



Department: Science

Subject: Biology

Program of Study: Key stage 3 to Key stage 5

Key Concepts

Cell Biology	Organisation	Infection and Response	Bioenergetics	Homeostasis	Inheritance, Variation and Evolution	Ecology
<p>Cells are the basic unit of all forms of life. Structural differences between types of cells enables them to perform specific functions within the organism and 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 before they have become too specialised, they can retain their ability to differentiate. This has led to the development of stem cell technology.</p>	<p>The human digestive system provides the body with nutrients and the respiratory system provides oxygen and removes carbon dioxide. They provide dissolved materials that need to be moved quickly around the by the circulatory system. Damage to any of these systems can be debilitating if not fatal.</p> <p>The plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with water and carbon dioxide for photosynthesis.</p>	<p>Pathogens are microorganisms that cause infectious diseases. They use their host to provide the conditions and nutrients to grow and reproduce. We can avoid diseases by reducing contact and the body has barriers against them. Once inside us, our immune system can usually destroy the pathogen. Our immunity can be enhanced by vaccination. Since the 1940s antibiotics have been developed against diseases caused by bacteria. Many groups of bacteria have become resistant to these antibiotics.</p>	<p>Plants use the Sun's energy in photosynthesis to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body switches to anaerobic respiration.</p>	<p>Cells in the body can only survive within narrow physical and chemical limits. The body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors and effectors. The nervous system can bring about fast responses. The hormonal system usually brings about much slower changes.</p>	<p>The number of chromosomes are halved during meiosis and then combined with new genes to produce unique offspring. Random gene mutations may occur and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and lead to increased fitness in the individual. Variation is the basis for natural selection and evolution. Scientists have intervened through selective breeding, cloning and genetic engineering.</p>	<p>The Sun is a source of energy for ecosystems. Materials including carbon and water are continually recycled, released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in complex ecosystems composed of communities of animals and plants dependent on each other and adapted to particular abiotic or biotic conditions. Humans are threatening biodiversity.</p>

Key Themes

Biological molecules	Cells	Populations and Ecosystems	Interdependence	Photosynthesis	Respiration	Cycles	Genetics	Evolution
Life processes depend on molecules whose structure is related to their function	The fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living processes to be performed effectively	Living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways	Living organisms are interdependent and show adaptations to their environment	Life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen	Organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life	The chemicals in ecosystems are continually cycling through the natural world	The characteristics of a living organism are influenced by its genome and its interaction with the environment	Evolution occurs by a process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees.

Key Stage 3

YEAR: 7

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Big Question: What are we made of? (Chemistry + Biology)							Big Question: What makes things move ? (Physics) How do organisms manage to live and survive together? (Biology)							Big Question: Where does the electricity in our homes come from? What is it? (Physics)							Big Question: Where do babies come from? (Biology)							Big Question: How do we fit into our Universe? (Physics)							Big Question: Is the phrase "you are what you eat" really true? (Biology) How do rocks change? (Chemistry)						
Key Concepts							Key Concepts							Key Concepts							Key Concepts							Key Concepts													
Key Themes							Key Themes							Key Themes							Key Themes							Key Themes													
Assessment Method: GL initial assessment Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test GL assessment (tbc)							Assessment Method: Educake + ERA/Prac + End of topic test						

YEAR: 8

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Big Question: What makes me, me? Where did we all come from? (Biology) How do we see? (Physics)							Big Question: What is the Periodic Table? (Chemistry) Do we really live on a ball of rock? (Chemistry)							Big Question: Can space travel help me lose weight? (Physics) Why do magnets 'stick'? (Physics)							Big Question: Are all acids dangerous? What is a chemical reaction? (Chemistry)							Big Question: Why don't all my house lights go out when a bulb blows? What is 'green energy'? (Physics)							Big Question: Do plants eat sunshine? Where do we get our energy from? (Biology) If a tree falls in the woods but no one sees, does it still make a sound? (Physics)						
Key Concepts							Key Concepts							Key Concepts							Key Concepts							Key Concepts													
Key Themes							Key Themes							Key Themes							Key Themes							Key Themes													
Assessment Method: GL initial assessment Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: Educake + ERA/Prac + End of topic test GL assessment (tbc)							Assessment Method: Educake + ERA/Prac + End of topic test						

Key Stage 4

YEAR: 9

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Cell structure and division							Organisation and systems							Communicable disease					Photosynthesis and reproduction				Variation and evolution					Adaptations and ecosystem organisation										
Key Concepts							Key Concepts							Key Concepts					Key Concepts				Key Concepts					Key Concepts										
Key Themes							Key Themes							Key Themes					Key Themes				Key Themes					Key Themes										
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YEAR: 10

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Cell structure (microscopy) and transport							Animal and plant organisation and systems Plant diseases.							Communicable disease Respiration					Homeostasis and the nervous system				DNA structure, Variation and evolution. Classification					Cycles and decomposition Human impact on Biodiversity										
Key Concepts							Key Concepts							Key Concepts					Key Concepts				Key Concepts					Key Concepts										
Key Themes							Key Themes							Key Themes					Key Themes				Key Themes					Key Themes										
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YEAR: 11

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Hormonal control Genetics							Plant hormones Trophic levels in an ecosystem							PPE exams Food production and security					REVISION				REVISION															
Key Concepts							Key Concepts							Key Concepts					Key Concepts				Key Concepts															
Key Themes							Key Themes							Key Themes					Key Themes				Key Themes															
Assessment Method: Educake + ERA/Prac PPE (paper 1)							Assessment Method: Educake + ERA/Prac + End of topic test							Assessment Method: PPE Exams (full set) Educake + ERA/Prac + End of topic test					Assessment: Educake + ERA/Prac				Assessment Method: EXAMs															

Key Stage 5

YEAR: 12

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Biological molecules Cells and microscopy Enzymes Cell cycle and mitosis							Cell transport DNA/RNA Water and inorganic ions Digestion and absorption Immunity Protein synthesis							Gas exchange Genetic diversity and natural selection					Mass transport in animals Species and taxonomy Biodiversity					Mass transport in plants Populations and ecosystems PPEs.					Succession Sampling techniques Statistical tests FIELD TRIP Ecosystems and nutrient cycles Farming practices									
Key Concepts							Key Concepts							Key Concepts					Key Concepts					Key Concepts					Key Concepts									
Key Themes							Key Themes							Key Themes					Key Themes					Key Themes					Key Themes									
Assessment Method: End of topic test							Assessment Method: End of topic test							Assessment Method: End of topic test					Assessment: End of topic test					Assessment Method: EXAM					Assessment Method: End of topic test									

YEAR: 13

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Photosynthesis Stimuli and response Nervous coordination Respiration							Respiration (continued) Muscle structure and contraction Homeostasis Inheritance and genetics							Control of gene expression Regulation of transcription and translation Populations – Hardy Weinberg PPEs					Regulation of transcription and translation (continued) DNA technology					DNA technology (continued) Revision and required practical catch ups.														
Key Concepts							Key Concepts							Key Concepts					Key Concepts					Key Concepts														
Key Themes							Key Themes							Key Themes					Key Themes					Key Themes														
Assessment Method: End of topic test							Assessment Method: End of topic test							Assessment Method: PPE EXAMS					Assessment: End of topic test					Assessment Method: EXAMS														