Curriculum Area: GCSE Combined Science (Trilogy) Biology and GCSE Biology

Knutsford Academy Curriculum Map

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Organising animals and plants tt / Cell division	**Communicable diseases / Human defences and vaccination**	**Non-communicable diseases / Bioenergetics - Photosynthesis**	**Bioenergetics – Respiration / Nerves and Hormones**	**Biodiversity and Ecosystems**	
Year 10	**Organisation and the digestive system** Substantive knowledge headlines: • cells as the fundamental units of living organisms • cells may be part of highly adapted structures, enabling life processes to be performed more effectively • carbohydrates, proteins, nucleic acids, and lipids as key biological molecules • enzymes and factors affecting the rate of enzymatic reactions Disciplinary knowledge headlines: • carry out experiments having due regard for the correct manipulation of apparatus, and health and safety considerations • use scientific theories and explanations and hypothesis on how pH affects amylase activity • translate numeric data into graphical form • investigate the distribution of stomata and guard cells • measure the rate of transpiration by the uptake of water Math skills: • carry out rate calculations for chemical reactions Link to knowledge from previous units: • KS3 Cells; KS3 Digestive system Link to knowledge in future units: • GCSE- The rate and extent of chemical change (Chemistry) • GCSE Photosynthesis • A Level Biology – Biological molecules, Exchange **Cell division** Substantive knowledge headlines: • the nucleus of a cell contains chromosomes, made of DNA molecules, and each chromosome carries many genes • the stages of the cell cycle, including mitosis • stem cells in animals and meristems in plants Disciplinary knowledge headlines: • use models and analogies to develop explanations of how cells divide • evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments Link to knowledge from previous units: • KS3 Cells; KS3 Variation Link to knowledge in future units: • GCSE – Reproduction • A-Level Biology – Cell Structure, Genetic Diversity	**Communicable diseases** Substantive knowledge headlines: • communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) • bacteria, viruses, and fungi as pathogens in animals and plants Disciplinary knowledge headlines: • technological applications of science Link to knowledge from previous units: • KS3 - Cells Link to knowledge in future units: • GCSE Biology – Non-communicable diseases. • A-Level Biology – Cell recognition and the immune system. **Human defences and vaccination** Substantive knowledge headlines: • body defences against pathogens and the role of the immune system against disease • reducing and preventing the spread of infectious diseases in animals and plants • the process of discovery and development of new medicines • the impact of lifestyle factors on the incidence of non-communicable diseases. Disciplinary knowledge headlines: • understand that the results of testing and trials are published only after scrutiny by peer review • evaluate the global use of vaccination in the prevention of disease • appreciate the power of monoclonal antibodies and consider any ethical issues (Triple Science only) • evaluate the advantages and disadvantages of monoclonal antibodies (Triple Science only). Link to knowledge from previous units: • KS3 - Cells Link to knowledge in future units: • GCSE Biology – Non-communicable diseases • A-Level Biology – Cell recognition and the immune system.	**Non-communicable diseases** Substantive knowledge headlines: • the relationship between health and non-communicable diseases • risk factors linked to an increased rate of a disease Disciplinary knowledge headlines: • evaluate methods of treatment bearing in mind the benefits and risks associated with the treatment • interpret data about risk factors for specified diseases. Link to knowledge from previous units: • KS3 – Cells; KS3 - Organisms Link to knowledge in future units: • GCSE Biology – Variation and evolution. • A-Level Biology – Mass transport. Math skills: • translate disease incidence information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables • understand the principles of sampling as applied to scientific data, including epidemiological data. **Bioenergetics - Photosynthesis** Substantive knowledge headlines: • photosynthesis as the key process for food production and therefore biomass for life • the process of photosynthesis • factors affecting the rate of photosynthesis. Disciplinary knowledge headlines: • use data to relate limiting factors to the cost effectiveness of adding heat, light, or carbon dioxide to greenhouses • tests to identify starch, glucose and proteins using simple qualitative reagents Math skills: • solve simple algebraic equations. Link to knowledge from previous units: • KS3 Photosynthesis; KS3 Gas exchange Link to knowledge in future units: • GCSE Organising an ecosystem; Biodiversity and ecosystems. • A-Level Biology – Photosynthesis	**Bioenergetics respiration** Substantive knowledge headlines: • the importance of cellular respiration • the processes of aerobic and anaerobic respiration. Disciplinary knowledge headlines: • investigations into the effect of exercise on the body. Math skills: • solve simple algebraic equations Link to knowledge in future units: • A-Level Biology - Respiration **Nerves and hormones** Substantive knowledge headlines: • principles of nervous coordination and control in humans • the relationship between the structure and function of the human nervous system • the relationship between structure and function in a reflex arc • principles of hormonal coordination and control in humans • homeostasis Disciplinary knowledge headlines: • evaluate the benefits and risks of procedures carried out on the brain and nervous system (Triple Science only). • evaluate the advantages and disadvantages of treating organ failure by mechanical device or transplant (Triple Science only). Math skills: • extract and interpret data from graphs, charts, and tables, about the functioning of the nervous system • translate information about reaction times between numerical and graphical forms Link to knowledge from previous units: • KS3 Cells; KS3 Reproduction. Link to knowledge in future units: • A-Level Biology – Response to stimuli; Nervous coordination and muscles; Homeostasis	**Biodiversity and Ecosystems** Substantive knowledge headlines: • the importance of biodiversity • levels of organisation within an ecosystem • positive and negative human interactions with ecosystems • the importance of interactions between organisms in a community. Disciplinary knowledge headlines: • interpret graphs used to model predator-prey cycles • explain how waste, deforestation and global warming have an impact on biodiversity. • understand the conflict between the need for cheap available compost to increase food production and the need to conserve peat bogs and peatlands as habitats for biodiversity and to reduce carbon dioxide emissions. • evaluate the environmental implications of deforestation • understand that the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications • evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment • explain and evaluate the conflicting pressures on maintaining biodiversity given appropriate information. Math skills: • extract and interpret information from charts, graphs and tables relating to the interaction of organisms within a community • in relation to abundance of organisms: understand the terms mean, mode and median; calculate arithmetic means; plot and draw appropriate graphs selecting appropriate scales for the axes Link to knowledge from previous units: • KS3 Plant biology Link to knowledge in future units: • GCSE– Adaptations; Interdependence, and competition; Organising an ecosystem. • A-Level Biology – Populations in ecosystems.	
Assessments	**Test: Organisation and the digestive system / Cell division**	**Test: Communicable diseases / Human defences and vaccination**	**Test: Non-communicable diseases / Bioenergetics - Photosynthesis**	**Test: Bioenergetics – Respiration / Nerves and Hormones**	**Exam: Year 10 trial exam**	

Year 11

Autumn1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Homeostasis / Types of reproduction	**Variation and evolution/Genetics and evolution**	**Adaptations, interdependence, and competition/Organising an ecosystem**	**Biodiversity and ecosystems**	**Revision and examinations**	
Homeostasis Substantive knowledge headlines: • principles of hormonal coordination and control in humans • how kidney dialysis works Disciplinary knowledge headlines: • evaluating the advantages and disadvantages of treating organ failure by mechanical device or transplant. • evaluating information about obesity and diabetes • make recommendations, considering social and ethical issues • why issues around contraception cannot be answered by science alone • understand social and ethical issues associated with IVF treatments. Math skills: • construct and interpret frequency tables and diagrams, bar charts and histograms • translate information between graphical and numeric form • translate tables and bar charts of glucose, ions. and urea before and after filtration (Triple Science only) Link to knowledge from previous units: • KS3 Cells, Reproduction Link to knowledge in future units: • A-Level Biology – Homeostasis **Types of reproduction** Substantive knowledge headlines: • the genome as the entire genetic material of an organism • how the genome, and its interaction with the environment, influence the development of the phenotype of an organism • the potential impact of genomics on medicine • most phenotypic features being the result of multiple, rather than single, genes • single gene inheritance and single gene crosses with dominant and recessive phenotypes • sex determination in humans Disciplinary knowledge headlines: • modelling behaviour of chromosomes during meiosis • modelling insertions and deletions in chromosomes to illustrate mutations (Triple Science only) • appreciate that embryo screening and gene therapy may alleviate suffering but consider the ethical issues which arise Math skills: • use direct proportion and simple ratios to express the outcome of a genetic cross • complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees • construct a genetic cross by Punnett square diagram and use it to make predictions using the theory of probability. Link to knowledge from previous units: • KS3 Reproduction • GCSE Biology – Cell division Link to knowledge in future units: • A-Level Biology – DNA, genes and protein synthesis, Gene expression	**Variation and evolution** Substantive knowledge headlines: • genetic variation in populations of a species • the process of natural selection leading to evolution • the evidence for evolution • developments in biology affecting classification • the importance of selective breeding of plants and animals in agriculture • the uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology. Disciplinary knowledge headlines: • the benefits and risks of selective breeding and related ethical issues • interpret information about genetic engineering techniques and make informed judgements about issues concerning cloning and genetic engineering, including GM crops • how scientific methods and theories develop over time • interpret evolutionary trees. Math skills: • extract and interpret information from charts, graphs, and tables such as evolutionary trees. Link to knowledge from previous units: • KS3 Variation Link to knowledge in future units: • GCSE Biology – Types of reproduction • A-Level Biology – Genetic diversity; Populations and evolution; Recombinant DNA technology Genetics and evolution Substantive knowledge headlines • Theory of evolution • Speciation • The understanding of genetics • Evidence for evolution • Fossils • Extinction • Resistant bacteria • Classification of living organisms Disciplinary knowledge headlines • The theories of evolution and speciation have developed overtime and from information gathered by many scientists • Our understanding of genetics has developed over time as is still developing • The use of fossils and antibiotic resistant bacteria to support the theory of evolution • Appreciate why the fossil record is incomplete • Interpret evolutionary trees Math skills: • Extract and interpret information from charts, graphs and tables Link to knowledge from pervious units • GCSE Variation and Evolution Link to knowledge in future units: • A-Level Biology – Genetic diversity; Populations and evolution; Recombinant DNA technology	**Adaptations, interdependence, and competition** Substantive knowledge headlines: • organisms are interdependent and are adapted to their environment • methods of identifying species and measuring distribution, frequency, and abundance of species within a habitat • abiotic and biotic factors which affect communities. Disciplinary knowledge headlines: • recording first-hand observations of organisms. Math skills: • extract and interpret information from charts, graphs and tables relating to the interaction of organisms within a community • extract and interpret information from charts, graphs and tables relating to the effect of abiotic factors on organisms within a community • extract and interpret information from charts, graphs and tables relating to the effect of biotic factors on organisms within a community. Link to knowledge from previous units: • KS3 Plant biology Link to knowledge in future units: • GCSE Biology – Organising an ecosystem • A-Level Biology – Populations in ecosystems **Organising an ecosystem** Substantive knowledge headlines: • levels of organisation within an ecosystem • how materials cycle through abiotic and biotic components of ecosystems • the role of microorganisms (decomposers) in the cycling of materials through an ecosystem Disciplinary knowledge headlines: • interpret and explain the processes in diagrams of the carbon cycle, the water cycle • evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment • explain and evaluate the conflicting pressures on maintaining biodiversity given appropriate information Math skills: • calculate rate changes in the decay of biological material • translate information between numerical and graphical form • plot and draw appropriate graphs selecting appropriate scales for the axes. Link to knowledge from previous units: • GCSE Bioenergetics Link to knowledge in future units: A-Level Biology – Energy and ecosystems; Biodiversity; Populations in ecosystems.	**Biodiversity and Ecosystems** Substantive knowledge headlines: • the importance of biodiversity • levels of organisation within an ecosystem • positive and negative human interactions with ecosystems • the importance of interactions between organisms in a community. Disciplinary knowledge headlines: • interpret graphs used to model predator-prey cycles • explain how waste, deforestation and global warming have an impact on biodiversity. • understand the conflict between the need for cheap available compost to increase food production and the need to conserve peat bogs and peatlands as habitats for biodiversity and to reduce carbon dioxide emissions. • evaluate the environmental implications of deforestation • understand that the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications • evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment • explain and evaluate the conflicting pressures on maintaining biodiversity given appropriate information. Math skills: • extract and interpret information from charts, graphs and tables relating to the interaction of organisms within a community • in relation to abundance of organisms: understand the terms mean, mode and median; calculate arithmetic means; plot and draw appropriate graphs selecting appropriate scales for the axes Link to knowledge from previous units: • KS3 Plant biology Link to knowledge in future units: • GCSE– Adaptations; Interdependence, and competition; Organising an ecosystem. A-Level Biology – Populations in ecosystems.		
Assessments	**Test: Homeostasis / Types of reproduction**	**Exam: Year 11 Trial 1**	**Test: Adaptations, interdependence, and competition/organizing an ecosystem**	**Test: Biodiversity and ecosystems** **Exam: Year 11 Trial 2**	**GCSE Exams**	