Curriculum Map
Year 12

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 2 – Foundations in biology** All living organisms have similarities in cellular structure, biochemistry, and function. An understanding of these similarities is fundamental to the study of Biology. This module is broken into several sub-topics which develop an understanding of: • Cellular ultrastructure, through the use of microscopy to study the cell structure of a variety of organisms. • The structure and function of biologically important molecules such as carbohydrates, proteins, water and nucleic acids, • The structure and mode of action of enzymes in catalysing biochemical reactions, as well as factors which affect the rates of these. • The structure and function of membranes, which form barriers within, and at the surface of, cells. • How the structure of membranes relates to the different methods by which molecules enter and leave cells and organelles. • How the division and subsequent specialisation of cells is carried out, together with the potential for the therapeutic use of stem cells.	**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.	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.

Lent	**Module 3 – Exchange and transport** In this module, learners study the structure and function of gas exchange and transport systems in a range of animals and in terrestrial plants. This module covers concepts such as: • The significance of surface area to volume ratio in determining the need for ventilation, gas exchange and transport systems in multicellular. • The structure and function of gas exchange systems of terrestrial green plants. • The structure, function and similarities and differences of the gas exchange systems of a range of animals (including fish, locusts and mammals/humans) • How the supply of nutrients and removal of waste is controlled in animals, requiring coordinated activity of the heart and circulatory system. • The structure and function of blood vessels and the heart of mammals, including initiation of heart contraction. • The structure and function of haemoglobin, including its affinity to oxygen and study of dissociation curves. • The structure and function of transport and vascular systems in multicellular plants, including examination of sections of plant tissue. • How supply of nutrients from the soil depends on the flow of water through a vascular system (transpiration), as does the movement of the products of photosynthesis (translocation and the mass flow hypothesis). • Adaptations of plants to the availability of water in their environment, including those or xerophytes and hydrophytes. **Module 4 – Biodiversity, Evolution and Disease** This module covers the pathogens which surround organisms, and how they have evolved defences against them. Also covered it how medical intervention can be used to support these natural defences. This module covers concepts such as: • The different types of pathogens and the diseases they cause to plants and animals, including the means of transmission of these pathogens. • How plants and animals defend themselves against pathogens, including active and passive physical and chemical defences. • In depth understanding of the primary and secondary responses of the human immune system, including autoimmune diseases, active and passive immunity. • The principles of vaccination and the benefits and drawbacks of vaccination programmes in the prevention of epidemics. • Sources of modern medicines, with a link to conservation of natural resources. • The benefits and risks of using antibiotics to manage bacterial infection on small and large scales. • The types of biodiversity, factors affecting richness of biodiversity of ecosystems, and the ecological, economic, and aesthetic reasons for conservation using both *in situ* and *ex situ* methods. This includes an overview of local and international conservation agreements to protect species and habitats. • How biodiversity can be measured, sampling methods to capture data on biodiversity, and statistical analysis of these data. • Features used to name and classify organisms into modern systems such as the 'five kingdoms' and 'three domains' models, including the taxonomic and phylogenetic evidence supporting this. • Fossil, DNA and molecular evidence for the theory of evolution, including contributions of both Charles Darwin and Alfred Russel Wallace. • The mechanism of natural selection, and how this affects the genetic and phenotypic characteristics of a population over time. • The different types of variation shown by organisms, and how organisms may be adapted to their environments using specific examples.	Apply knowledge, understanding and other skills developed in the specification to new situations and/or to solve related problems. Select and apply appropriate areas of mathematics to new biological contexts. Biological drawing.	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	Content of Module 3 & 4 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 End of Year 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. • End of Year examination.

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: abiotic, biotic, active immunity, active site, active transport, adaptation, adhesion, affinity, agglutination, allele, ampiphillic, amylopectin, amylose, antibiotic, antibody, antigen, antigen-presenting cell, antitoxin, aorta, apoplast, apoptosis, archaea, artery, arteriole, artificial immunity, asexual reproduction, assimilate, atrio-ventricular ote, atrio-ventricular valve, B memory cell, binary fission, binomial system, biodiversity, Bohr effect, Bohr shift, bradycardia, buccal cavity, callose, canker, carbaminohaemoglobin, carbohydrate, carbonic acid, carbonic anhydrase, casparian strip, catalyst, chloride shift, chromatid, ciliated epithelium, classification, clonal expansion, clonal selection, coenzyme, cofactor, cohesion, collenchyma, companion cells, competitive inhibitor, concentration gradient, condensation reaction, conformational change, conjugated protein, conservation, convergent evolution, continuous variation, discontinuous variation, correlation coefficient, cotransport, countercurrent flow, crenated, cytochrome c, cytokine, cytokinesis, cytolysis, denature, dicotyledon, diastole, systole, differential staining, diffusion, diploid, disaccharide, dissociation, disulfide link, DNA polymerase, domain, ecosystem, elastin, electron microscope, endemic, endocytosis, exocytosis, endothelium, endodermis, epidermis, ester bond, ES complex, eukaryote, extinction, extracellular, facilitated diffusion, fibrillation, fibrous protein, flaccid, fluid mosaic model, gamete, gene, genome, genus, fill filaments, globular protein, glycocalyx, glycogen, glycosidic bond, goblet cell, graticule, guard cell, haemoglobin, haemolysis, haploid, helicase, histamine, homologous chromosome, homozygosity, hydathodes, hydrogen bond, hydrolysis reaction, hydrophilic, hydrophobic, hydrophyte, hydrostatic pressure, hypertension, hyphae, inflammation, inhibitor, interleukins, interphase, intracellular, keratin, keystone species, kinetic energy, kingdom, lamellae, leucocyte, lignin, limiting factor, lipophilic, lipophobic, locus, lymphatic system, macrophage, meristem, mesenchyme, mesoderm, mesophyll, metabolism, (stage) micrometer, micrometre, monoculture, monocyte, monomer, monosaccharide, mucous membrane, mutation, mycelium, myocardial infarction, myofibril, myogenic, neutrophil, non-competitive inhibition, nucleotide, oncotic pressure, operculum, opsonin, osmosis, ossification, ostia, oxygen tension, oxyhaemoglobin, partial pressure, parenchyma, peptide bond, pericycle, phagocytosis, phloem, phospholipid, phylogeny, phylum, plasmodesmata, plasmolysis, pluripotent, polar, polymer, polynucleotide, polypeptide, polysaccharide, potometer, primary structure (protein), prokaryote, prosthetic group, protoctista, purkyne tissue, Q_{10}, qualitative, quantitative, quaternary structure, residual volume, resolution, respiration, ribose, ribosome, sarcomere, sclerenchyma, semi-conservative replication, sieve plates, Simpson's index, source, sink, sino-atrial node (SAN), species, species richness, species evenness, spiracle, spirometer, squamous epithelial cell, standard deviation, statin, stem cell, stomata, SA:Vol ratio, symbiosis, symplast pathway, systematic sampling, T-cells, t-test, tachycardia, tendinous cords, tertiary structure, tidal volume, tissue fluid, toxin, transcription, translation, transect, translocation, triglyceride, turgid, tylose, vascular tissue, vasodilation, vasoconstriction, vital capacity, water potential, xerophyte, xylem, zygote. Skills key words: accuracy, discuss, evaluate, precision, reliability, repeatability, validity,	
Super-curricular enrichment and scholarly extension	**Read:** The Origin of Species (Charles Darwin), The Selfish Gene (Richard Dawkins), Entangled Life (Merlin Sheldrake), Sapiens (Yuval Noah Harari), Genome (Matt Ridley), **Watch**: Frozen Planet (David Attenborough, BBC), Fantastic Fungi (Apple TV, Netflix), Racing Extinction (amazon Prime), How to Survive a Plague (Apple TV, Amazon), A Plastic Ocean (Apple TV, Amazon), Life in the Undergrowth (BBC David Attenborough), Unnatural Selection (Netflix), Pain, Pus and Poison (old Channel 4 documentary, episodes available on YouTube), Inside Nature's Giants (old Channel 4 documentary, episodes available on YouTube), Chimp Empire (Netflix) **Listen:** 28(ish) days Later, Teach Me Biology, The Naked Scientist, **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	
Useful websites		
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