

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<p>Content</p> <p>Knowledge</p>	<p>a) Communication and Homeostasis and Energy: Communication and Homeostasis</p> <ul style="list-style-type: none"> Endotherms vs Ectotherms Cell signalling <p>Module 5: Communication and Homeostasis Knowledge Know how animals and plants respond to changes in the internal and external environment. Understand the importance of cell signalling. Recall negative feedback loops and understand the need for them and positive feedback loops in the body. Understand how ectotherms and endotherms control temperature using behaviour and physiological responses.</p> <p>b) Communication and Homeostasis and Energy: Excretion</p> <ul style="list-style-type: none"> The mammalian 	<p>a) Communication and Homeostasis and Energy: Neuronal Communication</p> <ul style="list-style-type: none"> Types and structure of neurons Generation and transmission of nerve impulses Structure and role of synapse <p>Module 5: Neuronal Communication Knowledge Identify differences in structure for sensory, relay and motor neurons. Explain how nerve impulses are generated and transmitted in mammals. Explain the structure and roles of synapses in neurotransmission. Describe the importance of summation and temporal control.</p> <p>b) Energy for biological processes: Respiration</p> <ul style="list-style-type: none"> Mitochondria Glycolysis Link reaction Krebs cycle Oxidative 	<p>a) Genetics and evolution: Cellular Control</p> <ul style="list-style-type: none"> Mutations Transcription factors Lac operon Body plans Hox genes <p>Module 6: Cellular Control Knowledge Know why and how gene mutations occur. Describe different types of mutations and their effects. Outline the different transcription factors. Explain how the lac operon works in e.coli. Describe what a body plan is and how it is controlled by hox genes. Explain how mitosis and apoptosis act as mechanisms which control the development of body form.</p> <p>b) Genetics and Evolution: Patterns of Inheritance</p> <ul style="list-style-type: none"> Genetic vs environmental variation meiosis Genetic diagrams Linkage and epistasis Chi square 	<p>a) Genetics and Evolution: Patterns of Inheritance</p> <ul style="list-style-type: none"> Factors affecting evolution of a species Hardy-Weinberg Isolating mechanisms Artificial selection <p>Module 5: Patterns of Inheritance Knowledge Know how different factors can affect the evolution of a species. Explore examples of stabilising and directional selection, genetic drift, bottleneck and founder effect. Describe differences in allopatric and sympatric speciation. Explore examples of selective breeding in animals and plants and the ethics behind this.</p> <p>b) Cloning and Biotechnology</p> <ul style="list-style-type: none"> Natural clones Artificial clones Microorganisms and biotechnology Microorganisms and food production Immobilised enzymes 	<p>Revision of Modules 1-6</p> <ul style="list-style-type: none"> To focus on recapping key knowledge and re-address common misconceptions Embed additional exam practice for each chapter Focus on key aspects of required practicals Walk-Talk-Mocks 	<ul style="list-style-type: none"> A level Exams

	<ul style="list-style-type: none"> liver The mammalian kidney <p>Module 5: Excretion Knowledge Recall the histology of the mammalian liver and kidney. Understand how both organs are responsible for excretion in mammals. Understand the role of the hepatic artery, hepatic vein, hepatic portal vein and sinusoids in the liver. Understand the role of the nephron. Explain how the kidney controls water potential of the blood through osmoreceptors in the hypothalamus, the posterior pituitary gland, and ADH. Identify problems leading to kidney failure and how these problems can be treated. Describe how urine is used in pregnancy tests and testing for anabolic steroids.</p> <p>c) Communication, Homeostasis and Energy: Plant responses</p> <ul style="list-style-type: none"> Phototropism Geotropism Apical dominance Gibberellins <p>Module 5: Plant Responses Knowledge</p>	<p>phosphorylation</p> <ul style="list-style-type: none"> Respiratory quotient <p>Module 5: Respiration Knowledge: Explain the sequential process of aerobic respiration by going through glycolysis, link reaction, Krebs cycle, and oxidative phosphorylation. Outline how many ATP are produced at each stage. Describe the chemiostic theory. Compare anaerobic respiration to aerobic respiration in eukaryotes. Compare the difference in relative energy values of carbohydrates, lipids, and proteins as respiratory substrates. Calculate respiratory quotients. Investigate rates of respiration in yeast under aerobic and anaerobic conditions. Investigate how temperature, substrate concentration and difference respiratory substrates affect the rate of respiration.</p> <p>c) Module 5: Animal Responses</p> <ul style="list-style-type: none"> Organisation of the mammalian nervous system The brain Coordination of the nervous and endocrine system Reflex actions Types of muscle Muscle contraction <p>Module 5: Animal Responses Knowledge Outline how the</p>	<ul style="list-style-type: none"> Continuous vs. Discontinuous variation <p>Module 6: Patterns of Inheritance Knowledge Identify characteristics and traits due to genetics and those caused by the environment. Explore Mendelian genetics and look into sex-linked genes, co-dominance, monogenic and dihybrid crosses. Explain epistasis and linkage. Use chi square to determine the significance of the difference between observed and expected results. Compare and contrast continuous and discontinuous variation.</p> <p>c) Genetics and Evolution: Manipulating Genomes</p> <ul style="list-style-type: none"> DNA sequencing DNA profiling PCR Electrophoresis Genetic Engineering Gene therapy <p>Module 6 Manipulating Genomes Knowledge Describe the processes of DNA sequencing and profiling. Describe how gene sequencing has allowed for genome-wide comparisons between individuals and species. Explore how gene sequencing has allowed for the development of synthetic biology. Describe the process of PCR and</p>	<p>Module 6: Cloning and Biotechnology Knowledge Know what is meant by natural and artificial clones. Understand the use of natural clones in horticulture. Know examples of artificial and natural clones in animals. Create well balanced arguments for and against artificial cloning in animals. Outline areas in industry where microorganisms are used (ie. Brewing, baking, insulin). List advantages and disadvantages for using microorganisms to make food for human consumption. Learn how to culture microorganisms effectively using aseptic technique. Explore the use of immobilised enzymes in biotechnology.</p> <p>c) Ecosystems</p> <ul style="list-style-type: none"> Biotic vs abiotic factors Biomass Recycling nitrogen Succession Distribution and abundance Sampling <p>Module 6: Ecosystems Knowledge Recall differences between biotic and abiotic factors. Describe how biomass transfers through ecosystems. Explain how decomposers and microorganisms recycle nitrogen within ecosystems. To understand what is meant</p>		
--	--	--	---	---	--	--

	<p>Describe how plants respond to light and gravity. Outline the practical investigations which support these responses. Outline experimntal evidence showing the role of auxin in apical dominance. Outline the experimental evidence for the role of giberellins in the control of stem elongation and seed germination. Explore the use of plant hormones to control ripening of fruit, the use of rooting powders and hormonal weed killers. Explain the role of plant hormones in leaf loss in deciduous plants, seed germination and stomatal closure.</p> <p>c) Energy for Biological Processes: Photosynthesis</p> <ul style="list-style-type: none"> ● chloroplast ● light-indepe ndant stage ● light dependant stage ● Triose phosphate ● Factors affecting photosynthe sis <p>Module 5: Photosynthesis Knowledge Describe the</p>	<p>mammalian nervous system is organised. Know the different part of the brain and what they control. Recall the reflex arc. Describe how the body's response is coordinated by both the endocrine and nervous system. Explore the response of 'fight or flight'. Explain how hormones and nervous mechanisms affect heart rate. Differentiate between skeletal, involuntary and cardiac muscle. Explain how muscles contract using the sliding filament model.</p>	<p>its application in DNA analysis. Outline the process of electrophoresis. Explain how genetic engineering is done, and the ethical issues that arise from it.</p>	<p>by sucession within a species. Recall how distribution and abundance of organisms can be measured .</p> <p>d) Population and sustainability</p> <ul style="list-style-type: none"> ● Limiting factors ● Predator-prey ● Conservation and preservation ● Management and sustainability <p>Module 6: Population and sustainability Knowledge Identify limiting factors of a given environment and how they can impact population size. Explore examples of predator-prey relationships and interspecific and intraspecific competition. Understand economic, social and ethical reasons for conservation of biological resources. Understand how ecosystems can be managed to balance the conflict between conservation/preservation and human needs.</p>		
--	--	---	---	--	--	--

	differences between the light dependent and light independent reaction and where they take place in plants. Describe how triose phosphate is used and recycled to regenerate the supply of RuBP. Describe limiting factors in photosynthesis.					
Skills	<ul style="list-style-type: none"> Dissect a mammalian kidney Use a microscope to examine prepared slides of stained liver and kidney tissue 	<ul style="list-style-type: none"> Use a microscope to examine prepared slides of muscle tissue Measure Daphnia heart rate 	<ul style="list-style-type: none"> Model Chi-square Run a gel-electrophoresis 	<ul style="list-style-type: none"> Model hardy-weinberg Carry out sampling techniques 	<ul style="list-style-type: none"> Recalling important information Exam Technique Spacing Interleaving Elaboration 	<ul style="list-style-type: none">
Key Questions	<p>What are endotherms and ectotherms and how are they different?</p> <p>What scientific evidence do we have to support theories for the role of auxin and gibberellins?</p> <p>What are the two stages of photosynthesis?</p> <p>How do cells communicate with each other?</p>	<p>What are the stages of respiration and where do they take place?</p> <p>How is the nervous system organised?</p> <p>What are the roles of the different neurons?</p> <p>How do hormones and neurons coordinate responses for survival?</p>	<p>What is the difference between a monohybrid and dihybrid cross?</p> <p>What determines a body plan?</p> <p>How can we use DNA profiling in forensics?</p> <p>How can we use chi square in population genetics?</p> <p>What is PCR and why was it an important breakthrough in the scientific community?</p>	<p>How does Hardy-Weinberg model population genetics?</p> <p>How can we measure abundance and distribution in a population?</p> <p>What are some examples of natural and artificial clones?</p> <p>How is cloning used in industry?</p> <p>How is nitrogen recycled in an ecosystem?</p> <p>How can we use biological resources in a sustainable way to support an</p>		

				increasing human population?		
Assessment	End of topic Test: 1)Endotherms, Ectotherms, the liver and kidney PAG 1 Microscopy PAG 2 Dissection	End of topic tests: 1) Photosynthesis 2) Respiration PAG 12 Research skills PAG 11 Investigation into the measurement of plant and animal responses	End of topic tests: 1) Genetics and Manipulating Genomes PAG 6 Electrophoresis	Project Presentation PAG 7 Microbiological technique PAG 3 Sampling techniques	Mock Exam Paper 1, Paper 2, and Paper 3 Paper 1: Modules 1,2,3, and 5 Paper 2: Modules 1,2,4, and 6 Paper 3: Modules 1-6	A-level exams Paper 1: Modules 1,2,3, and 5 Paper 2: Modules 1,2,4, and 6 Paper 3: Modules 1-6
Literacy/numeracy/SMSC/Character	Key words: thermoregulation, endotherm, ectotherm, auxin, nephron, bowman's capsule, counter-current system, giberellin, apical dominance, hepatocytes, sinusoid Numeracy: magnification formula, measuring size of cells using a graticule	Key words: action potential, Pacinian corpuscle, synapse, neurotransmitter, cholinergic, acetylcholine, photolysis, light-independent, light-dependent, thylakoid, matrix, compensation, ATP, Rubisco, oxidative phosphorylation, glycolysis, kreb's cycle, respiratory substrate Numeracy: calculating respiratory quotient	Key words: homeobox, HOX, apoptosis, monohybrid, dihybrid, co-dominance, linkage, epistasis, sex-linkage, DNA profiling, PCR, electrophoresis Numeracy: ratios, calculating percentages and working out fractions, , chi-square calculation	Key words: decomposer, allopatric, sympatric, founder's effect, bottleneck, biomass, immobilised enzymes Numeracy: hardy-weinberg calculation, draw and use the slope of a tangent, calculate rate		
Enrichment opportunities and futures	<p>Learn about conservation, genetics and breeding programs at ZSL in Regent's Park, London.</p> <p>Visit Kew gardens and explore the biodiversity of plant species in Kew, London.</p> <p>Visiting Body World's exhibition in Leicester square- Get up close to real bodies and examine their organs and systems</p> <p>Francis Crick Institute at King's Cross- Look into some current research taking place at the Francis Crick Institute in London https://www.crick.ac.uk/</p> <p>Learn more about Dolly the Sheep and if you ever find yourself in Edinburgh visit her at the National Museum of Scotland- https://www.nms.ac.uk/explore-our-collections/stories/natural-world/dolly-the-sheep/</p>					