

## BIOLOGY KEY STAGE 5 CURRICULUM OVERVIEW

### By the end of Key Stage 5, students should:

<b>Know</b>	<i>By the end of the OCR A Level Biology course, students should have a deep understanding of the key principles that underpin biological science, including cell structure and function, biological molecules, genetics, evolution, and ecosystems. They should know how organisms exchange substances with their environment, maintain homeostasis, and respond to internal and external changes. Students will also understand the role of enzymes, DNA replication, and gene expression in living systems, as well as the mechanisms of inheritance and variation. In addition, they should have a strong grasp of practical and mathematical skills, allowing them to analyse data, evaluate evidence, and apply their knowledge to unfamiliar contexts in biology and beyond.</i>
<b>Do</b>	<i>Students should be able to confidently apply their understanding of biological principles to explain processes in living organisms at the molecular, cellular, and systems levels. They should be able to plan, carry out, and evaluate a wide range of practical investigations, using appropriate techniques and data analysis skills. Students will develop the ability to critically interpret experimental data, draw evidence-based conclusions, and communicate scientific ideas clearly using accurate terminology. Ultimately, they should be well prepared to progress to higher education in biology or related sciences, demonstrating strong analytical thinking and an appreciation of how biology contributes to society and technological advancement.</i>
<b>Appreciate</b>	<i>Students should appreciate the complexity, interdependence, and beauty of living systems, from the molecular level to entire ecosystems. They should develop an awareness of how biological knowledge is continually evolving through research and technological advances, and how it can be applied to solve real-world problems in health, sustainability, and the environment. Students should also appreciate the importance of ethical considerations in biological work, the value of evidence-based reasoning, and the relevance of biology to everyday life and future scientific progress. Ultimately, they should leave the course with a curiosity about the natural world and a respect for the processes that sustain life.</i>

### Curriculum coverage

	Topic	Sub topic	Coverage
Year 12	Foundations in Biology	What are the basic components of living systems?	<i>The Light microscope, staining and preparing samples; Magnification, Resolution &amp; Using the graticule; Other types of microscopy; Cell Structure &amp; Division of Labour; Prokaryotic vs eukaryotic cells</i>
		What are biological molecules?	<i>Water; Carbohydrates Introduction &amp; Glucose Structure; Disaccharides, Starch &amp; Glycogen; Cellulose; Lipid structure; Amino acids &amp; Levels of Protein Structure; Thin Layer chromatography; Types of Proteins; Nucleic Acid structure; DNA Extraction; Genetic Code; DNA replication</i>
		What is the structure and function of enzymes?	<i>Enzyme Action; How Temperature and pH affect enzyme action; How enzyme and substrate concentration effect enzyme action; Enzyme inhibitors cofactors, coenzymes &amp; prosthetic groups</i>
		What is the structure and function of plasma membranes?	<i>Structure &amp; Function of Plasma membranes; Factors affecting membrane structure; Active transport &amp; Bulk Transport; Osmosis; Diffusion (Simple and Facilitated)</i>
		What happens during cell division?	<i>The Cell cycle; Mitosis; Meiosis; Organisation and specialisation of cells; Stem Cells</i>
	Exchange & Transport in Living Organisms	How are gas exchange surfaces adapted for efficient gas exchange?	<i>Specialised Exchange surfaces &amp; Mammalian Gas Exchange System; Insects Exchange System; Bony fish exchange system</i>
		How are molecules transported around animals?	<i>Types of Circulatory System; Blood vessels; Blood, Tissue Fluid &amp; Lymph; Transport for oxygen and carbon dioxide; The Heart; Heart Beating and rhythm of the heart</i>
		How are molecules transported in plants?	<i>Transport system in dicotyledonous plants; Water transport in plants; Transpiration; Factors affecting transpiration; Translocation; Plant adaptations to water availability</i>
	Biodiversity, Evolution & Disease	How are organisms classified and what role does evolution play in classification?	<i>Classification Systems; The Five Kingdoms; Phylogeny &amp; Evidence for Evolution; Variation; Adaptations; Evolution &amp; Natural Selection</i>
		What is biodiversity?	<i>Biodiversity; Genetic Biodiversity; Factors Affecting Biodiversity; Maintaining Biodiversity</i>
What are diseases and how are they spread?		<i>Animal and Plant pathogens; Plant diseases; Animal diseases; Transmission of Disease; Plant defences against diseases; Non-specific animal defences; Phagocytosis; Antibody Structure; Lymphocytes, cell mediated and humoral immunity; Autoimmune diseases; Natural and Artificial Immunity; Medicines (Sources and their use)</i>	

**Curriculum Coverage continued:**

	<b>Topic</b>	<b>Sub Topic</b>	<b>Coverage</b>
<b>Year 13</b>	<b>Communication, Homeostasis &amp; Energy</b>	What is the structure and function of the nervous system?	<i>Cell signalling and why organisms need communication; Neurone Structure; Sensory Receptors; Maintenance of the resting potential; Action Potential; Propagation of an action potential and salutatory conduction; Synapses; Organisation of the nervous system; Structure of the brain; Reflexes; Muscle contraction; Sliding filament model</i>
		How is the body controlled by hormones?	<i>Endocrine System and adrenal glands; Structure and function of the pancreas; Regulating blood glucose; Regulating release of insulin; Diabetes and its control</i>
		What is the role of homeostasis?	<i>Homeostasis: Principles of homeostasis; Thermoregulation; Liver Structure &amp; Functions; Kidney Structure; Kidney Dissection and Looking at Kidney cells; Ultrafiltration &amp; Selective reabsorption; The Loop of Henle &amp; Collecting Duct; Osmoregulation; Urine &amp; Diagnosis</i>
		How are plant responses to stimuli controlled?	<i>Introduction to different plant hormones; Plant responses to abiotic stress; Plant responses to herbivory; Phototropism; Commercial use of plants; Geotropism</i>
		What provides the energy for living systems?	<i>Photosynthesis: Energy Cycles &amp; ATP Synthesis; Structure of chloroplasts; Light dependent reaction; Photosynthesis: Light Independent reaction; Application and Photorespiration; Factors Affecting Photosynthesis</i>
		What is the role of respiration?	<i>Glycolysis; Link reaction &amp; the Krebs Cycle; Oxidative phosphorylation; Anaerobic respiration; Respiratory substrates</i>
	<b>Genetics, Evolution &amp; Ecosystems</b>	How are living organisms controlled by their genetics?	<i>Gene Mutations; Control of gene expression – Lac Operon; Control of gene expression – post transcriptional/pre-translational control; Body Plans</i>
		How is inheritance and variation controlled?	<i>Variation &amp; Inheritance; Monogenetic Inheritance; Dihybrid Inheritance; Sex Linkage; Epistasis; Evolution &amp; Population Genetics; Speciation &amp; Artificial Selection</i>
		How can genomes be manipulated?	<i>DNA Profiling; PCR; DNA sequencing; Uses of DNA sequencing; Genetic Engineering; Gene Technology &amp; Ethics</i>
		What is the role of biotechnology?	<i>Natural Cloning in Plants; Artificial cloning in plants; Animal Cloning; Microorganisms and Biotechnology; Culturing microorganisms; Culturing microorganisms industry; Immobilised enzymes</i>
		How do ecosystems function?	<i>Ecosystems, Biomass &amp; Energy Transfers; Recycling within an Ecosystem; Succession</i>
How is population size and sustainability within ecosystems maintained?		<i>Population Size; Competition; Predator-Prey Relationships; Conservation and preservation; Sustainability; Environmentally Sensitive Ecosystems</i>	

**Wider Key Stage 5 Curriculum**

*Homework expectations - Students will be set independent work that will encourage them to use their study periods wisely and practice the new skills that they need for A level. Homework tasks for KS5 science students might include researching scientific concepts, completing data analysis, answering extended-response questions, preparing practical write-ups, or revising past exam questions. Students also have access to a range of resources via Microsoft Teams.*