Biology Year 12 Curriculum Overview 2023-24

	Autumn		Spring		Summer	
	Learning Cycle 1	**Learning Cycle 2**	**Learning Cycle 3**	**Learning Cycle 4**	**Learning Cycle 5**	**Learning Cycle 6**
Topic	Teacher A: Biological molecules Teacher B: Cells	Teacher A:Nucleic acids Teacher B:Transport across membranes	Teacher A: Cell recognition and the immune system Teacher B: Exchange	Teacher A: DNA and Protein Synthesis Teacher B: Exchange continued	Teacher A: Genetic Diversity and Biodiversity Teacher B: Mass Transport	Revision for assessments Review of independent booklets: Energy and ecosystems and Populations in ecosystems
Critical Prior Knowledge	GCSE organisation (enzymes, proteins, carbohydrates, lipids). GCSE chemistry – Bonding and rates. GCSE Microscopy and cells and cells and cell structure.	GCSE inheritance and variation – DNA structure GCSE Transport across membranes, cells and cell structure	GCSE Immunity, bacteria and microorganisms GCSE Organisation: ventilation and digestion. Plant transport	GCSE Protein synthesis (triple). Inheritance and variation. GCSE Organisation: ventilation and digestion. Plant transport	GCSE: Genetics and evolution GCSE: GCSE Organisation: ventilation and digestion. Plant transport	GCSE: Biodiversity and genetics, adaptations.
Overall Intent (Big ideas and key concepts)	Students will explore the fundamental building blocks of organisms – the molecules of which their cells are composed (carbohydrates, lipids proteins and nucleic acids). Students will look at the cell as a fundamental unit of life, considering how all new cells are	Students will explore the fundamental building blocks of organisms – the molecules of which their cells are composed (DNA, RNA). The process of DNA replication and the importance of water in organisms. Students will study cell surface membrane structure, how membrane	Students will cover the role of antigens, the immune system cells and proteins in defence against foreign cells and pathogens. Students will also cover vaccination and how we control immunity and the HIV virus and ELISA test. Students will study how single celled and multi-cellular	Students will look at the universal molecule DNA and the ability for this one molecule which carries the genetic code in “genes” to code for all the variety of life on Earth. Students will study the structure of DNA in greater detail, drawing on knowledge from the earlier nucleic acids unit and study the	Students will explore the method by which all life on earth ensures variation and the methods of evolution by which natural selection and speciation takes place. Students will also consider the diversity of organisms in environments and the impacts of	Students will look at how the sun is the energy source for most life on Earth and how energy flows through ecosystems. In communities, molecules produced by photosynthetic organisms are consumed by other organisms such as bacteria, fungi and animals. Students will explore the concept of a population and ecosystem and the interactions between

	derived from existing ones following the process of binary fission (prokaryotic cells) and mitosis and meiosis (eukaryotic cells). Students will investigate the structure of cells, organelles and the methodology by which cells are studied. Through practical's, students will use appropriate instrumentation to record quantitative measurements. Use laboratory glassware apparatus and qualitative reagents to identify biological materials. Identify variables that must be controlled and calculate the uncertainty of the measurements they make. Students will also consider margins of error,	proteins control the vast array of cell actions and interactions, and transport materials into and out of cells.	organisms from amoeba to mammals to plants, exchange materials between themselves and their environment. The topic of metabolic rate is covered.	production of proteins, again drawing on protein knowledge taught in "Cells". Students will study how single celled and multi-cellular organisms from amoeba to mammals to plants, exchange materials between themselves and their environment. The topic of metabolic rate is covered.	human populations on biodiversity. Students will take the fundamentals of transport across membranes and exchange to apply to more detailed concepts in the mass transport unit. This focuses on transport in multicellular organisms with transport systems and the challenges they have had to overcome through evolution and adaptation to enable all their cells to be nourished by oxygen and glucose, and removal of waste into the external environment.	different organisms within species and between species. Students will consider how populations can be investigated through quantitative studies and the process of succession. The study of conservation of habitats is also covered.

	accuracy and precision of data.					
Essential Knowledge milestones (What students must master)	Teacher A: Ultrastructure and comparison of viruses, eukaryotic and prokaryotic cells. The structure and function of biological molecules including DNA, carbohydrates, ATP, ions and water. A comparison of the structure and function of prokaryotic and eukaryotic DNA. Teacher B: The structure of cells and biochemistry underpins the study of biology. The bridging work introduces the organelles and DNA structure and builds on KS4. These initial concepts are then developed to include polymers, production of	Teacher A: The process of DNA replication and mitosis. The expression of DNA in the formation of proteins in transcription and translation and the significance of mutations Teacher B: The detailed structure of the plasma membrane builds on the knowledge gained the cells unit. This leads on to transport across membranes by diffusion, osmosis, facilitated diffusion, active transport and co-transport of glucose in the ileum.	Teacher A: The interaction of cells, membranes, mitosis, and protein production is combined in the study of the immune system. Vaccination and the structure and features of HIV. Teacher B: The general principle of exchange between organisms and their environment. Gas exchange in single celled organisms, insects, fish, plant leaves. How plants manage to limit water loss but maintain diffusion of gases for photosynthesis. Structure of the human gas exchange system.	Teacher A: Genes and the triplet code, DNA and Chromosome structure and function, The structure of RNA and their involvement in the processes of transcription and translation to form proteins. Teacher B: the mechanisms of breathing and exchange of gases in the lungs. Enzymes and digestion and absorption of the products of digestion.	Teacher A: Mutations, meiosis and genetic variation. Genetic diversity and adaptation. Types of selection. Teacher B: Haemoglobin structure and adaptations, Transport of oxygen by haemoglobin. Circulatory system of a mammal. The cardiac cycle. Blood vessels and their functions. Transport of water in the xylem of plants and transport of organic molecules in the phloem. Investigating transport in plants.	Teacher A: Food chains and energy transfer. Energy transfer and productivity. Nutrient cycles. The use of natural and artificial fertilisers. Environmental issues concerning use of nitrogen-containing fertilisers. Teacher B: Populations in ecosystems and their interactions. Variation in population size. Competition and predation. Investigating populations. Succession and conservation of habitats.

	proteins and cell division. Following the production of proteins the importance of the tertiary structure in catalysing metabolic process is study use of proteins as catalysts. Practical and mathematical skills in determining the rate of reaction and diffusion are developed and assessed					
Cultural Capital	Fundamental practical course is followed by all students to ensure correct use of apparatus, measuring skills and errors. Maths skills are also covered including statistics.				Understanding of biodiversity and human impacts on biodiversity.	Conservation and maintenance of habitats.
Assessment	In class teacher led reviews and formative feedback – this low-risk challenge and review environment for pupils will include: - recap recall quick starters from reading ahead booklet, homework(know) - review tasks, multiple choice and extended questions (extend) - in class exam style questions (apply) Through rigorous, reliable and accessible assessment - Formal assessments at the end of two sections (9 Multi-topic assessments 50 mins each, with dip-back questions to previous topics) - Mutli topic assessments (Mocks) to inform progress grades: 90 mins at the end of AS content (June/July) 9 Multi topic assessments across the year.					

ECC Student Characteristics	Through these units we will encourage students to work hard and be **resilient individuals** who **embrace challenge** and through their **creativity** and endeavours become **reflective learners.** Mastering the key concepts of each topic before being able to build on these ideas as they are interleaved through other units later in the course.

Connection to future learning (When is this developed / revisited)?	Biological molecules links in to all future units. It is fundamental knowledge and so taught first. Cells and transport is needed primarily for Exchange, and mass transport in Y12 and photosynthesis and respiration, nerves and muscles and homeostasis in year 13. Year 12 and 13 revision sessions.	Nucleic acids is revisited in DNA genes and protein synythesis (Y12), then again in inherited change in Y13 Membranes and transport is needed primarily for Exchange, and mass transport in Y12 and photosynthesis and respiration, nerves and muscles and homeostasis in year 13. Year 12 and 13 revision sessions.	Cell recognition and the immune system is a stand alone unit but is revisited in Year 12 and 13 revision sessions. Exchange is revisited in mass transport where the principles are applied. In year 13, homeostasis also revisits concepts learnt in the role of the nephron in osmoregulation. Year 12 and 13 revision sessions.	DNA, Genes and protein synthesis. Revisited in Y12 genetic diversity and Y13 inherited change, gene expression and recombinant DNA technology. Year 12 and 13 revision sessions.	Genetic diversity and biodiversity are revisited in inherited change and in populations and ecosystems. Mass transport is a stand alone unit drawing knowledge from previous units but is revisited in Year 12 and 13 revision sessions. Year 12 and 13 revision sessions.	Energy and ecosystem links in with photosynthesis and respiration at the start of Year 13. Populations in ecosystems links in with inherited change and populations and evolution in Year 13. Year 12 and 13 revision sessions.