Curriculum Map
Year 13

Biology

Learning Aims and Curriculum Intent:

Studying Biology at A Level enables students to delve deeper into understanding biochemical processes on a cellular level, as well as that of whole ecosystems. Students will learn about complex biochemical pathways, developing their knowledge and understanding in order to apply knowledge to new contexts. Students will be able to justify experimental methods, suggesting modifications to improve validity. Students will apply mathematical skills from GCSE and beyond to draw conclusions and analyse statistical significance of experimental data. Practical competency will be assessed in the Practical Endorsement; a separate certificate from the A Level itself.

Term	Content, Key Questions and Knowledge	Skills	Assessment
Michaelmas	**Module 5 – Communication, Homeostasis and Energy** In this module, learners study the importance of both plant and animal responding to stimuli. This is achieved by communication within the body, which may be chemical and/or electrical. Communication is also fundamental to homeostasis with control of temperature, blood sugar and blood water potential being studied as examples. In-depth content of the following contexts are studied: • How organisms use both chemical and electrical systems to monitor and respond to any deviation from the body's steady state. • The role of the kidneys, liver and lungs in the removal of toxic products of metabolism from the blood and how they contribute to homeostasis. • The role of the kidneys in the control of the water potential of the blood. • The role of the liver in metabolising toxins that are ingested. • The stimulation of sensory receptors leading to the generation of an action potential in a neurone. • The process of transmission at synapses. • The ways in which specific hormones bring about their effects, to exemplify endocrine communication and control. • Type 1 diabetes an example of how medical technology is used to regulate the hormonal control systems. • 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.	**Module 1- Development of practical skills** This topic will be taught all the way through Year 12 and 13, contextualised within other topic content. Students will apply knowledge of the following skills to topic-based contexts: • Independent thinking. • Use and application of scientific methods and practices. • Research and referencing. • Instruments and equipment. • Use of apparatus and techniques. Acquire knowledge and understanding of biological facts, terminology, concepts, principles and practical techniques. Apply knowledge, understanding and other skills developed in the specification	All of the Biology teachers at Forest will use some or all of the following modes of assessment throughout the course: • Retrieval quizzes. • Online topic progress multiple choice quizzes. • Exam questions from OCR A exam board. • Extended-response questions. • End of topic tests composed of past exam questions.

	Module 6 – Genetics, Evolution and Ecosystems In this module, learners study the role of genes in regulating and controlling cell function and development, as well as heredity and the mechanisms of evolution. Practical techniques used to manipulate DNA and microorganisms in biotechnology are considered along with their therapeutic medical use. Learners will study the balance within ecosystems, appreciating the need to sustainably conserve environmental resources, whilst considering the impacts of human activities and the potential conflict arising from the needs of an increasing human population. The following concepts will be covered in-depth, using examples: • The way cells control metabolic reactions to determine how organisms, grow, develop and function (at the pre-transcriptional, post-transcriptional, post-translational levels, as well as the role of mitosis and apoptosis). • Using genetic diagrams to show patterns of inheritance, including the use of phenotypic ratios to identify autosomal-linkage, sex-linkage and epistasis. • Using the chi-squared (χ^2) statistical analysis to determine the significance of the difference between observed and expected results. • The factors that affect the evolution of a species, and the use of the Hardy–Weinberg principle to calculate allele frequencies in populations. • The process of evolution, and how isolating mechanisms lead to the accumulation of different genetic information in populations, creating new species. • The use of artificial selection to produce changes in plants and animals which benefit humans, as well as ethical considerations. • The principles, techniques and benefits of DNA sequencing, DNA profiling, PCR, electrophoresis, genetic engineering, and gene therapy (somatic and germline). • The ethical issues (both positive and negative) relating to the genetic manipulation of animals (including humans), plants and microorganisms. • The balanced arguments of benefits of biotechnology (the industrial use of living organisms to produce food, drugs or other product) aligned with ethical considerations. • How agriculture exploits “natural” vegetative propagation in the production of uniform crops (monoculture), as well as the production of artificial clones of plants and animals through micropropagation, embryo twinning and SCNT. • The standard growth curves of microbes (along with factors affecting this) and the use of aseptic technique in culturing microbes effectively. • The use of immobilised enzymes in biotechnology and the different methods of immobilisation. • The dynamic nature of ecosystems, how energy and biomass are transferred through ecosystems, and factors which affect organisms and the size of populations within an ecosystem (biotic and abiotic, tending to succession of a climax community. • Practical investigations into the abundance and distribution of organisms within an ecosystem or environment, and statistical analysis of this. • Reasons for conservation and preservation, and how management of an ecosystem can sustainably provide resources whilst reducing human impact on the environment. • The role of microorganisms in recycling materials within the environment and maintaining balance within ecosystems.	to new situations and/or to solve related problems. Select and apply appropriate areas of mathematics to new biological contexts. Biological drawing.	
Lent	Content of Module 5 & 6 is split across two teachers and taught throughout the Lent and Trinity terms. Once the topic content is finished, students will revise content using various techniques such as past paper examination questions, before the final three A-Level examinations.		All of the Biology teachers at Forest will use some or all of the following modes of assessment throughout the course: • Retrieval quizzes. • Online topic progress multiple choice quizzes. • Exam questions from OCR A exam board. • Extended-response questions. • End of topic tests composed of past exam questions.
Trinity	Revision of content using a mixture of methods, especially past paper examination questions.		All of the Biology teachers at Forest will use some or all of the following modes of assessment throughout the course: • Retrieval quizzes. • Online topic progress multiple choice quizzes. • Exam questions from OCR A exam board. • Extended-response questions. • End of topic tests composed of past exam questions.

What consolidation looks like in this subject	Flashcards, quizlets, mind maps, concept maps, past paper exam question practice.	
Examples of Homework	Practice question booklets, synoptic essays, various worksheets, past exam questions, lab reports for practical endorsement, statistical calculations.	
Key terminology	Topic content key words: Communication, homeostasis, receptor, effector, negative feedback, positive feedback, ectotherm, endotherm, hypothalamus, homeostatic control, excretion, metabolism, water potential, urea, ammonia, ornithine cycle, nephron, ultrafiltration, selective reabsorption, osmoreceptors, pituitary gland, ADH, endocrine, adrenal glands, insulin, glucagon, sensory receptors, nerve impulses, synapses, neurotransmitters, cholinergic synapse, hormonal communication, Type 1 diabetes, Type 2 diabetes mellitus, tropisms, photosynthesis, respiration, glycolysis, Krebs cycle, oxidative phosphorylation, anaerobic respiration, respiratory substrates, respiratory quotient (RQ), evolution, sympatric speciation, allopatric speciation, geographic isolation, reproductive isolation, mutation, protein synthesis, nucleotides, gene expression, transcriptional level, post-transcriptional level, post-translational level, Homeobox gene, Hox genes, mitosis, apoptosis, body plan, phenotypic variation, sexual reproduction, genetic variation, phenotypic ratios, chi-squared test, continuous variation, discontinuous variation, evolution of species, Hardy–Weinberg principle, allele frequencies, isolating mechanisms, artificial selection, genome sequencing, genetic engineering, DNA sequencing, DNA profiling, polymerase chain reaction (PCR), electrophoresis, immobilised enzyme, cloning, biotechnology, vegetative propagation, micropropagation, tissue culture, artificial embryo twinning, somatic cell nuclear transfer (SCNT), microorganisms, biotechnology, monoculture, growth curve, climax community, primary succession, deflected succession, distribution, abundance, limiting factors, carrying capacity, predator-prey relationship, competition, conservation, preservation, sustainable management, environmental resources. Skills key words: accuracy, discuss, evaluate, precision, reliability, repeatability, validity.	
Super-curricular enrichment and scholarly extension	• **Read:** The Sixth Extinction: An Unnatural History (Elizabeth Kolbert), The Origin of Species (Charles Darwin), The Selfish Gene (Richard Dawkins), Entangled Life (Merlin Sheldrake), Sapiens (Yuval Noah Harari), Genome (Matt Ridley), The Immortal Life of Henrietta Lacks (Rebecca Skloot), The Gene: An Intimate History (Siddhartha Mukherjee), The Hidden Life of Trees: What They Feel, How They Communicate – Discoveries from a Secret World (Peter Wohlleben), The Violinist's Thumb: And Other Lost Tales of Love, War, and Genius, as Written by Our Genetic Code (Sam Kean), Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants (Robin Wall Kimmerer), Lab Girl (Hope Jahren), The Alchemy of Us: How Humans and Matter Transformed One Another (Ainissa Ramirez). • **Watch**: Frozen Planet (David Attenborough), Fantastic Fungi, Racing Extinction, How to Survive a Plague, A Plastic Ocean, Life in the Undergrowth, The Mind, Explained (Netflix), Bill Nye Saves the World, Wild Japan, The Zoo, One Strange Rock. • **Listen:** 28(ish) Days Later, The Naked Scientist, The Infinite Monkey Cage, TED Talks Health, Big Biology Podcast, Teach Me Biology, Huberman Lab, Ologies, The Life Scientific, Terrible Lizards, The Psychology Podcast, BBC Earth Podcast. • **Visit:** The Wellcome Trust, Natural History Museum, The Science Museum, Home of Charles Darwin (Down House), The Faraday Museum, Grant Museum of Zoology, Francis Crick Institute, Kew Gardens, London Zoo.	
Useful websites	Seneca Learning, Save My Exams, Physics & Maths Tutor, Khan Academy.	
Who can I contact?	**Head of Department**	**Mrs Annie Plumb, amp@forest.org.uk**
	Teachers	**Mr Luke Bouzguenda (lb@forest.org.uk), Mrs Katie Brosnan (kev@forest.org.uk), Mr Daniel Cawley (dac@forest.org.uk), Mr Matthew Clifford (mc@forest.org.uk), Mrs Vicki-Ann Jermutus (vj@forest.org.uk), Mr Martin Bassett-Jones (mgb@forest.org.uk), Ms Jill White (jrw@forest.org.uk), Ms Farah Naz (fn@forest.org.uk)**