Department	Biology A-Level
Key Stage	Key Stage 5
Course Level	A-Level
Exam Board	AQA

Unit	Title	Weighting	Examination Method
Topics 1-4 • Biological molecules • Cells • Organisms exchange substances with their environment • Genetic information, variation and relationships between organisms • Includes relevant practical skills	Paper 1	35%	External written exam 2 hours 91 marks
Topic 5-8 • Energy transfers in and between organisms • Organisms respond to changes in their internal and external environments • Genetics, populations, evolution and ecosystems • Control of gene expression • Includes relevant practical skills	Paper 2	35%	External written exam 2 hours 91 marks
Topics 1-8 All of the above.	Paper 2	30%	External written exam 2 hours 78 marks (including one essay worth 25 marks)

Unit Title	**End Point**	**Substantive Knowledge**	**Disciplinary Knowledge**	**Assessment Method**
Biological molecules	All life on earth shares a common chemistry which provides indirect evidence for evolution. Students will embark on this journey to explore the similarities and differences of structural components across many living organisms.	Students should be able to recall the function of carbohydrates, proteins, lipids and starch from GCSE and apply new learning. Students should be able to define and apply key terminology such as monomers, polymers, dimers, condensation and hydrolysis. Students must be able to name the monomers that make polymers for all essential food groups.	Interpret results of qualitative tests. Calculating Rf values. Producing a dilution series and using colorimetric techniques. Analyzing data and constructing graphs with suitable scales and labelled axes. Calculation percentage changes.	Two end of unit tests

		Students must be able to explain how the structure of the monomer and polymers relates to the function. Students should recall the GCSE lock and key model, but also appreciate how models of enzyme action have changed over time and the role of a catalyst. For a detailed breakdown, please refer to the specification.		
Cells	Exploring the differences between cells and how this also provides indirect evidence for evolution. Building on our existing knowledge of mitosis and meiosis in eukaryotic cells and binary fission in prokaryotic cells. Understanding how different types of white blood cells work together to create an effective immune response.	Students should be able to describe the structure and function of different sub-cellular structures found in both eukaryotic and prokaryotic cells. Discuss the limitations of optical microscopes, transmission electron microscopes and scanning electron microscopes. Recognize the stages of the cell cycle and explain the appearance of cells in each stage of mitosis. Explain how movement across membranes occurs by simple diffusion, facilitated diffusion, osmosis, active transport and co-transport. Explain how surface area, number of channel or carrier proteins and differences in gradients of concentration or water potential affect the rate of movement across cell membranes. Describe and explain the role of phagocytes, B-lymphocytes and T-lymphocytes in an immune response. Explain the concept of herd immunity. Explain the differences between active and passive immunity. Explain how monoclonal antibodies are used in medical diagnosis and in targeting medication to specific cell types by attaching a therapeutic drug to an antibody.	Conducting scientific research and reading published articles. Developing English written communication skills through 25-mark essay practice. Calculating image size, actual size and magnification. Converting between units. Drawing biological drawings. Conducting research to produce and present group presentations.	Two end of unit tests

		For a detailed breakdown, please refer to the specification.		
Organisms exchange substances with their environment	Students will recall GCSE content and build on the concept of large multicellular organisms being adapted to exchange substances with their environment.	Describe adaptations of gas exchange surfaces, shown by gas exchange across the body surface of a single-celled organism, in the tracheal system of an insect, across the gills of fish and the leaves of dicotyledonous plants. Interpret information relating to the effects of lung disease on gas exchange and/or ventilation. Analyze and interpret data associated with specific risk factors and the incidence of lung disease. Explore how during digestion, large biological molecules are hydrolysed to smaller molecules that can be absorbed across cell membranes. Understand the role of haemoglobin and red blood cells in the transport of oxygen. Compare the structure of arteries, arterioles and veins in relation to their function. Describe the cohesion-tension theory of water transport in the xylem. Explain mass flow hypothesis for the mechanism of translocation in plants. For a detailed breakdown, please refer to the specification.	Calculating surface area to volume ratios of cells. Explore the idea of dissecting mammalian lungs. Preparing mounts and examining vertical sections. Recognising correlations and casual relationships. Develop practical skills.	Two end of unit tests
Genetic information, variation and relationships between organisms	Build on previous knowledge of biodiversity to explore variation of cell types within a single multicellular organism. Students will challenge themselves by measuring biodiversity within a community using species richness and an index of diversity.	Complete diagrams showing the chromosome content of cells after the first and second meiotic division, when given the chromosome content of the parent cell. Explain the different outcome of mitosis and meiosis. Recognize where meiosis occurs when given information about an unfamiliar life cycle. Interpret data relating to the effect of selection in producing change within populations. Show	Calculating probabilities, ratios and fractions related to genetic variations. Analysing data to construct graphs with suitable scales and labelled axes. Calculating index of diversity and interpret he significance of the calculated value of the index. Develop practical skills.	Two end of unit tests. End of year test.

		understanding that adaptation and selection are major factors in evolution and contribute to the diversity of living organisms. Understand the advances in immunology and genome sequencing help to clarify evolutionary relationships between organisms. For a detailed breakdown, please refer to the specification.		

Unit Title	End Point	Substantive Knowledge	Disciplinary Knowledge	Assessment Method
Energy transfers in and between organisms (A-level only)	Students will further develop on their previous knowledge of photosynthesis and respiration from GCSE and embed new information on the role of enzymes in the reactions. Further enhance their knowledge on ecosystems.	Explain the light-dependent reaction to show the idea that chlorophyll absorbs light energy, leading to photoionization. Understand that this reaction results in the production of ATP and reduced NADP. Understand the role of ATP in the electron transport chain and how photolysis occurs. Identify environmental factors that limit the rate of photosynthesis and evaluate data relating to common agricultural practices used to overcome the effect of these limiting factors. Explain the different stages on anaerobic and aerobic respiration. Identify glycolysis as a stage that occurs in both types of respiration. Students must be aware of the stages in both processes in details. Explain how biomass can be measured in terms of mass of carbon or dry mass of tissue per given area. Explain how production is affected by farming practices designed to increase the efficiency of energy transfer. Explain how nutrients are recycled within natural ecosystems, exemplified by the nitrogen cycle and the phosphorus cycle. Describe the vital role microorganisms play in recycling chemical elements such as phosphorus and nitrogen. For a detailed breakdown, please refer to the specification.	Use chromatography and calculate Rf values. Investigate the effect of a named factor on the rate of enzyme activity. Develop a range of practical skills. Identify key variables. Design methods, identify anomalies and suggest improvements to improve reliability, validity and accuracy. Drawing cycle diagrams to showcase the processes. Calculating area and volume. Calculating the efficiency of energy transfers within ecosystems.	Two end of unit tests

Organisms respond to changes in their internal and external environments (A-level only)	After learning about nerve impulses at GCSE, students will now engage in the idea of how the tertiary structure of receptors on target cells allows more accurate long-lasting responses. Students will continue comparing between the nervous and endocrine systems in more advanced detail.	Investigate the effect of an environmental variable on the movement of an animal using either a choice chamber of a maze. Understanding the effect of different concentrations of indoleacetic acid on cell elongation in the roots and shoots of flowering plants as an explanation of gravitropism and phototropism in flowering plants. Using the Pacinian corpuscle as an example of a receptor to show that receptors respond only to specific stimuli and this results in a generator potential. Incorporate AS knowledge of sodium ion channels to the Pacinian corpuscle. Explore the roles of the sinoatrial node, atrioventricular node and purkyne tissue in the bundle of his. Exploring the all-or-nothing principle related to how changes in membrane permeability lead to depolorisation and the generation of an action potential. Understanding the principles of homeostasis and negative feedback relating to both control of blood glucose concentration and blood water potential. For a detailed breakdown, please refer to the specification.	Researching methods online to improve the accuracy of practical lab work. Use formulas to calculate heart rate, stroke volume and cardiac output. Drawing biological diagrams. Using appropriate units when calculating the maximum frequency of impulse conduction given the refractory period of a neurone. Producing dilution series and using colorimetric techniques to produce a calibration curve.	
Genetics, populations, evolution and ecosystems (A-level only)	Students will understand how the theory of evolution underpins modern Biology. The concept of all new species arising from existing species resulting in	Reflect on key terminology used during GCSE Inheritance unit. Use labelled diagrams to interpret, or predict, the results on monohybrid and dihybrid crosses involving dominant, recessive and codominant alleles and the crosses involving sex-linkage, autosomal linkage, multiple alleles and epistasis.	Drawing complex genetic crosses. Calculating percentages. Conducting a chi-squared test. Null-hypothesis. Comparing observed and expected ratios. Predicting allele frequencies. Measuring abundance. Using a logarithmic scale.	Two end of unit tests

	different species sharing a common ancestry.	Using chi-squared test to compare the goodness of fit of observed phenotypic ratios with expected ratios. Using the Hardy-Weinburg principle to predict allele frequencies. Applying knowledge of sampling to the concept of genetic drift. Devising investigations to mimic the effects of random sampling on allele frequencies in a population. Explore how population size can vary as a result of the effect of abiotic factors, interactions between organisms and intraspecific competition. Using quadrats along a belt transect to estimate the size of a population Explore how ecosystems are dynamic systems and explain each stage of succession. For a detailed breakdown, please refer to the specification.		
The control of gene expression (A-level only)	Explore the many factors that control the expression of genes and thus, the phenotypes of organisms. Students will look into the use of DNA technology in the diagnosis and treatment of human diseases.	Explain how gene mutations occur spontaneously and can result in a different amino acid sequence in the encoded polypeptide. Explain how totipotent cells can divide and produce any type of body cell. Compare pluripotent, multipotent and unipotent cells. Evaluate the use of stem cells in treating human disorders. Interpret data provided from investigations into gene expression.	Develop English written communication skills for high demanding exam questions. Continue the development of communication skills and the correct use of key terminology throughout 25-mark essay practice.	Two end of unit tests End of year tests.

		Evaluate appropriate data of the relative influences of genetic and environmental factors on phenotype. Evaluate evidence showing correlations between genetic and environmental factors and various forms of cancer. Interpret information relating to the way in which an understanding of the roles of oncogenes and tumour suppressor genes could be used in the prevention, treatment and cure of cancer. Interpret information relating to the use of recombinant DNA technology. Evaluate the ethical, financial and social issues associated with the use and ownership of recombinant DNA technology in agriculture, in industry and in medicine. Relate recombinant DNA technology to gene therapy. Evaluate information relating to screening individuals for genetically determined conditions and drug responses. Explain the biological principles that underpin genetic fingerprinting techniques. Interpret data showing the results of gel electrophoresis to separate DNA fragments. For a detailed breakdown, please refer to the specification.		