

Curriculum Map: Year 12 Biology Autumn Term

Autumn		
	Teacher 1	Teacher 2
<p>Content Declarative knowledge 'I Know'</p>	<p>Module 2: Foundations in Biology</p> <p>2.1.1 Cell structure Know the use of staining in light microscopy. Know the difference between magnification and resolution. Know the ultrastructure of eukaryotic cells and the functions of the different cellular components. Know the interrelationships between the organelles involved in the production and secretion of proteins. Know the importance of the cytoskeleton. Know the similarities and differences in the structure and ultrastructure of prokaryotic and eukaryotic cells.</p> <p>2.1.5 Biological membranes Know the roles of membranes within cells and at the surface of cells. Know the fluid mosaic model of membrane structure and the roles of its components. Know the factors affecting membrane structure and permeability. Know the movement of molecules across membranes. Know the movement of water across membranes by osmosis and the effects that solutions of different water potential can have on plant and animal cells.</p> <p>2.1.6 Cell division, cell diversity and cellular organisation Know the stages of the cell cycle. Know the main stages of mitosis. Know the significance of mitosis in life cycles. Know the significance of meiosis in life cycles. Know the main stages of meiosis. Know the organisation of cells into tissues, organs and organ systems. Know the features and differentiation of stem cells. Know the production of erythrocytes and neutrophils derived from stem cells in bone marrow. Know the production of xylem vessels and phloem sieve tubes from meristems.</p>	<p>Module 2: Foundations in Biology</p> <p>2.1.2 Biological Molecules Know how H bonding occurs between water molecules and relate this and other properties of water to the roles of water for living organisms. Know the concepts of monomers and polymers and the importance of condensation and hydrolysis reactions in a range of biological molecules. Know the chemical elements that make up biological molecules. Know the ring structure and properties of glucose as an example of a hexose monosaccharide and the structure of ribose as an example of a pentose monosaccharide. Know the synthesis and breakdown of a disaccharide and polysaccharide by the formation and breakage of glycosidic bonds. Know the structure of starch, glycogen and cellulose. Know the general structure of an amino acid. Know the synthesis and breakdown of dipeptides and polypeptides, by the formation and breakage of peptide bonds. Know the levels of protein structure. Know the structure and function of globular proteins including a conjugated protein. Know the properties and functions of fibrous proteins. Know the key inorganic ions that are involved in biological processes. Know the principles and uses of paper and thin layer chromatography to separate biological molecules / compounds.</p> <p>2.1.3 Nucleic acids Know the structure of a nucleotide as the monomer from which nucleic acids are made. Know the synthesis and breakdown of polynucleotides by the formation and breakage of phosphodiester bonds. Know the structure of ADP and ATP as phosphorylated nucleotides. Know the structure of DNA (deoxyribonucleic acid). Know the process of semi-conservative DNA replication. Know the nature of the genetic code. Know the processes of transcription and translation of genes resulting in the synthesis of polypeptides.</p>

		<p>2.1.4 Enzymes Know the role of enzymes in catalysing reactions that affect metabolism at a cellular and whole organism level. Know the role of enzymes in catalysing both intracellular and extracellular reactions. Know the mechanism of enzyme action. Know the effects of pH, temperature, enzyme concentration and substrate concentration on enzyme activity. Know the need for coenzymes, cofactors and prosthetic groups in some enzyme-controlled reactions. Know the effects of inhibitors on the rate of enzyme controlled reactions.</p>
<p>Skills Procedural Knowledge 'I know how to'</p>	<p>PAG 1: Using a light microscope to study onion cells Know how to use microscopy to observe and investigate different types of cell and cell structure in a range of eukaryotic organisms. Know how to prepare and examine microscope slides for use in light microscopy, including the use of an eye piece graticule and stage micrometer. Know how to represent cell structure as seen under the light microscope using drawings and annotated diagrams of whole cells or cells in sections of tissue. Know how to use and manipulate the magnification formula. Know how to interpret photomicrographs. Know how to safely and correctly use a range of practical equipment and materials. Know how to keep appropriate records of experimental activities. Know how to present information and data in a scientific way. Know how to use a wide range of experimental and practical instruments, equipment and techniques appropriate to the knowledge and understanding included in the specification. Know how to produce scientific drawings from observations with annotations. Know how to carry out practical investigations into the factors affecting diffusion rates in model cells. PAG 5.1: The effect of temperature on membrane permeability PAG 8.1: An investigation into the water potential of potato Know how to use laboratory glassware apparatus to carry out serial dilutions. PAG 1.1: Using a light microscope to study mitosis Know how the cell cycle is regulated. Know how to interpret sections of plant tissue showing the cell cycle and stages of mitosis. Know how cells of multicellular organisms are specialised for particular functions.</p>	<p>Know how to keep appropriate records of experimental activities. Know how to present information and data in a scientific way. Know how to use a wide range of experimental and practical instruments, equipment and techniques appropriate to the knowledge and understanding included in the specification. PAG 9.3: Qualitative testing of glucose Know how to carry out and interpret the results of the following chemical tests:</p> <ul style="list-style-type: none"> • biuret test for proteins • Benedict's test for reducing and non-reducing sugars • reagent test strips for reducing sugars • iodine test for starch • emulsion test for lipids <p>PAG 5.2: Determining glucose concentration Know how to use quantitative methods to determine the concentration of a chemical substance in a solution. Know how to use laboratory glassware apparatus to carry out serial dilutions. Know how to carry out practical investigations to analyse biological solutions using paper or thin layer chromatography. Know how to purify DNA by precipitation. PAG 10.1: Investigating DNA structure using RasMol Know how to use ICT and software to collect and process data. PAG 4.1: The effect of substrate concentration on the rate of an enzyme controlled reaction</p>
<p>Strategies Conditional Knowledge</p>	<p>Understand the potential uses of stem cells in research and medicine.</p>	<p>Understand how the discovery of the structure of DNA was made and appreciate the contributions made by some that were not recognised at the time.</p>

'I know when to'		
Key Questions	<p>What is the ultrastructure of a typical eukaryotic and prokaryotic cell?</p> <p>What are the functions of the cell organelles?</p> <p>How can microscopes be used to view these organelles?</p> <p>How do substances cross the plasma membrane?</p> <p>How does the plasma membrane exert control over which substances enter and exit the cell?</p> <p>How do cells divide?</p> <p>What are stem cells and what are their potential uses?</p>	<p>What is the structure of the key biological molecules, how are they formed and how do their structures relate to their functions?</p> <p>How can we test for these molecules?</p> <p>How does DNA replicate?</p> <p>How is DNA used to make polypeptides?</p> <p>How do enzymes catalyse reactions?</p> <p>What factors affect the rate of enzyme-controlled reactions?</p>
Assessment topics	<p>2.1.1 Cell ultrastructure and 2.1.2 Water, carbohydrates and lipids multiple choice test (25 minutes) in mid-October.</p> <p>End of Module 2 test: (55 minutes) in early December.</p>	
Cross curricular links/Character Education	<p>Chemistry: Structure of biological molecules, hydrogen bonding, condensation reactions, hydrolysis, activation energy, chemical symbols and formulae.</p> <p>Maths: Recognise and make use of appropriate units in calculations, recognise and use expressions in decimal and standard form, use ratios, fractions and percentages, use an appropriate number of significant figures, find arithmetic means, construct and interpret frequency tables and diagrams, bar charts and histograms, understand the terms mean, median and mode, make order of magnitude calculations, understand measures of dispersion, including standard deviation and range, identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined, understand and use the symbols: \approx, \ll, \gg, \approx, \sim, \pm, change the subject of an equation, substitute numerical values into algebraic equations using appropriate units for physical quantities, solve algebraic equations, translate information between graphical, numerical and algebraic forms, plot two variables from experimental or other data, understand that $y = mx + c$ represents a linear relationship, calculate rate of change from a graph showing a linear relationship, draw and use the slope of a tangent to a curve as a measure of rate of change.</p> <p>Character education: Understanding the reasons why scientists' contributions to discovery may be overlooked.</p>	