

Science Curriculum Map

Year 7	Topics covered	Key knowledge and skills covered	Sequencing of units
Year 7 term 1	Organisms	<p>The levels of complexity from cells to organ systems and focussing on the skeletal system by looking at tendons, ligaments and the actions of antagonistic muscles. Then looking closer at the smallest units of living organisms, describing the differences and similarities between plant and animal cells by comparing organelles. Observing specialised cells using microscopes and describing how they are adapted to their functions. Observing single celled organisms and attempting to classify them based on the structures evident.</p>	<p>This links to the KS2 curriculum where they have studied living things and the differences between them and the skeleton. It introduces the fundamental topic of cells and starts to build on the complex relationships between cells within living organisms. Practical skills of microscopy and how it is carried out are introduced at this point.</p>
Y7 term 2	Genes	<p>We explain how variation is caused within species and how different species are adapted to their environments leading to the introduction of competition. The pupils are then taught the reproductive organs of the human body with reference to the function of the various parts of the anatomy. This is then highlighted in how the body changes during adolescence including the emotional changes as well as physical. The monthly cycle of the menstruation is highlighted explaining how hormone levels control the physical changes. What happens when an egg is fertilised and then implants in the uterus is explored leading to the development of the foetus throughout the nine months of pregnancy.</p>	<p>We explore why there is variation between organisms within a species and how different individuals may show adaptations that give them an advantage. This builds on work covered on adaptations and sexual reproduction in animals in year 5 & 6. Pupils will be able to name reproductive organs and we now extend their knowledge by explaining the functions of the various parts of the human anatomy. We deal with adolescence and the changes within the body, leading to the way in which the menstrual cycle works each month. This leads to fertilisation and implantation of the foetus in the uterus and the ways in which the foetus develops before birth.</p>

Science Curriculum Map

Year 7 term 3	Ecosystems	Plants are shown to be producers and form the bottom layer of food chains which are then developed to show the complex relationships in food webs within ecosystems. The interference of humans on these food chains is explored and the effects of changing environment on competition between species and individuals. This is enhanced by looking at analysis and evaluation skills by looking at predator-prey interactions. We then look more closely at the structures found in flowering plants and use these to explain how reproduction and pollination occur in plants. Germination is explained and the reasons that plants need to spread their seeds to avoid competition. Methods of seed dispersal are explored.	This builds on work covered in KS2 (food webs and chains) and the previous KS3 organisms topic by looking more closely at the organs and cells found in plants. The processes of reproduction in plants are looked at in further depth (this was started at KS2).
------------------	------------	---	---

Year 8	Topics covered	Key knowledge and skills covered	Sequencing of units
Year 8 term 1	Organisms – Systems	This unit deals with the two different key systems in the body – respiratory and digestive. We start by looking at the exchange of gases and how breathing is achieved within the lungs. We then consider the effect of alcohol and drugs on our various systems before we examine the effect of smoking on the body and in particular the lungs and therefore your breathing. We then move on to the nutrients needed by the human body and how we can test whether food contains these substances. Following on from this we cover the dangers of an unhealthy diet and the illnesses caused if it was to continue. Finally, we move on to the mechanisms of digestion and the importance of enzymes and bacteria in the gut.	In this topic after teaching how we breathe, we introduce the effects of smoking on the body. Drugs and their effect on our bodies has been started in Year 6 but here we develop it further to include the dangers of alcohol and smoking. Then we look at the effect of poor diets on the body by building on the energy content of foods which was taught in Energy in Year 7. We pick up on the work introduced in Year 4 on the basic parts of the digestive system and develop them further introducing the concept of enzymes and their function in the human body. We then look at the importance of the blood in transporting the products of digestion as was previously started in Year 6.

Science Curriculum Map

<p>Year 8 term 2</p>	<p>Genes – Evolution & Genetics</p>	<p>We start this unit by looking at chromosomes and genes, where they are found and what they do. This is linked to the structure of DNA, how it was discovered and by whom and looking at greater depth at the base pairing of DNA. We then examine how we can predict the outcomes of genetic crosses based on the dominance or recessive nature of alleles in a Punnett square cross. The advantages and disadvantages involved in genetic manipulation are considered before we move into how genes are selected for in nature. This enables us to examine the work of Darwin and his theory of evolution leading to the importance of biodiversity and the dangers of extinction that exist upon the Earth.</p>	<p>Pupils originally studied inheritance in Year 6 and we build on this by linking to the ideas that organisms change due to inherited characteristics in your DNA (focussing on the work of Franklin, Watson & Crick). This is then developed further to explain how we can predict characteristics and manipulate them through genetic engineering. We then look at Darwin’s work on natural selection and evolution, and show the importance of biodiversity.</p>
<p>Year 8 term 3</p>	<p>Ecosystems – Processes</p>	<p>This unit is all about the processes that take place in living organisms to ensure their survival. Plants are the first organism looked at and pupils’ study what photosynthesis actually is, the chemistry behind it and how plants have adapted both their cells and their organs to maximise the rate at which it is done. We then also study the importance of minerals and their role in the health of plants. Respiration is studied then, both anaerobic and aerobic, and its importance in both plants and animals is emphasised. This leads to the industrial uses in baking and fermentation.</p>	<p>Photosynthesis is the starting point for this unit picking up from the requirements of plants to survive taught in Year 3. We develop this further linking to the structures inside the leaves and the specialised cells (taught in Year7 term 1) and how they contribute to the plant’s ability to photosynthesise. From there we develop pupil’s knowledge of the processes in plants to include both types of respiration and how this differs in animals.</p>

Science Curriculum Map

Y9 Term 1	Cells	<p>In this unit, students will learn about microscopy and cells, and will be able to explain how the development of microscopy techniques, particularly electron microscopy, has enabled scientists to investigate the sub-cellular structures. Students will be able to differentiate between animal and plant cells, differentiate between eukaryotic and prokaryotic cells, and identify adaptations of specialised animal and plant cells. They will also be able to use the formula for magnification. Students will also learn about the transport of material into and out of cells by diffusion, osmosis, and active transport. When studying the processes for transferring material, students will also be able to explain how adaptations of exchange surfaces and link these to the processes of material transport. Students will learn about the process of cell division and they should be able to describe the three overall stages of the cell cycle. Students will develop an understanding of mitosis as a stage within the cell cycle. Along with cell division, students will study cell differentiation and learn that stem cells are undifferentiated cells that have the potential to become a specialised cell within an organism. Students will be able to describe some potential uses of stem cells, as well as the disadvantages and objections to the use of stem cells, particularly in relation to medical treatments.</p>	<p>This picks up on the starting points from Year 7 term 1 and Year 8 but develops the knowledge of the specialist cells within organisms. It also picks up on the movement of molecules first touched on in Year 7 Term 1 linking to diffusion and osmosis. Finally we deal with cell division and looking at the importance of DNA which was started in Year 8 Term 3.</p>
-----------	-------	---	--

Science Curriculum Map

<p>Y9 Term 2</p>	<p>Organisation</p>	<p>In this unit, students will learn about the principles of organisation. Building on their knowledge of differentiation and specialisation of cells, they should be able to define a tissue, an organ, and an organ system. They will study the human digestive system as an organ system in which several organs work together to digest and absorb food, breaking down large insoluble molecules so they can be absorbed into the bloodstream. Students should understand the hierarchical organisation of the digestive system. By studying chemical digestion, students will recognise carbohydrates, proteins, and lipids as large molecules that need to be digested, and be able to name the molecules they are broken down into. They should be familiar with the enzymes that digest carbohydrates, proteins, and lipids, along with the sites of production of these enzymes in the digestive system. Students will understand enzyme action and that enzymes are proteins with a specific shape including the active site. They will be taught the lock and key model in which the substrate has a specific shape complementary to the active site, allowing it to bind to the active site where the reaction takes place, releasing products. They will study the effect of high temperature and extremes of pH on enzymes in changing the active site, which denatures the enzyme. Furthermore they will learn about the organisation of animals and plants. They will be taught the components of blood, describing their functions, and summarising the process of blood clotting. Students will recognise the three main types of blood vessel, link their structures with their functions, and understand the importance of a double circulatory system. They will describe the main structures of the human heart and their functions and be aware of problems that can develop in the blood vessels and their treatments. They will examine breathing and gas exchange, and recognise the main structures of the gas exchange system along with their functions. They will explain that gas exchange happens in the alveoli and describe adaptations of alveoli. They should be able to describe the processes of ventilation and gas exchange and the differences in composition of inhaled and exhaled air. In studying plant tissues and organs, they will be taught the different plant tissues and their functions and recognise plant organs such as a leaf. They will be able to explain that the roots, stem, and leaves form a plant organ system for transport of substances around the plant, stating the</p>	<p>Here we pick up from the work started in the Cells topic (Year 9 term 1) and develop this to look at tissues and different organs found in both plants and animals. We develop the ideas taught in Year 8 term 1 and examine the use of enzymes in the digestive system to a much greater detail, looking at the effects of heat and pH on their structures. We then study further the transport systems in plants and how these can be altered by changing various factors.</p>
------------------	---------------------	---	---

Science Curriculum Map

		<p>functions of xylem and phloem tissue. When studying transpiration, they should explain the function of stomata and recognise factors that affect transpiration rate.</p>	
<p>Y9 Term 3</p>	<p>Infection & Response</p>	<p>In this unit, students will see how the concept that health is affected by communicable diseases. They look at the different pathogens that can cause communicable disease, including bacteria, viruses, fungi, and protists, and how these can be spread between organisms – both animals and plants. As part of this, they look at the development of simple hygiene methods to prevent the spread of pathogens as well as the isolation of individuals who are infected, the destruction of or control of vectors, and the use of vaccination. Students will be able to describe the different defence mechanisms of the human body and plants. Students study the prevention of disease by vaccination. They will know how the immune system works and what is meant</p>	<p>This unit starts by looking at the importance of health and wellbeing which links to Year 8 term 1. It then deals with pathogens and how they infect our systems on a cellular level (Year 9 term 1). We then move on to see how our bodies defend themselves and the importance of vaccination. The production of antibiotics and the testing of new drugs are included before linking to non-communicable diseases such as cancer and the</p>

Science Curriculum Map

		<p>by an antigen. They understand what a vaccine contains and how it works and the concept of herd immunity. They should be able to explain what memory cells are and that they remain in the body to provide long-term immunity. Students will study the treatment of disease by drugs including painkillers and antibiotics. They will be aware that antibiotics are drugs used to cure bacterial infections. They will be taught how they work and be aware of the current crisis of antibiotic-resistant strains of bacteria. They will be aware of how drugs are made today to be effective and safe, and be able to outline the processes of clinical trials including double blind trials and using placebos. Students will study cancer and the different types of tumour, along with the general causes and treatment of cancer. Students will be made aware of the risks of diseases from smoking. They can explain the effects of nicotine, carbon monoxide, and tar, and understand how each specifically affects health, as well as recalling the dangers of smoking whilst pregnant. Students should understand the impact of smoking on the heart. In considering the effect of diet and exercise on disease, students should appreciate the connection between obesity and other diseases such as type 2 diabetes. Students will explain the effect of alcohol on health, and will understand the effect of alcohol on the brain and liver, and of drinking alcohol during pregnancy.</p>	<p>uncontrolled cell division and growth (Year 9 term 1).</p>
--	--	---	---

Science Curriculum Map

<p>Y10 Term 1</p>	<p>Bioenergetics</p>	<p>In this unit, students will study photosynthesis in both plants and algae. They will be familiar with the word and symbol equation for photosynthesis. They will be aware that photosynthesis is an endothermic reaction. Students will study the adaptations of leaves to achieve maximum efficiency in photosynthesis and will identify the factors that affect the rate of photosynthesis and the limiting factors involved. They will complete a required practical on the effect of light intensity on the rate of an aquatic plant. Students will study the use of glucose in respiration, and also how it can be assimilated into starch and cellulose. Students will consider the use of greenhouses and study how the conditions can be monitored and manipulated to achieve the highest rate of photosynthesis. Students will study respiration, and should be able to recall that this is one of the most important processes in living cells. They will be able to describe the process of respiration and write the word and symbol equations. Students will look at mitochondria as the site of respiration and be able to list examples of living processes that need the energy released from respiration. They should link this with active transport, in particular the transport of mineral ions into the root hair cell. Students will study the response of humans to exercise, including changes in heart rate, breathing rate, and breakdown of glycogen, all to increase the rate of respiration in muscle cells. When studying anaerobic respiration, they will be able to describe this process in mammalian muscles, and be able to write the word equation. Students will also be able to link anaerobic respiration in mammalian muscles to the oxygen debt. They will be able to explain that anaerobic respiration occurs in yeast cells and some plant cells. They should explain that fermentation is an economically important reaction and will be able to write the word equation. Finally in this unit they will study metabolism, students will be able to define metabolism and give specific examples of it.</p>	<p>Photosynthesis and respiration are the main foci in this module picking up from work started in Year 8 term 3. We develop this further by looking at how plants use photosynthesis to build proteins and how aerobic respiration is used during exercise combined with anaerobic to help our bodies. Finally we look at the use of the Liver to regulate metabolism, something not previously covered.</p>
-----------------------	----------------------	---	---

Science Curriculum Map

<p>Y10 term 2/3</p>	<p>Ecology</p>	<p>In this unit students study communities, environments, adaptations, and competition. There are several ecological terms including community, population, habitat, ecosystem, abiotic factor, and biotic factor, and students should be able to 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. Students should recall the effects of abiotic and biotic factors on populations. Students will study competition in animals and plants and should be able to 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 studying animals in cold climates students should make a link to surface area to volume ratio. They then move on to study how feeding relationships are represented in food chains. They need to understand the importance of photosynthesis in feeding relationships and should recall the main feeding relationships within a community and understand how the numbers of predators and prey are inter-related, including interpreting predator–prey population graphs. Students should measure the distribution of organisms with quadrats and transects and carry out a practical to investigate the population size of a common species in a habitat.</p> <p>Students then study biodiversity and ecosystems, starting with the reasons for and the effects of the human population explosion. Students should understand the effect of different types of pollution including land, water, and air pollution. They 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. 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.</p>	<p>The importance of communities and biodiversity is highlighted in this unit of work</p> <p>It looks at the effect of different species on each other by examining predator-prey interactions (previously covered in Y7 term 3) and how both plants and animals are adapted on a cellular and gross level It then moves on to look at the effect of humans on pollution, deforestation, and global warming</p>
-------------------------	----------------	---	---

Science Curriculum Map

		<p>Students then look 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 then study 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. Biology students should be able to describe how biomass is transferred from one trophic level to the next, pyramids of biomass, and the efficiency of this energy transfer. 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.</p>	
<p>Y11 term 1</p>	<p>Homeostasis</p>	<p>In this unit students will study the principles of homeostasis, and be able to give some examples and outline the control system involved. They will be able to recall details of the human nervous system and its structure and function. They will be able to describe a reflex arc, with detail of synaptic transmission. During this part of the topic students will complete the required practical investigating reaction time with the ruler drop experiment. Biology students will take this further by studying the eye and the brain in further detail. Next students will study the principles of hormonal control and the endocrine system. They will be able to identify the main parts of the endocrine system and recall the hormones they produce. They will be able to recall how blood-glucose concentration is controlled, including the role of insulin and glucagon, and clearly distinguish between glucose, glycogen, and glucagon. Students will be aware of the causes and treatments of both type 1 and type 2 diabetes. Students will study hormones in human reproduction. They will be able to recall the action of hormones in bringing about puberty. They should be aware of the role of oestrogen in the menstrual cycle in females, and of testosterone in males. Students should understand how hormones are used in the control of fertility as applied to contraception, and to infertility treatments. Biology students will develop their understanding of homeostasis by studying how the</p>	<p>This is concerned with the way in which organisms respond internally to deal with changes externally. We look at specialised nerve cells (Year 9 term 1) and the way in which both nervous and hormonal control systems are used to good effect in the body. We focus on the role of insulin to balance blood glucose levels after digestion (Year 9 term 2) and the diseases caused by the body getting it wrong (Year 9 term 2). Finally, we develop an understanding of the importance of hormones in fertility and how we can control it.</p>

Science Curriculum Map

		<p>body regulates it's body temperature, making links to the brain studied earlier. They will also look at maintaining water balance and osmoregulation, looking in depth at the role of the kidney. Further developing their understanding of hormones, the Biology students will study plant hormones, looking at their functions within the plant making links to photosynthesis and how they can be used in horticulture. Biology students will complete a required practical on phototropism.</p>	
Y11 term 2	Advanced information from AQA	<p>Topics will be planned following a question by question analysis of the Feb PPEs and the topics released from the exam board in February.</p>	