to predict the magnitude of lattice enthalpy From year 12 students will deepen knowledge of Group 2 decomposition to link lattice enthalpy with the polarisation and polarisability of ions Analyse and link lattice enthalpy, hydration and solution enthalpies to overall exothermic and endothermic changes to deepen their understanding of what happens when ionic charge and radius change. Comment on the covalent character of an ionic compounds by comparing lattice enthalpies found using Born–Haber cycles with those calculated theoretically Gain a deep understanding of transition metals in order to explain the formation of transition metal complexes and use examples of transition metal's electronic configurations to define a transition metal Understand the structure, ligands and reactions of transition metal complexes (in particular copper and cobalt) to explain and identify ligand exchange reactions. Draw the shape of the d-orbitals to explain how the shape of complex ions and ligand interaction influence the energy levels of the orbitals Understand the interaction of light and electrons to explain the origin of colour in transition metal complexes	particle physics and nuclear decay. They will delve into the world of subatomic particles and understand the real life applications Such as P.E.T scanners. They will study exciting concepts such as wave- particle duality and matter - antimatter interactions. They will then go on to study nuclear fission and fusion and be aware of its future uses and limitations. Students will also be assessed on their practical skills at predetermined points throughout the cycle..	
Why?		**Students' viewpoint will further expand in this learning cycle as they take their earlier learning at the organ system/organism level and apply it in the context of interactions between organisms and within ecosystems. The placement of this work at this point of the year was also influenced by the suitability of weather conditions for fieldwork.**			

	Cycle 3	Revision and exam practice: Application of skills and knowledge	Describe what a heterogeneous and homogeneous catalyst are in order to explain how they increase the rate of reaction. Developing fluency in writing rate equations and calculating rate constants, to quantitatively predict and analyse the rate of reaction Understand how a rate equation is linked to reaction mechanisms in order to predict which chemical pathways are supported by the rate equation Develop fluency in analysing initial rates results to create rate equations and understand how each reactant affects the overall rate Gain a deep understanding of the relevance of the rate constant to explain the effect of temperature on a rate constant and hence the rate of a reaction Students will explain the cause of optical isomerism in order to identify molecules that are optically active and draw pairs of optical isomers in 3D and how enantiomers affect plane polarised light in order to test for a racemic mixture From year 12 students will develop understanding of the reactions of aldehydes and ketones to relate them to the chemistry of alcohols and carboxylic acids. Improve proficiency in mechanism writing by learning the mechanism for creating hydroxy nitriles and master the identification of carbonyl compounds using 2,4-DNPH, Fehlings solution and Tollen's reagent Explain the reactions of carboxylic acids, acyl chlorides, esters and similar molecules in order to predict the products of reactions	This cycle will bring together thermodynamics, astrophysics, cosmology and oscillations. Thermodynamics was driven by the needs of the industrial revolution and perhaps astrophysics by the needs of future generations.Astrophysics will introduce students to possible new mysterious quantities such as dark energy and dark matter. The cycle will finish with a look at simple harmonic motion and its many applications. Students will also be assessed on their practical skills at predetermined points throughout the cycle.	
Why?		**Students will need to consolidate and synthesise knowledge and skills from across the two years of the course.**			
	Cycle 4	Revision and exam practice: Application of skills and knowledge	Understand the process of esterification and the other reactions of carboxylic acids in order to link carboxylic acids to other types of chemical and understand hydrolysis of different	Revision and exam practice: Application of skills and knowledge	

			compounds in order to form carboxylic acids and other similar chemicals Revision and exam practice: Application of skills and knowledge		
Why?		**This is students' final opportunity to practice skills and refine knowledge before the terminal examinations.**			