Programme of study for Year 11 GCSE BIOLOGY

Autumn (1st term)	Autumn (2nd term)	Spring (1st term)	Spring (2nd Term)	Summer (1st term)	Summer (2nd term)
Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:	Other timescale: From: To:
Topic / Big Question: B16 Ecology B17 organising an ecosystem Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B18 Biodiversity and ecosystems B13 Reproduction Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B14 Variation and evolution Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	Topic / Big Question: B15 Genetics and evolution Skills (students should be able to do): AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures. AO2: Apply knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures. AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.	**Revision and Summer exams**	
Key Learning Outcomes (students should know): In this B16 topic students have studied communities, environments, adaptations, and competition. There are a number of ecological terms including community,	Key Learning Outcomes (students should know): In this B18 topic students have studied biodiversity and ecosystems, starting with the reasons for and the effects of the human population explosion. Students should	Key Learning Outcomes (students should know): All students should be able to discuss the causes of variation in terms of genetic, environmental, or a combination of both. In studying evolution by natural selection, students should	Key Learning Outcomes (students should know): Students have studied Mendel and his discoveries, and should understand how later understanding of the mechanism of inheritance and genetics applies to his findings.		

population, habitat, ecosystem, abiotic factor, and biotic factor, and students should recall the precise meaning of each. Students should understand the importance of communities including the interdependence of all the species present, and be able to give real examples to illustrate interdependence. In studying organisms in their environments, students should recall the effects of abiotic and biotic factors on populations. Students should have measured the distribution of organisms with quadrats and transects, and carried out a practical to investigate the population size of a common species in a habitat. Students have studied competition in animals and plants and should recall what factors they compete for and how they compete, and how they become successful in their environments. Students should understand how organisms are adapted to survive in many different conditions. They should be able to give examples of the ways in which animals and plants are adapted to their environments. In this B17 topic students have studied how feeding relationships are represented in food chains. They should understand the importance of photosynthesis in feeding Relationships. They should recall the main feeding relationships within a community and understand how the numbers of predators and prey are inter-	understand the effect of different types of pollution including land, water, and air pollution. Students should be able to outline the processes of deforestation and peat destruction. Students should understand what is meant by the greenhouse effect, global warming, and its predicted effects. Students should be able to distinguish greenhouse gases from those that cause acid rain. Higher-tier students have studied the impact of environmental change and should be able to recall how changes in the distribution of organisms can be evaluated. On the topic of maintaining biodiversity, all students should understand how waste, deforestation, and global warming affect biodiversity, and be able to give examples of some of the actions being taken to stop the reduction in biodiversity. Students have studied trophic levels, how biomass is transferred from one trophic level to the next, pyramids of biomass, and the efficiency of this energy transfer. They have also studied some of the factors that affect global food security. They should be able to outline ways of improving the efficiency of food production, discuss the ethics of factory farming, and understand the concept of sustainable food production with a focus on fisheries. Finally, students should be familiar with biotechnological	understand the role of mutation in variation, understand the theory of evolution by survival of the fittest and natural selection, and be able to give examples. Students have studied the process of selective breeding. They should understand this as an example of artificial selection, and be aware of its limitations. In studying genetic engineering, all students should understand what is meant by the term, and be able to give examples of its use and consider the potential benefits and problems. Higher-tier students should be able to recall the steps involved in the process of genetic engineering. Finally, students have studied cloning as applied to both plants and animals. They should recall different ways of creating clones, and be able to describe why they are useful. They should understand the processes of embryo transplants and adult cell cloning in animals, and be able to discuss the choices that need to be made about all genetic technologies.	They should be able to describe several theories of evolution including the work of Lamarck and Darwin, focusing on Darwin's theory of natural selection. Students should also be able to outline the reasons why Darwin's ideas were not accepted for some time. They should be familiar with Wallace's ideas on evolution and how he established our current theory of speciation. Students should understand that each part of a divided population undergoes natural selection separately and therefore differently, and over a long period of time can end up being very different from each other. All students should be aware of evidence for evolution, including the fossil record and reasons for extinction. They should be able to describe antibiotic resistant bacteria and their fast evolution, in particular the problem of MRSA. Finally, all students should understand how living organisms are classified. They should recall the natural system designed by Linnaeus, and be able to give the rules of the binomial system of naming living things. They should be familiar with the three-domain system developed in the light of recent technological advances.	

related, including interpreting predator–prey population graphs. Students have looked at mineral cycling and the microbes involved. They should understand how materials are recycled through the abiotic and biotic components of an ecosystem, and the importance of decay. Students have studied the water cycle and should recall the main stages of condensation, precipitation, evaporation, transpiration, and respiration. They should understand what the carbon cycle is and recall the processes that remove carbon dioxide from the atmosphere and return it again. They should understand the role of microbes in the carbon cycle as carrying out respiration to release carbon dioxide. Students have studied factors that affect decomposition and the rate of decay, and the importance of decay in recycling. They should have conducted a required practical investigating the decay of organic matter. These students should be able to apply the processes of decay to the recycling of organic waste to produce compost, and also recall that anaerobic decay produces methane gas in a biogas generator.	methods of food production including the production of mycoprotein and the use of genetically modified organisms. In this B13 topic, all students should be able to outline asexual and sexual reproduction, and should be aware of the importance of meiosis, fertilisation, and variation in sexual reproduction. *S*tudents should be able to compare the advantages of each type of reproduction. Students should recall that fungi, plants, and malaria parasites are able to use both types of reproduction. All students have studied DNA and its role in inheritance. They should be aware of the genetic code and genomes, including how the data produced by genome research can be used. Students should be able to outline DNA structure, with higher-tier students recalling the detailed structure of DNA and also studying protein synthesis, including how the genetic code is used to assemble amino acids into proteins and the different types of mutation and their consequences. All students have studied inheritance, and should be able to use genetic terms and set out a genetic cross with the use of a Punnett square. They should be able to predict ratios of different phenotypes, and apply this to sex determination and family trees. Students should be able to describe the inheritance of genetic disorders as applied to polydactyly and cystic fibrosis.			

	They should be aware of developments in genetic engineering with the aim of curing genetic disorders. Finally, students should be able to discuss screening for genetic disorders and the implications of using this technology.			
Autumn Term – centrally planned, standardised and teacher marked piece(s) of work Linear Exam on B1 Cells, B2 Cell Division, B3 Organisation and digestive system, B4 Organising animals and plants, B5 Communicable diseases, B6 Preventing and treating disease, B7 Non-communicable disease, B8 Photosynthesis, B9 Respiration, B10 The human nervous system, B11 Hormonal coordination, B12 Homeostasis in action, B16 Ecology, B17 organising an ecosystem, B18 Biodiversity and ecosystems, B13 Reproduction. Required practical: Field investigations Required practical: Decay		Autumn Term – centrally planned, standardised and teacher marked piece(s) of work Linear Exam on B1 Cells, B2 Cell Division, B3 Organisation and digestive system, B4 Organising animals and plants, B5 Communicable diseases, B6 Preventing and treating disease, B7 Non-communicable disease, B8 Photosynthesis, B9 Respiration, B10 The human nervous system, B11 Hormonal coordination, B12 Homeostasis in action, B16 Ecology, B17 organising an ecosystem, B18 Biodiversity and ecosystems, B13 Reproduction, B14 Variation and evolution		
Building understanding: Rationale / breakdown for your sequence of lessons: In this B16 topic we are studying organisms in their environments, students should recall the effects of abiotic and biotic factors on populations. They should link this with the importance of temperature and pH on the action of enzymes in B3 *Organisation and the digestive system*.	**Building understanding: Rationale / breakdown for your sequence of lessons:** In B18 students learn about the exponential growth of the human population and the impact this has had on land, resources and managing waste. They consider land, water and air pollution, the effects of deforestation and peat bog destruction and global warming. Triple students continue by	**Building understanding: Rationale / breakdown for your sequence of lessons:** All students should be able to discuss the causes of variation in terms of genetic, environmental, or a combination of both. They should link environmental variation with the effect of alcohol on a foetus in B7.5 *Alcohol and other carcinogens*.	**Building understanding: Rationale / breakdown for your sequence of lessons:** Students should be able to describe several theories of evolution including the work of Lamarck and Darwin, focusing on Darwin's theory of natural selection. They should link this with B14.2 *Evolution by natural selection*.	

In studying animals in cold climates students should make the link to surface area to volume ratio in their work on diffusion in B1 *Cells and organisation*. In this topic students have studied how feeding relationships are represented in food chains. They should understand the importance of photosynthesis in feeding relationships, linking with work in B8 *Photosynthesis*. Students should understand how materials are recycled through the abiotic and biotic components of an ecosystem, and the importance of decay. They should link this with the main chemicals that make up cells in B1.2 *Animal and plant cells*, respiration in B9 *Respiration*, and transpiration in B4.8 *Evaporation and transpiration*. In this B17 topic students have studied how feeding relationships are represented in food chains. They should understand the importance of photosynthesis in feeding relationships, linking with work in B8 *Photosynthesis*. They should understand how materials are recycled through the abiotic and biotic components of an ecosystem, and the importance of decay. They should link this with the main chemicals that make up cells in B1.2 *Animal and plant cells*, respiration in B9 *Respiration*, and transpiration in B4.8 *Evaporation and transpiration*.	learning about the impact of the changes on the distribution of organisms and how biodiversity can be maintained. They consider how this is monitored by looking at trophic levels and biomass, how biomass is transferred, factors that affect food security and making food production more efficient and sustainable. This topic builds upon; GCSE Biology Topic B8 Photosynthesis, B15 Genetics and evolution, B16 Adaptations, interdependence and competition and B17 Organising an ecosystem. In B13, all students should be able to outline asexual and sexual reproduction, and should be aware of the importance of meiosis, fertilisation, and variation in sexual reproduction. They should link this with work on chromosomes and mitosis and the cell cycle in B2 *Cell division*. Students should recall that fungi, plants, and malaria parasites are able to use both types of reproduction. They should link this with work on the life cycle of the malarial protist in B5.8 *Diseases caused by fungi and protists*. Students should be able to discuss screening for genetic disorders and the implications of using this technology. This links in with the *AQA GCSE Biology* topic of monoclonal antibodies in B6 *Preventing and treating disease*.	In studying evolution by natural selection, students should understand the role of mutation in variation, understand the theory of evolution by survival of the fittest and natural selection, and be able to give examples. They should link this with previous studies on sexual reproduction and meiosis in B13.2 *Cell division in sexual reproduction*. In studying genetic engineering, all students should understand what is meant by the term, and be able to give examples of its use and consider the potential benefits and problems. They should link this with work on diabetes treatment using human insulin in B11.3 *Treating diabetes*, and with the treatment of cystic fibrosis in B13.9 *Inherited disorders*. Students should recall different ways of creating clones, and be able to describe why they are useful. They should link cloning plants with work in B11.10 *Using plant hormones*.	All students should be able to describe antibiotic resistant bacteria and their fast evolution, in particular the problem of MRSA. They should link this with work in B6 *Preventing and treating disease* on antibiotics and the discovery and development of drugs. Students should be familiar with the three-domain system developed in the light of recent technological advances. They should link this with B1.3 *Eukaryotic and prokaryotic cells*	

Students should be able to outline the processes of deforestation and peat destruction. They should link this with how materials are cycled in B17.3 *The carbon cycle*.				
Home – Learning: Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Home – Learning: Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Home – Learning: Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	Home – Learning: Teachers to set their own home learning from the resources provided in the topic folder. All students to be given the centrally planned and standardised topic workbooks to complete as part of their Home learning.	
Reading / High Quality Text: Use of online Kerboodle text book to support reading around the subject and deepening understanding. Practice of extended writing through 6 marks questions. Modelling of reading for purpose with exam questions; underlining/highlighting key command words. Recommended wider reading list for students: Ecology: Journals: https://www.sciencejournalforkids.org/wp-content/uploads/2019/09/wild-bees_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2021/04/bumble_bee_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2022/08/bee_brains_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2019/09/bee_diet_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2022/05/bee-distance_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2019/09/pesticide_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2022/02/whales_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2022/02/cobenefits_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2022/03/pm2.5_article.pdf https://www.sciencejournalforkids.org/wp-content/uploads/2021/10/lockdowns_article.pdf Websites: https://www.bbc.co.uk/bitesize/guides/z83qcj6/revision/1 Documentaries: Seaspiracy (Netflix) Artifishal: The Fight to Save Wild Salmon - https://www.youtube.com/watch?v=XdNJ0JAwT7I Videos:				

https://www.youtube.com/watch?v=0mjafH5pVLA
https://www.youtube.com/watch?v=lR2zIlJuaD4
https://www.youtube.com/watch?v=2me1PjYk4sA
https://www.youtube.com/watch?v=LeH5FUKSPzU
https://www.youtube.com/watch?v=6utMftGxuaI
https://www.youtube.com/watch?v=urzpnjwazV0
https://www.youtube.com/watch?v=NFTSm3D2xrM

Reproduction, Genetics, Variation Evolution:
A Brief History of Everyone Who Ever Lived: The Stories in Our Genes, author Adam Rutherford
The dark lady of DNA, author Rosalind Franklin
The Gene – Siddhartha Mukherjee
The Selfish Gene – Richard Dawkins
Unweaving the Rainbow – Richard Dawkins
The Ancestor's Tale – Richard Dawkins
Y: The Descent of Men – Steve Jones
Francis Crick: Discoverer of the Genetic Code – Matt Ridley
Journals:
https://www.sciencejournalforkids.org/wp-content/uploads/2022/07/gonads_article.pdf
https://www.sciencejournalforkids.org/wp-content/uploads/2017/06/voles_article.pdf
https://www.sciencejournalforkids.org/wp-content/uploads/2019/09/rhino_article.pdf
https://www.sciencejournalforkids.org/wp-content/uploads/2019/09/target_mpa_article.pdf
https://www.sciencejournalforkids.org/wp-content/uploads/2021/08/falcon_article.pdf
https://www.sciencejournalforkids.org/wp-content/uploads/2021/05/aDNA_article.pdf
Websites:
https://www.bbc.co.uk/bitesize/guides/zgcxsbk/revision/1
Documentaries:
Extinction: The Facts – David Attenborough: https://www.bbc.co.uk/programmes/m000mn4n
Videos:
https://www.youtube.com/watch?v=7VM9YxmULuo
https://www.youtube.com/watch?v=jphrpR9ffKA&t=111s

Numeracy:
1 Arithmetic and numerical computation
a Recognise and use expressions in decimal form
b Recognise and use expressions in standard form
c Use ratios, fractions and percentages
d Make estimates of the results of simple calculations
2 Handling data
3 Algebra
a Understand and use the symbols: =, <, <<, >>, >, $\propto$, ~
d Solve simple algebraic equations
4 Graphs
a Translate information between graphical and numeric form

a Use an appropriate number of significant figures b Find arithmetic means c Construct and interpret frequency tables and diagrams, bar charts and histograms d Understand the principles of sampling as applied to scientific data e Understand simple probability f Understand the terms mean, mode and median g Use a scatter diagram to identify a correlation between two variables h Make order of magnitude calculations	b Understand that y = mx + c represents a linear relationship c Plot two variables from experimental or other data d Determine the slope and intercept of a linear graph 5 Geometry and trigonometry c Calculate areas of triangles and rectangles, surface areas and volumes of cubes	
Enrichment / opportunities to develop cultural capital (including careers, WRL and SMSC): Science week activities (involving a range of different Biology topics); including lectures, workshops and visits. Where a lesson relates to a potential career the teacher will discuss future career pathways; eg. Geneticist, Genetic counsellor, Ecologist, Conservationist, Anthropologist. SMSC will be highlighted through discussions on ethics, for example of; genetic screening of embryos, designer babies, animal testing and ideas about evolution and the concept of survival of the fittest. Understanding of tolerance and respect for genetic variations between people.		