BIOLOGY CURRICULUM MAP

Intent:

‘To instil a passion for biological processes and to cultivate enthusiasm through excellent teaching and learning. To develop independent, scientifically literate students who are equipped with the analytical and evaluative skills required for their future careers.’

Key Stage 4: GCSE

YEAR 9	Unit 1 (B1-B2)	Unit 2 (B3-B4)	Unit 4 (B8-B9)
Key Knowledge	Microscopes (Required Practical) Animal and plant cells Eukaryotes and prokaryotes Cell division Specialisation Stem cells and their uses Ethical dilemmas of stem cell use Diffusion Osmosis (Required Practical) Active transport Exchanging materials in living things End of unit test	Organisation of tissues and organs Digestive system structure and function Macromolecule structure Food tests (Require Practical) Enzymes Effect of temperature on enzyme activity Effect of pH on enzyme activity (Required Practical) Function of the liver and bile Blood composition and function Blood vessels The heart Problems with the heart and their solutions Breathing and gaseous exchange Tissues and transport in plants (leaf, xylem and phloem) Transpiration and the rate of transpiration End of unit test	Photosynthesis The rate of photosynthesis and limiting factors (Required Practical) Glucose uses in plants How to test a leaf for starch Optimising photosynthesis for increased yields Aerobic respiration Response to exercise Anaerobic respiration Metabolism and the liver End of unit test
Key Subject Skills	Biological drawing Using a microscope Rearranging equations and using formulae Graph drawing Data analysis Percentage change calculations Evaluate question practice	Command word analysis Applying more complex methodology Graph drawing Data analysis Dissection	Graph drawing Graph analysis

Personal development: • **RSE** • **Online safety** • **Enrichment**	Ethical debates	Heart disease treatments	Discussion on exercise and healthy living
Connections with careers	Biology teacher Microbiologist Electron microscope technician Stem cell researcher Cell culture technician Oncologist	Dietician Food scientist Gastroenterologist Cardiologist Perfusionist Clinical cardiovascular researcher	Farmer Horticulturalist Botanist Garden landscaper Tree surgeon Sports scientist P.E. teacher Personal trainer Athlete Brewer Baker Hepatologists
Home support	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook)	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook)	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook)

Key stage 4: GCSE

YEAR 10	**Unit 3 (B5-B7)**	**Unit 6 (B13-B15)**	**Unit 7 (B16-B18)**
Key Knowledge	Health, disease and risk factor Cancer and cancer treatment Smoking and risk of disease Diet, exercise and disease	Types of reproduction Meiosis in sexual reproduction DNA structure Protein synthesis	Ecosystems Measuring abundance and distribution (Required Practical) Animal adaptations

	Alcohol and other carcinogens Pathogens and disease Growing bacteria in the lab Investigating preventing bacterial growth (Required Practical) Preventing transmission Viral, bacterial, fungal and protist disease examples Human defence responses Vaccination Plant diseases and defences Antibiotics and painkillers Discovering and developing drugs Monoclonal antibodies End of unit test	The history of genetics Gene expression and mutations Modelling inheritance Genetic disorders Screening for genetic disorders Variation and evolution by natural selection Theories of evolution and Darwin's ideas Speciation Evidence for evolution and fossils Extinction Antibiotic resistance Classification Selective breeding Genetic engineering Cloning plants Embryonic cloning Adult cell cloning End of unit test	Plant adaptations Extremophiles Feeding relationships Trophic levels and biomass transfers
Key Subject Skills	Aseptic technique Microbiology plate analysis Data analysis Percentage change calculations	Using punnet squares to model inheritance Evaluate question practice	Fieldwork Percentage change calculations Estimating population calculations Research
Personal development: • **RSE** • **Online safety** • **Enrichment**	Questioning the validity of research and online information Hygiene practices	Exploring historical beliefs Ethical debates Appropriate antibiotic usage	Global stewardship
Connections with careers	Microbiologist Pharmaceutical scientist Immunologist Epidemiologist Medical practitioner Pathologist	Geneticist Radio crystallographer Research scientist Phylogenist Natural history museum curator Genetic councillor	Ecologist National park ranger Zoologist

	Plant pathologist	Research ethics committee member Farmer Genetic engineer	
Home support	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook)	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook)	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook)

YEAR 11	**Unit 7 continued** **(Trilogy: B16-B17/Separate: B16-B18)**	**Unit 5 continued** **(Trilogy: B10-B11/Separate: B10-B12)**	**Revision**
Key Knowledge **Italics indicate separate science content only*	Human population explosion Carbon cycle Decay and rates of decomposition (Required Practical) Global warming *Impact of environmental change* Water cycle and pollution Land and air pollution *Factors affecting food security* *Making food production efficient and sustainable* End of unit test	The nervous system Reflexes Investigating reaction times (Required Practical) *The brain* *The eye* *Accommodation and common eye problems* Homeostasis *and controlling body temperature* Hormonal control and negative feedback Blood glucose and diabetes Menstrual cycle and puberty Contraception Infertility *Plant tropisms* *Investigating the effect of light/gravity on seedling germination (Required Practical)* *Uses of plant hormones* *Kidney and waste removal* *Dialysis and kidney transplants* End of unit test	Revision tailored to individual and class needs. Could include: • Required practical recap • Extended response practice • Data analysis • Revisiting year 9 content • Consolidating difficult topic knowledge • Exploring cross topic links • Exam question practice • Full past paper practice

Key Subject Skills	Research Data analysis	Dissection Graph drawing	Metacognition Revision techniques
Personal development: • **RSE** • **Online safety** • **Enrichment**	Global stewardship	Causes and management of diabetes Kidney failure and treatments	
Connections with careers	Agricultural biodiversity adviser Forester Eden project staff member Conservation officer Policy advisor Farmer Fish farmer Fishers	Neurologist Psychologist Optician Endocrinologist Gynaecologist PSHE teacher School nurse Fertility consultant/nurse Farmer Horticulturalist Botanist Urologist	Teacher
Home support	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook) Seneca	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook) Seneca	Revision resources on TEAMS BBC bitesize YouTube Educake Kerboodle (virtual textbook) Seneca

Key Stage 5: A-Level

YEAR 12	Teacher 1: Module 2	Teacher 2: Module 2	Teacher 1: Module 3 + 6.6	Teacher 2: Module 4 + 6.5
Key Knowledge	**2.2: Biological molecules** Water Carbohydrates: mono, di and polysaccharides PAG 9.3 - Qualitative testing for glucose PAG 5.2 - Determining glucose concentration Lipids: triglycerides, phospholipids and cholesterol Proteins PAG 9.1 - Qualitative testing for proteins PAG 9.2 - Qualitative testing for lipids Inorganic ions The principles and uses of chromatography End of topic test **2.3: Nucleic acids** The structure of nucleotides and nucleic acids PAG 10.1 - Investigating DNA structure using RasMol Semi-conservative replication DNA precipitation Protein synthesis: transcription and translation	**2.1: Cell structure** Microscopes Measuring objects under a microscope PAG 1.2 - The examination of cells observed in a blood smear Ultrastructure of eukaryotic cells How organelles work together Ultrastructure of prokaryotic cells End of topic test **2.5: Biological membranes** Structure of cell membranes Diffusion Osmosis PAG 8.1 - An investigation into the water potential of potato Active transport Bulk transport Factors affecting membrane structure and permeability PAG 5.1 - The effect of temperature on membrane permeability End of topic test **2.6: Cell division, diversity and differentiation** The cell cycle and its regulation	**3.1 & some 3.3: Exchange surfaces and breathing** Exchange surfaces The mammalian gas exchange system PAG 1.3 - Using light microscopes to observe sections of lung tissue Measuring lung volume Gas exchange in fish Gas exchange in insects Transport systems in animals Blood vessels The blood and tissue fluid The structure of the heart The cardiac cycle Transporting gases End of topic test **3.2 & some 3.3: Transport in plants** Transport in plants PAG 2.2 - Dissection of a stem Transport tissues Transpiration and factors affecting its rate The transpiration stream PAG 5.3 - Measuring the rate of transpiration	**4.1: Communicable disease** Organisms that cause disease Transmission of pathogens Plant defences Primary defences against pathogens Secondary non-specific defences The specific immune response Antibodies Vaccination and immunity Development and use of drugs End of topic test **4.2: Biodiversity** Biodiversity Calculating biodiversity Sampling techniques for animals and plants What affects biodiversity? Reasons to maintain biodiversity Conservation in and ex situ Conservation agreements End of topic test **4.3: Classification** Biological classification Features used in classification Evidence used in classification Phylogeny Evidence for natural selection

	2.4: Enzymes Enzymes and co-factors The mechanism of enzyme action The effect of temperature on the rate of enzyme-catalysed reactions The effect of pH on the rate of enzyme-catalysed reactions The effect of substrate concentration on the rate of enzyme-catalysed reactions PAG 4.1 - The effect of substrate concentration on the rate of an enzyme-controlled reaction The effect of enzyme concentration on the rate of enzyme-catalysed reactions Enzyme inhibitors End of topic test	Mitosis Meiosis Diversity in animal cells Animal tissues, organs and organ systems Diversity in plant cells Plant tissues and organs Stem cells and their potential uses End of topic test	Adaptations for the availability of water Translocation End of topic test END OF YEAR MOCK **6.6: Populations and sustainability** Determining population size Interactions between populations Conservation and preservation Sustainable management Balancing the conflict between conservation and human needs Controlling the effect of human activities	Variation Applying statistical tests Adaptation Evolution End of topic test PAG 3.1 – The calculation of species diversity PAG 3.3 -Correlation between species distribution and an abiotic factor END OF YEAR MOCK **6.5: Ecosystems** Ecosystem basics and dynamics Transfer of biomass and its manipulation Carbon and nitrogen cycles Succession
Key subjects Skills	Qualitative testing Serial dilutions Using a colourimeter Constructing and using calibration curves Computer modelling	Using microscopes Making slides Measuring using a graticule Graticule calculations Oral presentations Following a method with minimal teacher intervention Serial dilutions Percentage change calculations Using a colourimeter	Using microscopes Dissections Using a potometer Oral presentations	Fieldwork skills Statistical tests

Personal development: • **RSE** • **Online safety** • **Enrichment**		Communicating scientific concepts		Trip to Wildwood
Connections with careers	Nutritionist Food chemist Computer modelling	Biology teacher Microbiologist Electron microscope technician Stem cell researcher Cell culture technician Oncologist	Cardiologist Ecologist National park ranger Zoologist Agricultural biodiversity adviser Forester Eden project staff member Conservation officer Policy advisor	Microbiologist Pharmaceutical scientist Immunologist Epidemiologist Medical practitioner Pathologist Plant pathologist Ecologist National park ranger Zoologist Agricultural biodiversity adviser Forester Eden project staff member Conservation officer Policy advisor Farmer Fish farmer Fishers
Home support	Independent study work found on TEAMS	Independent study work found on TEAMS	Independent study work found on TEAMS	Independent study work found on TEAMS

YEAR 13	**Teacher 1: Module 5**	**Teacher 2: Module 6**	**Revision**
Key Knowledge	**5.6: Photosynthesis** Relationship between photosynthesis and respiration	**6.1 & 6.2: Cellular control and patterns of inheritance** Gene mutation and variation	Revision tailored to individual and class needs.

	Chloroplasts and photosynthetic pigments PAG 6.3 - practical investigations using thin layer chromatography (TLC) to separate photosynthetic pigments The light-dependent stage The light-independent stage Factors affecting photosynthesis PAG CS1 - Investigating the rate of photosynthesis using algae balls End of topic test **5.7: Respiration** The need for cellular respiration Glycolysis The structure of mitochondria The link reaction and Krebs cycle Oxidative phosphorylation and the chemiosmotic theory Anaerobic respiration in eukaryotes Practical investigations into respiration rates in yeast Energy values of different respiratory substrates Practical investigations into factors affecting the rate of respiration End of topic test **5.1 & 5.2: Homeostasis and excretion** Temperature control in ectotherms and endotherms Excretion The liver Kidney structure PAG CS2 - Dissection and a low power plan of a kidney	Monogenic inheritance Multiple alleles and codominance Sex linkage Dihybrid inheritance Autosomal linkage Epistasis Chi-squared test Continuous and discontinuous variation Factors affecting the evolution of a species Hardy-Weinberg principle Isolating mechanisms and artificial selection Protein synthesis and controlling gene expression Regulation of gene expression (the *Lac* operon) Regulation of gene expression (transcription factors, post-transcriptional and post-translational regulation) Genetic control of body plan Epigenetics End of topic test **6.3 & 6.4: Manipulating genomes, cloning and biotechnology** DNA structure and replication Polymerase chain reaction (PCR) DNA profiling PAG 6.3 - Gel electrophoresis Sanger sequencing Pyrosequencing and application of DNA sequencing DNA probes and microarrays Genetic engineering Issues relating to genetic engineering Gene therapy	Could include: • PAG recap • Extended response practice • Data analysis • Revisiting year 12 content • Consolidating difficult topic knowledge • Exploring cross topic links • Exam question practice • Full past paper practice .

	The function of the kidney Osmoregulation Urine analysis End of topic test **5.3 (5.5): Neuronal communication** Nerve impulses Action potentials Synapses The brain and nervous system Reflex actions Muscle structure Muscle contraction End of topic test **5.4 (5.5): Hormonal communication** Adrenal glands The pancreas Regulating blood glucose Coordinating responses Controlling heart rate PAG 11.1 - Investigation into the effect of exercise on pulse rate Controlling plant growth Tropisms Commercial uses of plant hormones End of topic test	Cloning plants Cloning animals Biotechnology Fermenters and batch/continuous fermentation Culturing microorganism PAG 7.2 – Immobilised enzymes End of topic test	
Key subjects Skills	Biochemistry Chromatography Immobilising algae Dissection Biological drawing Using organisms ethically in investigations	Modelling inheritance using punnet squares Logarithm calculations	Metacognition Revision techniques

Personal development: • **RSE** • **Online safety** • **Enrichment**	Ethical use of organisms	Trip to Sanger Institute	
Connections with careers	Neurologist Psychologist Endocrinologist Horticulturalist Botanist Urologist	Geneticist Data scientist Research assistant Database curator	Teacher
Home support	Independent study work found on TEAMS	Independent study work found on TEAMS	Independent study work found on TEAMS