

Biology Curriculum: Mapping of Core Ideas through KS3 & KS4

The Science curriculum at Lutterworth College fosters resilience, curiosity, & critical thinking, encouraging students to question the world, solve problems logically, & evaluate evidence. Through teamwork during investigations, students develop effective communication, respect for diverse perspectives, & a mindset of perseverance & continuous improvement. Practical activities & data analysis tasks provide hands-on experience, building confidence in interpreting information & solving real-world problems. By addressing issues like health inequalities, climate change, & sustainability, students learn to use science as a tool for creating a fairer, more equitable world.

At its core, the curriculum celebrates the intrinsic value of science in helping us understand the world & our place in it. Students are inspired to appreciate the beauty of scientific discoveries & the role they play in shaping our lives. Beyond exams, the program aims to nurture lifelong curiosity, exploring everything from the smallest particles to the vastness of the universe. By engaging with models & investigations, students think scientifically & deepen their understanding of the natural world & human innovation, empowering them to contribute meaningfully to society.

POWERFUL IDEAS IN SCIENCE	Domain 1 <i>Cells as the basic units of life</i>	Domain 2 <i>Genetics / Heredity: how organisms pass on information</i>	Domain 3 <i>Evolution & natural selection: explaining diversity</i>	Domain 4 <i>Ecology / Energy cycling: competition, dependence, energy flow</i>
Key Concepts	- Organisms are organised on a cellular basis. These cells have common features that carry out essential processes for life (movement, respiration, sensitivity, growth, reproduction, excretion, & nutrition) - In multicellular organisms, cells are organised into tissues, then organs, organ systems, & functioning organisms. - Living systems regulate themselves at the cell, organism, & ecosystem level to maintain stability in response to a changing environment. - The organisation of unicellular & multicellular organisms. - The function of a biological molecule depends on its shape & chemical features. - All life on Earth depends on photosynthetic organisms.	- Genetic information is passed down from one generation of organisms to another. - The inherited sequence of DNA underlies an organism's phenotype (e.g., shape or blood type). - An organism's features are determined by its genome & its environment. - Heritable mutations allow evolution or genetic change over time. - The genome as the entire genetic material of an organism. - Evolution can be manipulated with human intervention (e.g., selective breeding, biotechnology).	- The diversity & variation of organisms, living & extinct, is the result of evolution. - Evolution results in diverse adaptations to ensure survival. - Evolution happens by a process of natural selection but can be influenced by human intervention. - This diversity allows organisms to occupy different niches within an ecosystem.	- Organisms require a supply of energy & materials, often depending on or competing with other organisms. - Living systems are organised & regulate themselves at multiple levels, impacting & responding to their environment. - All life on Earth depends on photosynthetic organisms. - Organisms interact with each other & their environment, forming ecosystems & maintaining cycles (carbon, water, nitrogen). - Biodiversity & human impact on ecosystems.
End Points	- Understanding of core concepts - Appreciation of how multicellular organisms function - Understanding how to structure scientific investigations - Having a good grasp of numerical, analytical and literacy skills to communicate scientific ideas effectively.			

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Year 7 KS3	B1.1: Cells Broken down knowledge covered: • Introduction to Cells • Comparing Cells • Writing Methods • Observing Cells • Specialised Cells • Organising Cells	B1.5: Heredity & DNA Broken down knowledge covered: • Heredity & genetic material • DNA • Modelling the structure of DNA • Extracting DNA from fruit		B1.3: Interdependence Lessons including: • What is interdependence? • Food chains & food webs • The importance of pollinators for human food security • Sampling ecosystems • Human impact on ecosystems
		B1.2: Reproduction Lessons including: • Sexual v Asexual reproduction • Puberty & Adolescence • Male/Female reproductive systems • The Menstrual Cycle • Fertilisation & Embryo Development • Plant reproduction • Germination • Seed dispersal		
Assessments	End of topic quiz: (20 Questions containing a Combination of short answer, multiple choice and skill-based questions) • B1.1: Cells • B1.2: Reproduction • B1.3: Interdependence • B1.5: Heredity & DNA			
	Internal Assessment: (Created from past KS3 questions including short answer, multiple choice and extended questions) IA1: End of September: Introduction to Science/Skills Assessment IA2: May Core Content Assessment			

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Year 8 KS3	B2.1 Organs & Organ Systems Broken down knowledge covered: • Introduction to Organ Systems • Musculoskeletal System • Investigating Muscles • The Respiratory System	B2.3a DNA & Inheritance: Broken down knowledge covered: • Structure & Discovery of DNA • Discontinuous Variation • Continuous Variation • Inheritance • Inherited Disorders & Punnett Squares	B2.3b Selection & Evolution Broken down knowledge covered: • Natural Selection • Evolution • Artificial Selection • Biodiversity & Gene Banks	
	B2.4 Nutrition Broken down knowledge covered: • Diet & Nutrition • Energy in Food • Imbalanced Food • Food Tests • Digestive System • Enzymes & Digestion • Observing Amylase Action • The Digestive microbiome • Plant Nutrition			
Assessments	End of topic quiz: • B2.1 Organs & Organ Systems • B2.3a DNA & Inheritance • B2.3b Selection & Evolution • B2.4 Nutrition			
	Internal Assessment: (Created from past KS3 questions including short answer, multiple choice and extended questions) IA1: September Core Content Assessment IA2: May Core Content Assessment			

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Year 9 KS3/GCSE <i>(Separate Sciences Only)</i>	B1.a Cell Structure Broken down knowledge covered: - Eukaryotic Cells - Prokaryotic Cells - Microscopy & Calculations - Stem Cells - Specialised cells			B2.2 Intro to Bioenergetics: Broken down knowledge covered: - Respiration & Photosynthesis - Lifestyle Factors & Risks - Respiration & Exercise - Muscle Fatigue - Photosynthesis & Investigation - Plant Adaptations - Non-Photosynthetic Plants
	B1.b Cell Transport Broken down knowledge covered: - Diffusion - Active Transport - Osmosis - Exchange Surfaces			
	B1.c Cell Division Broken down knowledge covered: - Chromosomes - Cell Division & Mitosis • <i>Binary Fission</i> • <i>Culturing Microorganisms</i>			
	B2.a Health & Disease Broken down knowledge covered: - Risk Factors - Tumour Development - Coronary Heart Disease - Data Analysis			
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) - B2.2: Intro to Bioenergetics - B1a: Cells - B1b: Cell Transport - B1c: Cell Division - B2a: Health & Disease			
	Internal Assessment: (Created from past KS3 questions and GCSE past paper questions including short answer, multiple choice and extended questions) IA1: Test reviewing the core content from KS3 IA2: Test of GCSE Content			

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Year 10 GCSE (Separate Sciences Only)	B2.b Tissues & Organ Systems: Broken down knowledge covered: • Levels of organisation • The Lungs • The Heart • Blood vessels • Blood • Plant Cell organisation • Transpiration, Translocation & Stomata • Transpiration			B4a: Bioenergetics: Photosynthesis Broken down knowledge covered: • Photosynthesis Reaction • Limiting Factors • Investigating Photosynthesis
	B2.c Enzymes: Broken down knowledge covered: • Enzymes • Factors that affect enzymes • Investigating enzymes • Digestive System • Food Tests			B4b: Bioenergetics: Respiration Broken down knowledge covered: • Aerobic Respiration • Anaerobic Respiration • Effects of Exercise • Metabolism
	B3.a Communicable disease Broken down knowledge covered: • Communicable diseases • Bacterial & Viral Diseases • Fungal & Protist Diseases			B7.a: Organisms Are Interdependent Broken down knowledge covered: • Organisation of an Ecosystem • Relationships Between Organisms • Investigating Species Distribution • <i>Pyramids of Biomass</i>
	B3.b Preventing Disease Broken down knowledge covered: • Preventing Transmission • Vaccination • Non-Specific Responses • Specific Defences • Pain Killers, Antibiotics & Drug Development			B7b: Human Impact on the Environment Broken down knowledge covered: • Cycling of Materials • <i>Decomposition</i> • <i>Decay</i> • Biodiversity & Waste • Global Warming • Land Use & Deforestation • Maintaining Biodiversity • <i>Food Security</i> • <i>Biotechnology</i>

	B3.c Taking It Further Broken down knowledge covered: • <i>Plant Diseases and Defences</i> • <i>Making Monoclonal Antibodies</i> • <i>Uses of Monoclonal Antibodies</i>			
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) • B2.a Tissues & Organ Systems • B2.c Enzymes • B4.a Bioenergetics: Photosynthesis • B4.b Bioenergetics: Respiration • B6.b Genetics Disease & Gene Manipulation			
	Internal Assessment: IA1: Core Content Assessment IA2: Core Content Assessment End of Year 10 PPE: Bio/Chem/Phys Paper 1 Suite			

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Year 11 GCSE (<i>Separate sciences only</i>)	B5a: Nervous System: Broken down knowledge covered: • Homeostasis • The Nervous System & Reflex Arcs • Investigating Reaction Time • <i>Thermoregulation</i> • <i>The Brain</i> • <i>The Eye</i> • <i>Correcting Vision Defects</i>	B6a: DNA & Reproduction Broken down knowledge covered: • DNA • <i>DNA Structure</i> • <i>Mutations</i> • <i>Protein Synthesis</i> • Asexual & Sexual Reproduction • <i>Advantages/Disadvantages of Asexual & Sexual Reproduction</i> • Meiosis Vs Mitosis	B6.c Variation, Evolution & Classification: Broken down knowledge covered: • Variation • Evolution & Extinction • <i>Evolution & Speciation</i> • Evidence for Evolution • Classification	
	B5b: Endocrine System: Broken down knowledge covered: • Negative Feedback • Controlling Blood Glucose • Reproductive Hormones & Menstrual Cycle • Contraceptives & Increasing Fertility • <i>Controlling Water & Nitrogen Content</i> • <i>Kidney Failure & Treatment</i> • <i>Plant Hormones & Their uses</i> • <i>Investigating the Effect of Light on Seedlings</i>	B6.b Genetics, Disease & Gene Manipulation Broken down knowledge covered: • Sex Determination & Genetic Diagrams • <i>The Work of Gregor Mendel</i> • Inherited Disorders • Selective Breeding • Evidence for Evolution • Genetic Engineering • <i>Cloning</i> • <i>Evaluating The Use of Cloning</i>		
Assessments	End of topic quiz: (20-mark tests created from GCSE past paper questions including short answer, multiple choice and extended questions) • B5a: Nervous system • B5b: Endocrine system • B6a: DNA & Reproduction • B6b: Genetics, Disorders & Gene Manipulation • B6c: Variation, Evolution & Classification			
	Internal Assessment: (Past GCSE Papers) PPE1: October (Bio/Chem/Phys Paper 1) PPE2: February (Bio/Chem/Phys Paper 2)			