



Year 11 Biology – Ecology

Learning about this topic is important because: The Sun is a source of energy that passes through all ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being.

This builds on: Your knowledge of photosynthesis from Y8 'photosynthesis' unit of work and Y10 'bioenergetics', there are also links to genetic engineering from the Y11 'inheritance, variation and evolution' unit of work.

This leads to: Further studies at A-level: 'Energy transfers in and between organisms' and 'genetics, populations, evolution and ecosystems' units of work.

We will learn:

- About the levels of organisation in an ecosystem and the difference between topic levels of organisms
- That an ecosystem is the interaction of a community of living organisms (biotic) and with the non-living (abiotic) parts of their environment
- How organisms are adapted to live in their natural environment
- That a range of experimental methods using transects and quadrats are used by ecologists to determine the distribution and abundance of species in an ecosystem, including required practical activity 9: measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species
- That many different materials cycle through the abiotic and biotic components of an ecosystem
- the importance of the carbon and water cycles to living organisms
- About decomposition, the factors that affect the rate of decay and the use of biological waste material, including required practical activity 10: investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change

We will develop/practise skills including:

- Practical skills – sampling techniques and decay investigation, covering GCSE apparatus and technique skills:
 - Use of appropriate apparatus to make and record a range of measurements accurately, including length and area.
 - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
 - Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment
 - Measurement of rates of reaction by a variety of methods including production of gas, uptake of water and colour change of indicator
 - Application of appropriate sampling techniques to investigate the distribution and abundance of organisms in an ecosystem via direct use in the field
 - Use of appropriate techniques and qualitative reagents to identify biological molecules and processes in more complex and problem-solving contexts including continuous sampling in an investigation
- Evaluate risks – complete risk assessments for practical work / 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 / evaluate the conflicting pressures on maintaining biodiversity given appropriate information / evaluate food security / evaluate advantages and disadvantages of modern farming techniques
- Make predictions using scientific knowledge and understanding
- Select, plan, and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate



Year 11 Biology – Ecology

• About the impact of environmental change on the distribution of species in an ecosystem • That biodiversity is the variety of all the different species of organisms in earth, or within an ecosystem • That rapid growth in the human population and an increase in the standard of living mean that increasingly more resources are used, and more waste is produced • Humans reduce the amount of land available for other animals and plants by building, quarrying, farming, and dumping waste • The impact of deforestation, global warming and maintaining biodiversity • How to construct pyramids of biomass, and transfer of biomass • About food production, factors affecting food security, farming techniques, sustainable fisheries, and the role of biotechnology.	• Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience. Explain how waste, deforestation and global warming have an impact on biodiversity / the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications / explain why evidence is uncertain or incomplete in a complex context • Historical developments • Make and record observations and measurements using appropriate methods, including tables and graphs • Explaining data, using specific terminology confidently, in relation to predictions and hypotheses • Mathematical skills – ◦ Find arithmetic means ◦ Construct and interpret frequency tables and diagrams, bar charts and histograms ◦ Understand the terms mean, mode and median ◦ Translate information between graphical and numeric form ◦ Plot two variables from experimental or other data ◦ Calculate efficiency of biomass transfer • Creating • Analysing data - extract and interpret information from charts, graphs and tables / interpret and explain the processes in diagrams of the carbon cycle, the water cycle • Linking concepts and ideas
Some of the vocabulary that we will use includes: Ecosystem, community, interdependence, biotic, abiotic, adaptations, extremophiles, photosynthesis, ecologists, producer, consumer (primary, secondary, tertiary), predator, prey, decomposition, distribution, biodiversity, pollution, deforestation, global warming, endangered, trophic levels, pyramids of biomass, food security, biotechnology	You could learn more about this topic by: Read: https://www.chesterzoo.org/what-we-do/our-projects/ https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF (section 4.7 Ecology – use this as the basis for revision) Watch: https://www.youtube.com/watch?v=XVD5izWXmKo&list=PLs-2-P1PfE9K2zXoNoUMVOY1KA28e7xiR https://www.youtube.com/watch?v=OIUHnS-8kR4 (you can continue to watch all the Cognito videos for this unit) Listen: https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/ https://oceanconservancy.org/sustainable-fisheries/take-deep-dive/fishandus/
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: • HOME LEARNING: Adaptations examination question. Teacher assessed. • TASK: Required practical 9: results table, graph, and calculations. Teacher assessed. • TASK: Carbon cycle extended response examination question. Teacher assessed. • End of topic assessment. This is teacher assessed.	



Year 11 Biology – Homeostasis and response

Learning about this topic is important because: Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.

This builds on: Your knowledge of glands from the study of the digestive system in the Y10 'organisation' unit of work. Learning about the control of the menstrual cycle and the role of oestrogen and testosterone will build on knowledge from the Y7 'human reproduction' unit of work.

This leads to: Studying physiological adaptations of organisms in different environments in the Y11 'ecology' unit of work. Further studies at A-level include links to how organisms respond to changes in their internal and external environments.

We will learn:

- That homeostasis is the regulation of internal conditions to maintain optimum conditions for function in response to internal or external changes
- About the control of blood glucose concentration, including Type 1 and Type 2 diabetes and treatments, body temperature and water levels
- All control systems comprise of receptors, a coordination centre and effectors
- The structure and function of the human nervous system, the brain and eye and treatment of myopia and hyperopia, this will include required practical activity 7: plan and carry out an investigation into the effect of a factor on human reaction time
- About the human endocrine system, be able to identify the position of specific glands of the human body and the hormones they secrete
- About the roles of hormones in the human reproduction system, including the menstrual cycle.
- That fertility can be controlled by a variety of hormonal and non-hormonal methods of contraception and the use of hormones in modern reproductive technologies to treat infertility.

We will develop/practise skills including:

- Practical skills – human reaction time and phototropism investigation, covering GCSE apparatus and technique skills:
 - Use of appropriate apparatus to make and record a range of measurements accurately, including length and time.
 - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
 - Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment
 - Use of appropriate apparatus, techniques, and magnification, including microscopes, to make observations of biological specimens and produce labelled scientific drawings
- Evaluate risks – complete risk assessments for practical work / evaluate the benefits and risks of procedures carried out on the brain and nervous system / evaluate information around the relationship between obesity and diabetes, and make recommendations taking into account social and ethical issues / evaluate the advantages and disadvantages of treating organ failure by mechanical device or transplant / evaluate from the perspective of patients and doctors the methods of treating infertility
- Make predictions using scientific knowledge and understanding
- Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate



Year 11 Biology – Homeostasis and response



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- About the roles of thyroxine and adrenaline in the body and how they are controlled by a negative feedback loop
- About plant hormones, and the control and coordination of growth and responses to light (phototropism) and gravity (gravitropism or geotropism), including required practical activity 8: investigate the effect of light or gravity on the growth of newly germinated seedlings. Record results as both length measurements and as careful, labelled biological drawings to show the effects.
- The use of plant hormones as weed killers, in rooting power, in the control of ripening fruit and ending seed dormancy, promoting flowering, and increasing fruit size

- Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience. Understand social and ethical issues associated with IVF treatments
- Development in technology – developments in microscopy techniques have enabled IVF treatments to develop
- Make and record observations and measurements using appropriate methods, including tables and graphs
- Explaining data, using specific terminology confidently, in relation to predictions and hypotheses
- Mathematical skills –
 - Construct and interpret frequency tables and diagrams, bar charts and histograms
 - Translate information between graphical and numeric form
- Analysing data
- Linking concepts and ideas - impact of weedkiller on biodiversity

Some of the vocabulary that we will use includes:

Homeostasis, optimum, receptors, stimuli, coordination, effectors, central nervous system (CNS), sensory neurone, relay neurone, motor neurone, reflex actions, cerebral cortex, cerebellum, medulla, accommodation, retina, optic nerve, sclera, cornea, iris, ciliary muscles, suspensory ligaments, myopia, hyperopia, thermoregulatory centre, vasodilation, vasoconstriction, endocrine system, pituitary gland, pancreas, thyroid, adrenal gland, ovary, testes, glucose, glycogen, glucagon, insulin, diabetes, urea, deaminated, ADH, menstrual cycle, FSH, LH, oestrogen, progesterone, contraception, negative feedback, thyroxine, adrenaline, phototropism, gravitropism, geotropism, auxin, ethene, gibberellins

You could learn more about this topic by:

Read: <https://studymind.co.uk/notes/the-menstrual-cycle-hormones/>
<https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF> (section 4.5 Homeostasis and response – use this as the basis for revision)

Watch: <https://www.youtube.com/watch?v=XM5J-3qRVJM>

<https://www.youtube.com/watch?v=BvpPCn1rswu>

Listen: <https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/>

<https://www.theguardian.com/science/audio/2018/jul/27/in-vitro-fertilisation-40-years-on-science-weekly-podcast>



Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

- **TASK:** Required practical 7: identification of variables, results table, and graph. Teacher assessed.
- **HOME LEARNING:** Extended response examination question. Teacher assessed.
- **TASK:** Temperature and blood glucose regulation examination questions. Teacher assessed.
- End of topic assessment. This is teacher assessed.



Year 11 Biology – Inheritance, variation & evolution

Learning about this topic is important because: The discipline has **great impact on many everyday aspects of human life**. The food we eat and the clothes we wear come from organisms improved by application of genetic principles. The causes of important human diseases are being discovered, and therapies developed, based on fundamental genetic investigations. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. Scientists have now discovered how to take genes from one species and introduce them into the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.

This builds on: Your knowledge of animal and plant cells, mitosis, and the cell cycle from Y10 'cell biology', links to the study of malaria in the Y10 'infection and response' unit of work. This unit builds on previous studies at KS3; Y7 'human reproduction' and Y9 'inheritance and variation' units of work.

This leads to: Further studies at A-level: 'genetic information, variation, and relationships between organisms' and 'genetics, populations, evolution and ecosystems' units of work.

We will learn:

- How the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring
- The difference between sexual and asexual reproduction, advantages, and disadvantages
- To describe the structure of DNA, define genome, and understand the importance of knowing the human genome
- How proteins are synthesised
- That mutations occur continuously and that few mutations lead to beneficial characteristics
- Genetic inheritance, a dominant allele is always expressed, most characteristics are a result of multiple genes interacting
- How to construct Punnett square diagram and use it to make predictions using the theory of probability, understanding the importance of the work of Mendel
- That some disorders are inherited, caused by the inheritance of certain alleles
- Sex determination – one pair of genes that determine sex XX or XY
- That differences in characteristics of individuals in a population is called variation
- That evolution is a change in the inherited characteristics of a population over time through a process of natural selection which may

We will develop/practise skills including:

- Practical skills
 - Use of appropriate apparatus to make and record a range of measurements accurately, including length and time.
 - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
 - Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment
 - Use of appropriate apparatus, techniques, and magnification, including microscopes, to make observations of biological specimens and produce labelled scientific drawings
- Evaluate risks – complete risk assessments for practical work / the benefits and risks of selective breeding given appropriate information and consider related ethical issues / potential benefits and risks of cloning in agriculture and in medicine and that some people have ethical objections.
- Make predictions using scientific knowledge and understanding
- Select, plan, and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience. Appreciate that embryo screening and gene therapy may alleviate suffering but consider the ethical issues which arise.
- Historical developments of our understanding of the causes and prevention of malaria. The theory of evolution by natural selection developed over time and from information gathered by many scientists.



Year 11 Biology – Inheritance, variation & evolution

result in the formation of a new species, and that theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago • The impact of selective breeding of food plants and domesticated animals • The process of genetic engineering to modify the genome of an organism • Processes of cloning – tissue culture, cuttings, embryo transplant and adult cell cloning • The theory of evolution and speciation • Evidence for evolution – fossils, extinction, and resistant bacteria • The classification of living organisms	• Make and record observations and measurements using appropriate methods, including tables and graphs • Explaining data, using specific terminology confidently, in relation to predictions and hypotheses • Mathematical skills – ○ Use ratios, fractions, and percentages ○ Construct and interpret frequency tables and diagrams, bar charts and histograms ○ Understand simple probability ○ Understand and use the symbols: =, <, <<, >>, >, ∝, ~ ○ Translate information between graphical and numeric form • Creating –Modelling behaviour of chromosomes during meiosis / Modelling insertions and deletions in chromosomes to illustrate mutations. • Analysing data – interpret diagrams of DNA structure / interpret information about genetic engineering techniques and to make informed judgements about issues concerning cloning and genetic engineering, including GM crops / interpret evolutionary trees • Linking concepts and ideas
Some of the vocabulary that we will use includes: Meiosis, gametes, DNA, nucleotides, alleles, gene, chromosomes, amino acids, mutation, protein synthesis, dominant, recessive, homozygous, heterozygous, genotype, phenotype, Polydactyly, cystic fibrosis, variation, evolution, selective breeding, genetic engineering, cloning, tissue culture, embryo transplant, adult cell cloning, natural selection, speciation, fossils, extinction, resistant bacteria, classification	You could learn more about this topic by: Read: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078015/ https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF (section 4.6 Inheritance, variation and evolution – use this as the basis for revision) Watch: https://www.youtube.com/watch?v=VJIE5Qzl1S0 https://www.youtube.com/watch?v=ww1TQXBQ6wQ https://www.youtube.com/watch?v=zNEtVaNQ0s8 (you can continue to watch all the Cognito videos for this unit) Listen: https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/ https://international.neb.com/podcasts/the-history-and-impact-of-molecular-cloning
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: • TASK: Meiosis vs mitosis examination question. Teacher assessed. • TASK: Embryo screening examination questions. Teacher assessed. • End of topic assessment. This is teacher assessed.	