

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)
Spec 5. 2.1 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.	Demonstrate knowledge, understanding and application of: <ul style="list-style-type: none"> - The need for cellular respiration - The interrelationship between the processes of photosynthesis and respiration - The chemiosmotic theory - The structure of a chloroplast and the sites of the two main stages of photosynthesis - The importance of photosynthetic pigments - The light dependent stage of photosynthesis - The fixation of carbon dioxides and the light independent stages of photosynthesis - The uses of triose phosphate (TP) - Factors affecting photosynthesis - Practical investigations into factors affecting the rate of photosynthesis 	Year 2 HT 1
Spec. 5.1.5 Plant & 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 nervous, hormonal and muscular coordination.	Demonstrate knowledge, understanding and application of: <ul style="list-style-type: none"> - The roles of plant hormones - The experimental evidence for the role of auxins in the control of apical dominance - The experimental evidence for the role of gibberellin in the control of stem elongation and seed germination. - Types of plant responses - The roles of plant hormones - The commercial use of plant hormones - the organisation of the mammalian nervous system - the structure of the human brain and the functions of its parts - the reflex actions - the structure of mammalian muscle and the mechanism of muscular contraction - the examination of stained sections of photomicrographs of skeletal muscle 	Year 2 HT 1

Spec 5.1.3 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.	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - the need for communication systems in multicellular organisms - The structure & function of sensory, relay and motor neurons - The communication between cells by cell signalling - the roles of mammalian sensory receptors in converting different types of stimuli into nerve impulses - the structure and roles of synapses in neurotransmissions 	Year 2 HT 2
Spec 5.1.1 Communication & homeostasis	Organisms use both chemical and electrical systems to monitor and respond to any deviation from the body's steady state.	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - The principles of homeostasis - The coordination of responses by the nervous and endocrine systems - The effects of hormones and nervous mechanisms on heart rate - The physiological and behavioural responses involved in temperature control in ectotherms 	Year 2 HT 2
Spec 5.1.2 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.	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - The term excretion and its importance in maintaining metabolism & homeostasis - The structure and mechanisms of action and functions of the mammalian liver - The examination and drawing of stained section to show the histology of liver tissue. - The structure, mechanisms of action and functions of the mammalian kidney - The dissection, examination and drawing of the external and internal structure of the kidney - The examination and drawing of stained section to show the histology of kidney tissue - The control of the water potential of the blood - How excretory products can be used in medical diagnosis - The effects of kidney failure and its potential treatments 	Year 2 HT 3
Spec 5.1. 4 Hormonal communication	The ways in which specific hormones bring about their effects are used to exemplify endocrine communication and control. Treatment of diabetes is used as an example of the use of medical technology in overcoming defects in hormonal control systems.	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - Endocrine communication by hormones - Structure and function of adrenal glands - The histology of the pancreas - The examination and drawing of stained sections of the pancreas to show the histology of the endocrine tissue - How blood glucose concentration is regulated 	Year 2 HT 4

		<ul style="list-style-type: none"> - The differences between type 1 and 2 diabetes mellitus - The potential treatments for diabetes mellitus 	
Spec 6.1.2 Patterns of inheritance	<p>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.</p>	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - 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 and 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 using the chi-squared (χ^2) test to determine the significance of the difference between observed and expected results - the factors that can affect the evolution of a species - the role of isolating mechanisms in the evolution of new species - the principles of artificial selection and its uses - the ethical considerations surrounding the use of artificial selection. 	Year 2 HT 1
Spec 6.1.3 Manipulating genomes	<p>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</p>	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - DNA profiling and its uses - Polymerase chain reaction (PCR) and its application in DNA analysis - The principles and uses of electrophoresis - the principles of DNA sequencing and the development of new DNA sequencing techniques - how gene sequencing has allowed for: <ul style="list-style-type: none"> - genome wide comparisons between individuals and between species - the sequences of amino acids in polypeptides to be predicted - the development of synthetic biology - the principles of genetic engineering - the techniques used in genetic engineering - the ethical issues relating to the genetic modification of organisms - the principles of and potential for gene therapy in medicine 	Year 2 HT 1/2
Spec 6.2. 1 Cloning & Biotechnology	<p>Farmers and growers exploit “natural” vegetative propagation in the production of uniform crops. Artificial clones of plants and animals can now be</p>	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - natural clones in plants and the production of natural clones for use in horticulture - how to take plant cuttings as an example of a simple cloning technique 	Year 2 HT 2/3

	<p>produced. Biotechnology is the industrial use of living organisms (or parts of living organisms) to produce food, drugs or other product.</p>	<ul style="list-style-type: none"> - the production of artificial clones of plants by micropropagation and tissue culture - the arguments for and against artificial cloning in plants - natural clones in animal species - how artificial clones in animals can be produced by artificial embryo twinning or by nucleation and somatic cell nuclear transfer (SCNT) - the arguments for and against artificial cloning in animals - the use of microorganisms in biotechnological processes - the advantages and disadvantages of using microorganisms to make food for human consumption - the use of microorganisms in biotechnological processes to include penicillin production, insulin production and bioremediation - the standard growth curve of a microorganism in a closed culture - how to culture microorganisms effectively, using aseptic techniques - the importance of manipulating the growing conditions in batch and continuous fermentation in order to maximise the yield of product required - the uses of immobilised enzymes in biotechnology and the different methods of immobilisation 	
Spec 6.3.1 Ecosystems	<p>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.</p>	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> ecosystems, which range in size, are dynamic and are influenced by both biotic and abiotic factors biomass transfers through ecosystems - the role of decomposers in ecosystems the recycling of carbon and nitrogen with ecosystems the process of primary succession in the development of an ecosystem - how the distribution and abundance of organisms in an ecosystem can be measured - the use of sampling and recording methods to determine the distribution and abundance of organisms in a variety of ecosystems. 	Year 2 HT 3
Spec 6.3.2 Population & Sustainability	<p>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 resources in a sustainable way.</p>	<p>Demonstrate knowledge, understanding and application of:</p> <ul style="list-style-type: none"> - the factors that determine size of a population - the impact of limiting factors on carrying capacity and final population size - interactions between populations - predator-prey relationships - the reasons for, and differences between, conservation and preservation - how the management of an ecosystem can provide resources in a sustainable way - the management of environmental resources and the effects of human activities 	Year 2 HT 4

		<ul style="list-style-type: none">- the effects of human activities on the animal and plant populations in environmentally sensitive ecosystems and how these human activities are controlled	
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