

## Key Stage 3/4 Year 9 Science Long Term Planning Overview

Year 9 Entry level	ELC UNIT 2 BIOL	Inheritance, environment, evolution and inheritance	ELC UNIT 3 CHEM	Elements, mixtures and compounds	ELC UNIT 6 PHY	Electricity, magnetism and waves
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## Key Stage 4 Science Long Term Planning Overview

Year 10 (All)	ELC Unit 1 The human Body	ELC Unit 4 Chemistry in our world.	ELC Unit 5 Energy forces and structure of matter
Year 11 ELC group only	ELC UNIT 6 Electricity, magnetism and waves	ELC UNIT 3 Elements, mixtures and compounds	ELC UNIT 2 Inheritance, environment, evolution and inheritance

Generally in Key Stage 4 the units of work last for a full term to incorporate the practical controlled assessments required for each accreditation. This academic year all students will work towards Single or Double Entry level accreditation based on the new AQA science specification.

For some of our Key Stage 4 students year 11 will focus on extending their Biology Entry level knowledge from years 9 and 10 to enable them to take Biology GCSE in June 2018. This consists of two exam papers with the following topics.

### GCSE BIOLOGY COURSE CONTENT

- Paper 1, Cell Biology

This section explores how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of

medicine that allows doctors to repair damaged organs by growing new tissue from stem cells.

- Paper 1, Organisation

In this section the focus is on the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. Also, how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.

- Paper 1, Infection and Response

Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how to avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics.

- Paper 1, Bioenergetics

Sunlight is the ultimate source of energy for all living systems. In this section how plants harness the Sun's energy in photosynthesis in order to make food is studied. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue.

- Paper 2, Homeostasis and Response

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. These control systems include receptors which sense changes and effectors that bring about changes. This section explores the structure and function of the nervous system and how it can bring about fast responses. Also, 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.

- Paper 2, Inheritance, Variation and Evolution

This section looks at how the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant. These mutations may be damaging and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and consequently, lead to increased fitness in the

individual. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Scientists have now discovered how to take genes from one species and introduce them in to 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.

- Paper 2, Ecology

The Sun is the source of energy that passes through 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. This section explores 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.