

Year 12 Biology Curriculum Unit Overview

Curriculum Catch up Statement

Year 12 should have completed the issued transition tasks set during the summer term.

The regular teaching schedule for Science A Levels always starts with an introduction of the course and recap of GCSE. Consolidation and checking of the summer tasks are also scheduled at the beginning of term. This will be especially important due to students not revising and sitting GCSE exams. Concepts in Science change dramatically when students move from GCSE to A Level. Therefore, we will carry on with our planned curriculum and address any misconceptions and missing knowledge of concepts as the student progresses through the topics. Prior knowledge is always assessed before a topic is started so the teacher can plan accordingly. Students will be assessed during class using questioning, quick quizzes, group activities and low stakes testing. They will be provided with knowledge organisers that clearly sets out a checklist of concepts required for that topic. End of topic tests will give a clear indication of knowledge that still needs to be embedded and then targeted tasks will be issued to students as and when required. Homework will be based on current topics, so that additional judgements can be made on student's progress. Fortunately, we have gained teaching hours this year for A level which will also benefit the catch-up requirements.

Details of the topics are below in the Curriculum summary grids.

| Year 12 A Level Biology A Module 1: Development of practical skills in biology | | | | |
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| What are we learning? | What knowledge, understanding and skills will we gain?¹ | What does mastery look like?² | How does this build on prior learning?³ | What additional resources are available? |
| Practical skills in Biology Planning Implementing an investigation Analysing qualitative and quantitative data | <p>Knowledge Selection of appropriate equipment; safe methods of working; identification and reduction of errors (random and systematic); calculation of uncertainties; problem solving; approaches to research; referencing systems; record keeping</p> <p>Understanding Students will understand how to use a wide range of laboratory equipment to safely carry out relevant practical work in order to obtain accurate and reproducible results</p> <p>Skills</p> | Students will be able to: work entirely independently when carrying out practical work work with a high level of safety, ensuring the health and safety of self and peers by carefully considering the hazards and risks associated with the task design robust investigations alone or as part of a student team without teacher input | Picks up themes from KS3 Working Scientifically (Year 7, 8 and 9) Further develops the practical skills acquired in GCSE Science / Biology from both the general practical activities and specifically from the Required Practicals (Year 10 and 11) | OCR Year 1 textbook OCR Year 2 textbook OCR practical skills guide OCR Biology drawing skills handbook OCR Mathematical skills guide |

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| <p>Analysing graphs</p> <p>Evaluation</p> | <p>(a) use of appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH)</p> <p>(b) use of appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer</p> <p>(c) use of laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions</p> <p>(d) use of a light microscope at high power and low power, including use of a graticule</p> <p>(e) production of scientific drawings from observations with annotations</p> <p>(f) use of qualitative reagents to identify biological molecules</p> <p>(g) separation of biological compounds using thin layer/paper chromatography or electrophoresis</p> <p>(h) safe and ethical use of organisms to measure:</p> <p style="padding-left: 40px;">(i) plant or animal responses</p> <p style="padding-left: 40px;">(ii) physiological functions</p> <p>(i) use of microbiological aseptic techniques, including the use of agar plates and broth</p> <p>(j) safe use of instruments for dissection of an animal or plant organ</p> <p>(k) use of sampling techniques in fieldwork</p> <p>(l) use of ICT such as computer modelling, or a data logger to collect data, or use of software to process data</p> | <p>consistently produce accurate results</p> <p>critically reflect on and evaluate results produced, and outline the steps needed to improve in future tasks</p> | | |
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Year 12 A Level Biology A Module 2: Foundations in biology

| What are we learning? | What knowledge, understanding and skills will we gain? ¹ | What does mastery look like? ² | How does this build on prior learning? ³ | What additional resources are available? |
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| <p>To use microscopy</p> <p>Structure and function of biological molecules</p> <p>How enzymes work</p> <p>Structure and function of biological membranes</p> <p>Cell division, cell diversity and cell differentiation</p> | <p>Knowledge the use of microscopy to observe and investigate different types of cell; use and manipulation of the magnification formula; ultrastructure of cells; cytoskeleton; hydrogen bonding; the role of water in biological systems; structure and function of a range of biological molecules (carbohydrates, lipids, proteins, nucleic acids); separation techniques; the genetic code; DNA replication; transcription and translation; synthesis of polypeptides; structure of enzymes; factors affecting rate of enzyme reactions; coenzymes, cofactors and prosthetic groups; enzyme inhibitors; fluid mosaic model of membrane structure; factors affecting permeability; movement of molecules across membranes; cell cycle; mitosis, meiosis; stem cells; differentiation</p> <p>Understanding comparison of resolution and magnification; comparison of eukaryotic and prokaryotic organisms; how polymerisation occurs; formation of bond by condensation and breaking by hydrolysis; how structure of biological molecules contributes to function; how genes code for proteins; why enzymes are needed in biological systems; how membranes function in biological systems; control of substances in and out of cells; the significance of cell division; how stem cells can be used in therapeutic and research applications</p> <p>Skills staining specimens in light microscopy; drawing of biological specimens; identification of photomicrographs; testing for proteins, reducing and non-reducing sugars, lipids and starch; techniques in thin-layer chromatography; following the timecourse of enzyme-controlled reactions</p> | <p>Students will be able to: work entirely independently when carrying out practical work work with a high level of safety, ensuring the health and safety of self and peers by carefully considering the hazards and risks associated with the task design robust investigations alone or as part of a student team without teacher input consistently produce accurate results critically reflect on and evaluate results produced, and outline the steps needed to improve in future tasks</p> | <p>Picks up themes from KS3 work on cells and organisation, practical work with microscopes, understanding of biological molecules (Year 7, 8 and 9)</p> <p>Develops work from GCSE Biology from units in cell biology, organisation and inheritance, variation and evolution (Year 10 and 11)</p> <p>Picks up themes from GCSE Chemistry on atomic structure, bonding and properties of matter as well as work on organic chemistry. Also extends the work done on chromatography in the chemical analysis unit (Year 10 and 11)</p> <p>Further develops the practical skills acquired in GCSE Science / Biology from both the general practical activities and specifically from the Required Practicals (Year 10 and 11)</p> | <p>OCR Year 1 textbook</p> <p>OCR Year 2 textbook</p> <p>OCR practical skills guide</p> <p>OCR Biology drawing skills handbook</p> <p>OCR Mathematical skills guide</p> |

Year 12 A Level Biology A Module 3: Exchange and transport

| What are we learning? | What knowledge, understanding and skills will we gain? ¹ | What does mastery look like? ² | How does this build on prior learning? ³ | What additional resources are available? |
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| <p>Exchange surfaces and breathing</p> <p>Transport systems in animals</p> <p>Transport systems in plants</p> | <p>Knowledge specialised exchange surfaces; structures and functions of mammalian gas exchange systems; ventilation; countercurrent flow; circulatory systems; blood vessels; formation of tissue fluid and lymph; structures and functions of the mammalian heart; interpreting ECG traces; oxygen and carbon dioxide transport in the blood; structures in the plant transport system; xylem and phloem; transpiration; translocation; adaptations of plants (xerophytes and hydrophytes)</p> <p>Understanding the relationship between vital capacity, tidal volume, breathing rate and oxygen uptake; how size and metabolic rate is related to the need for specialist exchange systems; mechanisms of ventilation applied to bony fish and insects; how the cardiac cycle is regulated; relating oxygen dissociation curve for haemoglobin to needs in a foetus and an adult; why plants need a specialist transport system; factors that affect transpiration rate; unanswered questions in translocation</p> <p>Skills how to use and interpret traces from a spirometer; dissection of fish gills and insect trachea; microscopic examination of gas exchange surface histology; dissection and drawing of the mammalian heart; drawing and interpreting oxygen dissociation curves; dissection of plant xylem /phloem tissue; practical use of a potometer</p> | <p>Students will be able to: work entirely independently when carrying out practical work work with a high level of safety, ensuring the health and safety of self and peers by carefully considering the hazards and risks associated with the task design robust investigations alone or as part of a student team without teacher input consistently produce accurate results critically reflect on and evaluate results produced, and outline the steps needed to improve in future tasks</p> | <p>Picks up themes from KS3 work on cells and organisation, practical work with microscopes, exercise and fitness (Year 7, 8 and 9) Develops work from GCSE Biology from units in cell biology, organisation and bioenergetics (Year 10 and 11) Picks up themes from GCSE Chemistry on chemistry of the atmosphere and the rate and extent of chemical change (Year 10 and 11) Further develops the practical skills acquired in GCSE Science / Biology from both the general practical activities and specifically from the Required Practicals (Year 10 and 11)</p> | <p>OCR Year 1 textbook</p> <p>OCR Year 2 textbook</p> <p>OCR practical skills guide</p> <p>OCR Biology drawing skills handbook</p> <p>OCR Mathematical skills guide</p> |

Year 12 A Level Biology A Module 4: Biodiversity, evolution and disease

| What are we learning? | What knowledge, understanding and skills will we gain? ¹ | What does mastery look like? ² | How does this build on prior learning? ³ | What additional resources are available? |
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| <p>Communicable diseases</p> <p>Biodiversity</p> <p>Classification and evolution</p> | <p>Knowledge pathogens (bacteria, fungi, viruses and protoctista); primary defences in animals; plant defences against pathogens; primary and secondary immune response; autoimmune disease; vaccination; sources of medicine; sampling habitats; species richness and evenness; Simpson's Index of Diversity; factors affecting biodiversity; <i>in situ</i> and <i>ex situ</i> methods of maintaining biodiversity; international and local conservation efforts; biological classification systems; phylogeny; variation, natural selection and evolution</p> <p>Understanding causes and symptoms of a variety of pathogenic diseases; how B and T lymphocytes, phagocytes and antibodies work in the immune response; comparison of natural and artificial immunity; why overuse of antibiotics is an issue; interpreting calculations involving Simpson's Index; how biodiversity can be maintained; the importance of conservation agreements to protect biodiversity; the relationship between phylogeny and classification; the evidence of evolution by natural selection; the binomial system for naming organisms; why organisms are adapted to their environment</p> <p>Skills examination and drawing of cells obtained by blood smears; carrying out fieldwork; generating data for calculation of Simpson's Index of Diversity; using quadrat frames, point quadrats, transects and other sampling methodology; application of statistical methods in sampling and in data derived from variation studies (standard deviation, Student's <i>t</i>-test, Spearman rank correlation)</p> | <p>Students will be able to: work entirely independently when carrying out practical work with a high level of safety, ensuring the health and safety of self and peers by carefully considering the hazards and risks associated with the task design robust investigations alone or as part of a student team without teacher input consistently produce accurate results critically reflect on and evaluate results produced, and outline the steps needed to improve in future tasks carry out statistical tests in relation to data from sampling or variation and interpret results justifiably</p> | <p>Picks up themes from KS3 work on organisms, practical work with sampling, classification and adaptations (Year 7, 8 and 9)</p> <p>Develops work from GCSE Biology from units in infection and response, inheritance, variation and evolution as well as ecology. Students will have practiced some basic sampling techniques (Year 10 and 11)</p> <p>Picks up themes from GCSE Chemistry on chemistry of the atmosphere (Year 10 and 11)</p> <p>Some students taking Statistics at GCSE will be familiar with basic statistical tests but this unit builds on that knowledge</p> <p>Further develops the practical skills acquired in GCSE Science / Biology from both the general practical activities and specifically from the Required Practicals (Year 10 and 11)</p> | <p>OCR Year 1 textbook</p> <p>OCR Year 2 textbook</p> <p>OCR practical skills guide</p> <p>OCR Biology drawing skills handbook</p> <p>OCR Mathematical skills guide</p> |