Year 12 Curriculum Overview: Biology *subject to change

RESPECT
COURAGE
RESPONSIBILITY
KINDNESS
RESILIENCE

	Topics/ content outline:	Powerful Knowledge (key concepts, skills)	What will you be assessed on?	How can you help at home?
Autumn Term	Biological Molecules Biochemical Tests Enzymes Digestion + Absorption Eukaryotic Cell Structure Standard Deviation Studying Cells Plasma Membranes + Transport Across Membranes DNA Structure and Replication	Properties of water + importance, condensation reactions to form large molecules + hydrolysis for breakdown. How to determine molecules present in a solution + estimate concentration. How enzymes lower activation energy to catalyse reactions, + factors that affect enzyme action. Hydrolysis of starch, proteins + lipids to form small soluble molecules + the mechanisms of absorption. Measuring variation using standard deviation and its use to determine if differences are significant or not. Plasma membrane fluid mosaic structure and how this controls permeability. Size, solubility in lipids + water, and concentration gradient determine the mechanism used for transport across membranes. Watson + Crick model of DNA structure and how this relates to function Steps in the Semi-conservative replication of DNA to give accurate copies. Skills: Detailed factual recall, written communication, application of knowledge, data handling + analysis, evaluation, comprehension practical competencies	**End of topic booklets** assess factual knowledge, written communication, application, data handling + analysis, and evaluation through short and long answer questions **Practical Competencies** **Assessment 1**– Biological Molecules, Biochemical Tests Eukaryotic Cell Structure, Studying Cells **Assessment 2** – Any topic from assessment 1 + Enzymes, Plasma Membranes and Transport Across Membranes	Ensure students complete all homework thoroughly, using their lesson notes to help. Encourage them to make lists of questions/problem areas to ask teachers about. Ensure they use the checklists to methodically revise all topics. Make revision a part of the regular routine throughout the course. Prompt them to use the course study guide for tips on how to learn.
Spring Term	Surface area to volume ratio Gas Exchange, Ventilation + Disease Haemoglobin Circulatory System and Disease Tissue Fluid Cell Cycle, Mitosis + Cancer Genetic Code, Protein Synthesis + Mutations Prokaryotic cells + Binary Fission Viral Structure and Replication Immunology and Monoclonal Antibodies Meiosis Genetic Diversity and Natural Selection Classification+ Taxonomy	Problems associated with increased size of an organism and adaptations required. Features of gas exchange surfaces in humans, fish, insects and plants. Mechanism of ventilation by establishing a pressure gradient. How disease reduces ventilation, diffusion rates for gas exchange and therefore blood oxygen levels. How haemoglobin loads and unloads oxygen and adaptations of haemoglobin. Heart structure and function, events in the cardiac cycle, structure and adaptations of blood vessels. Cardiovascular disease, risk factors and correlations. How tissue fluid is formed and returned. Events of the cell cycle + mitosis that enable stem cells to produce new cells for growth and repair. What cancer is and how treatments can inhibit the cell cycle. The features of the universal genetic code and how it determines protein structure and function. The events in protein synthesis + how mutations change the genetic code + lead to changes in proteins. Structural features of prokaryotic cells compared to eukaryotic and how these cells divide to reproduce. General features of virus and replication. Specific structure of HIV and its replication. Passive + active immunity, vaccination + the uses of monoclonal antibodies in testing + treating disease. How gametes form and the causes of variation. Differences in alleles and the importance of genetic diversity in populations. The theory of natural selection and types of selection. Classification based on evolutionary relationships and how taxonomic groups are determined. Skills: Detailed factual recall, written communication, application of knowledge, data handling and analysis, evaluation, comprehension, practical competencies	**End of topic booklets** assess factual knowledge, written communication, application, data handling + analysis, and evaluation through short and long answer questions **Practical Competencies** **Assessment 3** – Any topic from the Autumn Term + SA:Vol ratio, Gas Exchange + Ventilation, Cell Cycle + Mitosis, Cancer, Genetic Code, Protein Synthesis + Mutations	Ensure students complete all homework thoroughly, using their lesson notes to help. Encourage them to make lists of questions/problem areas to ask teachers about. Ensure they use the checklists to methodically revise all topics. Make revision a part of the regular routine throughout the course. Prompt them to use the course study guide for tips on how to learn.
Summer Term	Transport of Water in Plants Xerophytes Transport Of Organic Molecules in Plants Antibiotic Resistance Biodiversity Statistics Ecosystems Ecological Techniques and Measuring Population Size Taxes and Kinesis Plant Responses	Cohesion-Tension theory for the transport of water + ions along the xylem + factors affecting rate of transpiration. Adaptations of xerophytes to prevent water loss and increase water uptake. Translocation and the mass flow hypothesis to transport sucrose and amino acids. The use of radioactive tracing and ringing experiments to study translocation. How antibiotics act + application of the theory of natural selection to explain how resistance develops. Species richness and the index of diversity as ways of measuring biodiversity. Human impact on biodiversity. Use of stats tests to determine if differences/correlations are due to chance. Selecting the correct test + writing conclusion. Terminology for ecosystems + use of quadrats, random sampling + mark-release recapture to determine population size. The use of transects to study the distribution of organisms. Responses of animals and plants to stimuli to increase survival chances – movement in animals and growth responses controlled by auxins in plants. Skills: Detailed factual recall, written communication, application of knowledge, data handling and analysis, evaluation, comprehension, practical competencies	**End of topic booklets** assess factual knowledge, written communication, application, data handling + analysis and evaluation through short and long answer questions **Practical Competencies** **Year 12 Mocks – 2 Papers** – All topics and skills from the AS Content (none of the red topics in the Summer Term)	Produce a timetable for increased revision for mocks. Ensure students complete all homework thoroughly, using their lesson notes to help. Tell them to make lists of questions/problem areas to ask teachers about. Ensure they use the checklists to methodically revise all topics. Make revision a part of the regular routine throughout the course. Prompt them to use the course study guide for tips on how to learn.

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	Topics/ content outline:	Powerful Knowledge (key concepts, skills)	What will you be assessed on?	How can you help at home?
Autumn Term	Decomposition , Nutrient Cycles and Fertilisers Succession Photosynthesis Respiration Monohybrid Inheritance and Sex Linkage Gene Technology – Fingerprinting, Screening, Gene therapy + Sequencing Nervous System Stem Cells	Role of saprobionts + hydrolysis reactions in the break-down of detritus, and factors that affect the rate of decay. Events and importance of the nitrogen and phosphorous cycles. Evaluation of the use of fertilisers to increase crop yields. Light dependent and light independent stages of photosynthesis, + factors that affect the rate of photosynthesis. Steps in respiration to include: glycolysis, link reaction, Kreb's cycle, substrate and oxidative phosphorylation. Inheritance of one gene with dominant and recessive alleles, multiple alleles and co-dominance. Genetic crosses where the gene is only located on the X chromosome. Interpreting pedigrees. Features of the genome, mutations and their consequences. Role of the genome project in determining the base sequence of DNA, its importance and issues. Use of electrophoresis, probes, labelling and microarrays in screening for disease alleles. Using gene therapy to enable the production of functional proteins to treat genetic diseases. Features of the nervous system + structure of cells. Resting potential, action potentials, refractory periods and saltatory conduction. Synaptic transmission and the effects of toxins and drugs. Features of stem cells and their uses, including induced pluripotent stem cells and their advantages. Skills: Detailed factual recall, written communication, application of knowledge, data handling + analysis, evaluation, comprehension, practical competencies, synoptic essays	**End of topic booklets** assess factual knowledge, written communication, application, data handling + analysis, and evaluation through short and long answer questions **Practical Competencies** **Assessment 1**– Named Year 12 topics + Decomposition, fertilisers, nutrient cycles, ecological techniques and population size, survival and response **Assessment 2** – Named year 12 topics + Gene Tech 1 and Nervous System	Ensure students complete all homework thoroughly, using their lesson notes to help. Encourage them to make lists of questions/problem areas to ask teachers about. Ensure they use the checklists to methodically revise all topics. Make revision a part of the regular routine throughout the course i.e. revise year 12 topics as well as completing work and revision for year 13 topics. Prompt them to use the course study guide for tips on how to learn Produce a timetable for increased revision for mock/external exams. Encourage them to practice planning for essays. Use recall first to identify topics, then checklists to see if there are others. Then, consider if there are topics on the list that they can't easily write about, these should be their focus for revision.
Spring Term	Population genetics Speciation Recombinant Gene Technology Gene Machine Energy and Ecosystems Regulation of Transcription and Translation Gene Expression and Cancer Skeletal Muscle Contraction Homeostasis	Frequency of alleles in a population + the application of the hardy Weinberg principle to determine frequency. How new species form through natural selection. Types of speciation (allopatric and sympatric) and genetic drift. Genetic Engineering to ransfer genes from one species to another so they product the protein product. To include the engineering of bacteria, plants and animals, and genetic markers to identify recombinants. The production of genes without a DNA template. How energy is transferred along a food chain and dissipated. The technique of calorimetry to determine energy levels within biomass. How the expression of genes is switched on and off using transcription factors, oestrogen and iRNA. Role of tumour suppressor genes and oncogenes in cancer. Epigenetics + the role of methylation and acetylation in gene expression, including links to cancer + treatments. Structure of skeletal muscles + the sliding filament hypothesis of contraction. Roles of calcium ions + ATP. Differences between Fast twitch and slow twitch muscle fibres linking to type of exercise. Negative feedback and the importance of maintaining a constant internal environment. Skills: Detailed factual recall, written communication, application of knowledge, data handling and analysis, evaluation, comprehension, practical competencies, synoptic essays	**End of topic booklets** assess factual knowledge, written communication, application, data handling + analysis, and evaluation through short and long answer questions **Practical Competencies** **Mock Exam (Assessment 3):** Paper 1 – Any year 12 Topic Paper 2 – Any year 13 topic from the Autumn term, including ecology and survival and response work from the summer of year 12 **Essay Writing**	
Summer Term	Control of Heart Rate Control of Blood Glucose Levels Kidneys and the Control of Water Potential Inheritance – Dihybrid, Epistasis and Autosomal Linkage	How heart rate is increased or decreased in response to changes in carbon dioxide levels and blood pressure. Detecting blood glucose levels and the roles of insulin, glucagon and adrenaline in returning levels to normal. Second messenger model to explain how binding to receptors leads to stimulation of events within cells. Structure of the kidney, ultrafiltration, selective reabsorption, counter-current multiplier mechanism and the production of a concentrated urine. Role of the pituitary gland and ADH in the control of water potential. Genetic inheritance of two genes located on different types of chromosomes, and how one gene can affect the expression of another in the phenotype. Genetic inheritance of two genes located on the same chromosome and the role of crossing over in forming recombinants. Skills: Detailed factual recall, written communication, application of knowledge, data handling and analysis, evaluation, comprehension, practical competencies, synoptic essays	**End of topic booklets** assess factual knowledge, written communication, application, data handling + analysis and evaluation through short and long answer questions **Practical Competencies** **Essay Writing** **Assessment 4** – Any Spring term topic **External Exams**: **Paper 1** – Any Year 12 topic or practical **Paper 2** – Any year 13 topic of practical **Paper 3** – Any topic or practical from either year + extended data handling and essay	