SUBJECT	BIOLOGY	KEY STAGE – Year	12	SUMMARY CURRICULUM PLAN

Subject content (What will be covered)	As a result, what students should know /understood	What students should be able to do (application/skills developed)	By when (Half term 1 > 6)
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.	Demonstrate knowledge, understanding and application of: - The use & preparation of light microscopes - the difference between magnification and resolution & manipulation of the magnification formula - the use of laser scanning confocal microscopy & electron microscopy. - the ultrastructure and functions of eukaryotic cellular components - the importance of the cytoskeleton - the interrelationship between the organelles involved in the production and secretion of proteins - the ultrastructure and functions of eukaryotic cellular components - the similarities and differences in the structure and ultrastructure of prokaryotic and eukaryotic cells.	Year 1 HT1
Biological molecules	The cells of all living organisms are composed of biological molecules. Proteins, carbohydrates and lipids are three of 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.	Demonstrate knowledge, understanding and application of: - the chemical elements that make up biological molecules - the key inorganic ions that are involved in biological processes - monomers and polymers as biological molecules. - how the properties of water relate to its roles in living organisms - the ring structure and properties of glucose & structure of ribose - the synthesis and breakdown of a disaccharide and polysaccharide - the structures and properties of glucose, starch, glycogen and cellulose molecules - the structure of a triglyceride and a phospholipid - the synthesis and breakdown of triglycerides - the properties of triglyceride, phospholipid and cholesterol molecules - how to carry out and interrupt the results of an emulsion test for lipids - the structure and function of globular & fibrous proteins including a conjugated protein	Year 1 HT 1

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.	Demonstrate knowledge, understanding and application of: - the roles of membranes within cells and at the surface of cells - the fluid mosaic model of membrane structure and the roles of its components - Factors affecting membrane structure and permeability - the passive movement of molecules across membranes - active transport of molecules across membranes - endocytosis and exocytosis as processes requiring ATP. - the movement of water across membranes by osmosis - the effects that solutions of different water potential can have on plant and animal cells	Year 1 HT 1 & 2
Nucleotides & 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	Demonstrate knowledge, understanding and application of: - the structure of a nucleotide - the synthesis and breakdown of polynucleotides - the structure of DNA - semi-conservative DNA replication - the nature of the genetic code - transcription and translation of genes resulting in the synthesis of polypeptides. - the structure of ADP and ATP as phosphorylated nucleotides	Year 1 HT 2
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.	Demonstrate knowledge, understanding and application of: - the role of enzymes in catalysing reactions that affect metabolism at a cellular and whole organism level - the role of enzymes in catalysing both intracellular and extracellular reactions - the mechanism of enzyme action - the effects of inhibitors on the rate of enzyme controlled reactions. - the need for coenzymes, cofactors and prosthetic groups in some enzyme-controlled reactions - the role of inactive presursors	Year 1 HT 2
Cell division	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.	Demonstrate knowledge, understanding and application of: - the cell cycle & how the cell cycle is regulated - the significance of mitosis in life cycles & the main stages of mitosis - the significance of meiosis in life cycles & the main stages of meiosis - how cells of multicellular organisms are specialised - the organisation of cells into tissues, organs and organ systems	Year 1 HT 2

	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.	- the features and differentiation of stem cells - the production of erythrocytes and neutrophils derived from stem cells in bone marrow & the production of xylem vessels and phloem sieve tubes from meristems - the potential uses of stem cells in research and medicine.	
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.	Demonstrate knowledge, understanding and application of: - the need for specialised exchange surfaces & the features of an efficient exchange surface - the structures and functions of the components of the mammalian gaseous exchange system - the mechanism of ventilation in mammals. - the relationship between vital capacity, tidal volume, breathing rate and oxygen uptake - the mechanisms of ventilation and gas exchange in bony fish and insects	Year 1 HT 3
Classification & 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.	Demonstrate knowledge, understanding and application of: - the biological classification of species including the binomial system of naming species and the advantage of such a system - the features used to classify organisms into the five kingdoms - evidence that has led to new classification systems - the relationship between classification and phylogeny - the evidence for the theory of evolution by natural selection including fossils, DNA and molecular evidence - Interspecific and intraspecific variation & Genetic and environmental causes of variation - The difference between continuous and discontinuous variation using examples from plants, animals and micro-organisms. - Standard deviation as a measure of spread of data - Students T-test to compare means of data values of two populations - Correlation co-efficient - the different types of adaptations of organisms to their environment - why organisms from different taxonomic groups may show similar anatomical features. - the mechanism by which natural selection can affect the characteristics of a population over time - how evolution in some species has implications for human populations.	Year 1 HT 3

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.	Demonstrate knowledge, understanding and application of: - how biodiversity may be considered at different levels - how sampling is used in measuring the biodiversity of a habitat and the importance of sampling - random & non-random sampling - the importance of sampling the range of organisms in a habitat - how to measure species richness and species evenness in a habitat - the use and interpretation of Simpson's Index of Diversity (D) to calculate the biodiversity of a habitat - how genetic biodiversity may be assessed e.g. calculating the percentage of gene variants (alleles) in a genome - the factors affecting biodiversity in isolated populations - in situ and ex situ methods of maintaining biodiversity - international and local conservation agreements made to protect species and habitats.	Year 1 HT 4
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 coordinated activity of the heart and circulatory system.	Demonstrate knowledge, understanding and application of: - the need for transport systems in multicellular animals - the different types of circulatory systems - the structure and functions of arteries, arterioles, capillaries, venules and veins - The differences in the composition of blood, tissue fluid and lymph & how tissue fluid is formed from plasma - the role of haemoglobin in transporting oxygen and carbon dioxide including the oxygen dissociation curve for fetal and adult human haemoglobin. - the external and internal structure of the mammalian heart - the cardiac cycle & how heart action is initiated and coordinated - the use and interpretation of electrocardiogram (ECG) traces	Year 1 HT 4
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.	Demonstrate knowledge, understanding and application of: - the need for transport systems in multicellular plants - the structure and function of the vascular system in the roots, stems and leaves of herbaceous dicotyledonous plants - the transport of water into the plant, through the plant and to the air surrounding the leaves - the process of transpiration and the environmental factors that affect transpiration rate - the transport of water into the plant, through the plant and to the air surrounding the leaves - the mechanism of translocation including the transport of assimilates between sources and sinks.	Year 1 HT 5

		- adaptations of plants to the availability of water in their environment	
Communicable disease & prevention	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.	Demonstrate knowledge, understanding and application of: - the different types of pathogen that can cause communicable diseases in plants and animals & their transmission - plant defences against pathogens - the primary non-specific defences against pathogens in animals - the structure and mode of action of phagocytes - modes of action of B and T lymphocytes in the specific immune response - the structure and general functions of antibodies - the action of opsonins, agglutinins and anti-toxins - the primary and secondary immune responses autoimmune diseases & the differences between active and passive immunity, and between natural and artificial immunity - the principles of vaccination and the role of vaccination programmes in the prevention of epidemics - The benefits and risks of using antibiotics to manage bacterial infection. - possible sources of medicines	Year 1 HT 5
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.	Demonstrate knowledge, understanding and application of: - The process and site of glycolysis - The link reaction and its site in the cell - The structure of the mitochondrion - The process and site of the Krebs cycle - The importance of coenzymes in cellular respiration - The process of oxidative phosphorylation - The process of anaerobic respiration in eukaryotes - The difference in relative energy values of carbohydrates, lipids, and protein as respiratory substances - The use and interpretation of the respiratory quotient (RQ)	Year 1 HT 6

Patterns of inheritance (Part 1)	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.	Demonstrate knowledge, understanding and application of: - the contribution of both environmental and genetic factors to phenotypic variation - how sexual reproduction can lead to genetic variation within a species - the meaning of the terms continuous an discontinuous variation and their genetic basis - genetic diagrams to show patterns of inheritance including dihybrid inheritance - the use of phenotypic ratios to identify linkage (autosomal and sex linkage) and epistasis	Year 1 HT 6
Genetics of Living Systems (Part 1)	The way in which cells control metabolic reactions determines how organisms, grow, develop and function.	Demonstrate knowledge, understanding and application of: - Types of gene mutations and their possible effects on protein production and function - The regulatory mechanisms that control gene expression at the transcription level, post transcriptional level and post translational level	Year 1 HT 6