Curriculum Mapping: Biology Year 12-13

St Martin's School
Be the best you can be

Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 12	Module 2: Foundations in biology		Module 3: Exchange and transport		Module 4: Biodiversity, evolution and disease	
	Concepts/Tier 3 vocabulary **Cell structure** Biology is the study of living organisms. Every living organism is made up of one or more cells, therefore understanding the structure and function of the cell is a fundamental concept in the study of biology. Since Robert Hooke coined the phrase 'cells' in 1665, careful observation using microscopes has revealed details of cell structure and ultrastructure and provided evidence to support hypotheses regarding the roles of cells and their organelles **Biological molecules** The cells of all living organisms are composed of biological molecules. Proteins, carbohydrates and lipids are three of	*Concepts/Tier 3 vocabulary* **Nucleotides and nucleic acids** Nucleic acids are essential to heredity in living organisms. Understanding the structure of nucleotides and nucleic acids allows an understanding of their roles in the storage and use of genetic information and cell metabolism. **Enzymes** Metabolism in living organisms relies upon enzyme controlled reactions. Knowledge of how enzymes function and the factors that affect enzyme action has improved our understanding of biological processes and increased our use of enzymes in industry.	*Concepts/Tier 3 vocabulary* **Exchange surfaces** As animals become larger and more active, ventilation and gas exchange systems become essential to supply oxygen to, and remove carbon dioxide from, their bodies. Ventilation and gas exchange systems in mammals, bony fish and insects are used as examples of the properties and functions of exchange surfaces in animals. **Transport in animals** As animals become larger and more active, transport systems become essential to supply nutrients to, and remove waste from, individual cells. Controlling the supply of nutrients and removal of waste requires the	*Concepts/Tier 3 vocabulary* **Transport in plants** As plants become larger and more complex, transport systems become essential to supply nutrients to, and remove waste from, individual cells. The supply of nutrients from the soil relies upon the flow of water through a vascular system, as does the movement of the products of photosynthesis.	*Concepts/Tier 3 vocabulary* **Communicable diseases, disease prevention and the immune system** Organisms are surrounded by pathogens and have evolved defences against them. Medical intervention can be used to support these natural defences. The mammalian immune system is introduced. **Biodiversity** Biodiversity refers to the variety and complexity of life. It is an important indicator in the study of habitats. Maintaining biodiversity is important for many reasons. Actions to maintain biodiversity must be taken at local, national and global levels.	*Concepts/Tier 3 vocabulary* **Classification and evolution** Evolution has generated a very wide variety of organisms. The fact that all organisms share a common ancestry allows them to be classified. Classification is an attempt to impose a hierarchy on the complex and dynamic variety of life on Earth. Classification systems have changed and will continue to change as our knowledge of the biology of organisms develops.

	the key groups of biological macromolecules that are essential for life. A study of the structure of these macromolecules allows a better understanding of their functions in living organisms. **Biological membranes** Membranes are fundamental to the cell theory. The structure of the plasma membrane allows cells to communicate with each other. Understanding this ability to communicate is important as scientists increasingly make use of membrane-bound receptors as sites for the action of medicinal drugs. Understanding how different substances enter cells is also crucial to the development of mechanisms for the administration of drugs.	**Cell division, cell diversity and cellular organisation** During the cell cycle, genetic information is copied and passed to daughter cells. Microscopes can be used to view the different stages of the cycle. In multicellular organisms, stem cells are modified to produce many different types of specialised cell. Understanding how stem cells can be modified has huge potential in medicine. To understand how a whole organism functions, it is essential to appreciate the importance of cooperation between cells, tissues, organs and organ systems.	coordinated activity of the heart and circulatory system.			

	Justification: This module gives learners the opportunity to use microscopy to study the cell structure of a variety of organisms. Biologically important molecules such as carbohydrates, proteins, water and nucleic acids are studied with respect to their structure and function. The structure and mode of action of enzymes in catalysing biochemical reactions is studied. Membranes form barriers within, and at the surface of, cells. This module also considers the way in which the structure of membranes relates to the different methods by which molecules enter and leave cells and organelles. The division and subsequent specialisation of cells is studied, together with the potential for the therapeutic use of stem cells.	***Justification:***	***Justification:*** In this module, learners study the structure and function of gas exchange and transport systems in a range of animals and in terrestrial plants. The significance of surface area to volume ratio in determining the need for ventilation, gas exchange and transport systems in multicellular organisms is emphasised. The examples of terrestrial green plants and a range of animal phyla are used to illustrate the principle. Learners are expected to apply knowledge, understanding and other skills developed in this module to new situations and/or to solve related problems.	***Justification:***	***Justification:*** In this module the learners study the biodiversity of organisms; how they are classified and the ways in which biodiversity can be measured. It serves as an introduction to ecology, emphasising practical techniques and an appreciation of the need to maintain biodiversity. The learners also gain an understanding of the variety of organisms that are pathogenic and the way in which plants and animals have evolved defences to deal with disease. The impact of the evolution of pathogens on the treatment of disease is also considered. The relationships between organisms are studied, considering variation, evolution and phylogeny.	***Justification***

	Assessment: *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*
	Wider reading/Cultural capital The A Level Biology A course will prepare learners for progression to undergraduate study, enabling them to enter a range of academic and vocational careers in biological sciences, medicine and biomedical sciences, veterinary science, agriculture and related sectors.					
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Year 13	Module 5: Communication, homeostasis and energy	Module 5: Communication, homeostasis and energy	Module 5: Communication, homeostasis and energy	Module 5: Communication, homeostasis and energy	Module 5: Communication, homeostasis and energy	**Course complete**

	Module 6: Genetics, evolution and ecosystems	Module 6: Genetics, evolution and ecosystems	Module 6: Genetics, evolution and ecosystems	Module 6: Genetics, evolution and ecosystems	Module 6: Genetics, evolution and ecosystems	
	Concepts/Tier 3 vocabulary **Communication and homeostasis** Organisms use both chemical and electrical systems to monitor and respond to any deviation from the body's steady state. Excretion as an example of homeostatic control The kidneys, liver and lungs are all involved in the removal of toxic products of metabolism from the blood and therefore contribute to homeostasis. The kidneys play a major role in the control of the water potential of the blood. The liver also metabolises some toxins that are ingested. **Cellular control** The way in which cells control metabolic reactions determines	***Concepts/Tier 3 vocabulary*** **Neuronal communication** The stimulation of sensory receptors leads to the generation of an action potential in a neurone. Transmission between neurones takes place at synapses. **Patterns of inheritance** Isolating mechanisms can lead to the accumulation of different genetic information in populations, potentially leading to new species. Over a prolonged period of time, organisms have changed and some have become extinct. The theory of evolution explains these changes. Humans use artificial selection to produce similar changes in plants and animals.	***Concepts/Tier 3 vocabulary*** **Hormonal communication** The ways in which specific hormones bring about their effects are used to exemplify endocrine communication and control. Type 1 diabetes is used as an example to demonstrate how medical technology is used to regulate the hormonal control systems. **Plant and animal responses** Plant responses to environmental changes are coordinated by hormones, some of which are important commercially. In animals, responding to changes in the environment is a complex and continuous process, involving	***Concepts/Tier 3 vocabulary*** **Respiration** Respiration is the process whereby energy stored in complex organic molecules is transferred to ATP. ATP provides the immediate source of energy for biological processes. **Cloning and biotechnology** Farmers and growers exploit "natural" vegetative propagation in the production of uniform crops. Artificial clones of plants and animals can now be produced. Biotechnology is the industrial use of living organisms (or parts of living organisms) to produce food, drugs or other product.	***Concepts/Tier 3 vocabulary*** **Ecosystems** Organisms do not live in isolation but engage in complex interactions, not just with other organisms but also with their environment. The efficiency of biomass transfer limits the number of organisms that can exist in a particular ecosystem. Ecosystems are dynamic and tend towards some form of climax community. **Populations and sustainability** There are many factors that determine the size of a population. For economic, social and ethical reasons ecosystems may need to be carefully managed. To support an increasing human population, we need to use biological	*N/A*

	how organisms, grow, develop and function.		nervous, hormonal and muscular coordination. **Photosynthesis** Photosynthesis is the process whereby light from the Sun is harvested and used to drive the production of chemicals, including ATP, and used to synthesise large organic molecules from inorganic molecules. **Manipulating genomes** Genome sequencing gives information about the location of genes and provides evidence for the evolutionary links between organisms. Genetic engineering involves the manipulation of naturally occurring processes and enzymes. The capacity to manipulate genes has many potential benefits, but the implications of genetic techniques are subject to much public debate		resources in a sustainable way.	

	Justification: Module 5 It is important that organisms, both plants and animals are able to respond to stimuli. This is achieved by communication within the body, which may be chemical and/or electrical. Both systems are covered in detail in this module. Communication is also fundamental to homeostasis with control of temperature, blood sugar and blood water potential being studied as examples. In this module, the biochemical pathways of photosynthesis and respiration are considered, with an emphasis on the formation and use of ATP as the source of energy for biochemical processes and synthesis of biological molecules.	***Justification*** *Module 6* This module covers the role of genes in regulating and controlling cell function and development. Heredity and the mechanisms of evolution and speciation are also covered. Some of the practical techniques used to manipulate DNA such as sequencing and amplification are considered and their therapeutic medical use. The use of microorganisms in biotechnology is also covered. Both of these have associated ethical considerations and it is important that learners develop a balanced understanding of such issues. Learners gain an appreciation of the role of microorganisms in recycling materials within the environment and maintaining balance within ecosystems. The need to conserve environmental resources	***Justification:***	***Justification:***	***Justification:***	*N/A*

		in a sustainable fashion is considered, whilst appreciating the potential conflict arising from the needs of an increasing human population. Learners also consider the impacts of human activities on the natural environment and biodiversity				
	Assessment: *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	***Assessment:*** *End of unit assessments, PAGs*	*N/A*
	Wider reading/Cultural capital The A Level Biology A course will prepare learners for progression to undergraduate study, enabling them to enter a range of academic and vocational careers in biological sciences, medicine and biomedical sciences, veterinary science, agriculture and related sectors.					