THE ABBEY SCHOOL
A BUSINESS & ENTERPRISE ACADEMY

Subject: Biology

Year 12

Scheme of Learning 2025 - 2026

Subject leader: Mr S Brock

A LEVEL								
Block	**Topic**	**BQ**	**Lesson Number**	**Lesson**	**LQ**	**Content**	**Practical**	**Activity**
1-Biological molecules 1	1	How do the structures of biomolecules support life processes?	1	Molecules of life & Sugars	How do energy-storage molecules differ in structure and use?	Difference between monomers and polymers. How condensation reactions join molecules together. How hydrolysis reactions break bonds.		
			2	Polysaccharides	What structural differences exist in polysaccharide?	Polysaccharides are long chains of monosaccharides linked by glycosidic bonds, and include storage molecules like starch and glycogen, and structural molecules like cellulose.		
			3	Lipids	How do energy-storage molecules differ in structure and use?	The structure and properties of triglycerides and phospholipids. Difference between saturated and unsaturated fatty acids.		
			4	Protein	How does sequence of amino acids function in protein?	Proteins are polymers of amino acids joined by peptide bonds and have complex structures (primary to quaternary) that determine their diverse functions in organisms.		
			5	Enzymes	How do enzymes lower activation energy ?	Enzymes are biological catalysts that speed up chemical reactions by lowering activation energy without being used up.		
2-Biological molecules (Enzymes & DNA).		Why are enzymes essential, and what factors control their activity?	1	Factors affecting Enzyme Activity	How does optimum conditions affect enzyme activity?	Enzyme activity is affected by temperature, pH, and substrate concentration, each altering the rate of reaction by influencing enzyme shape or availability.	1. Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction.	
			2	Enzyme controlled reactions (Required Practical).	How can rate of enzyme controlled reaction be measured?	This practical investigates how factors such as temperature or substrate concentration affect the rate of enzyme-catalysed reactions, often using color change or gas volume as indicators.		
			3	DNA & RNA	What is the difference between DNA & RNA ?	DNA and RNA are nucleic acids made of nucleotides; DNA stores genetic information with a double-helix structure, while RNA is single-stranded and involved in protein synthesis.		

			4	DNA Replication	How is genetic continuity ensured in cells?	DNA replication is semi-conservative, using each strand as a template to form two identical DNA molecules during cell division.		
			5	ATP-Adenosine triphosphate	Why is ATP linked to energy source in cells?	ATP (adenosine triphosphate) is the primary energy carrier in cells, releasing energy when hydrolysed to ADP and Pi.		
3 - More Biological Molecules & Cell Structure		How do cellular structures support function?	1	Water & Inorganic ions	How is water vital to biological systems?	Properties of water in a biological context. Properties and roles of inorganic ions.		
			2	Eukaryotic Cells and Organelles	How is cell structures related to functions?	Eukaryotic cells contain membrane-bound organelles such as the nucleus, mitochondria, and endoplasmic reticulum, each performing specific cellular functions.		
			3	Prokaryotic Cells and Viruses.	How is eukaryotic different from prokaryotic?	Prokaryotic cells, such as bacteria, lack a nucleus and membrane-bound organelles, while viruses are acellular particles that require host cells to replicate.		
			4	Analysis of Cell Components	How can organelles be isolated ?	Cell fractionation and ultracentrifugation are used to isolate and study different organelles based on size and density.		
			5	Microscopes and artefacts	How can specimens be prepared for microscopy?	Microscopes allow us to view cells and organelles, but artefacts may appear due to preparation techniques, especially in electron microscopy.		
4 - Cell structure & Division.		Why do different microscopes and cell structures reveal ?	1	Cell division-Mitosis & Cancer	How do cells divide accurately to form identical or varied daughter cells?	How to recognise the stages of the cell cycle in eukaryotic cells Role of mitosis The behaviour of chromosomes during the cell cycle. How uncontrolled cell division may lead to tumour formation and cancer.		
			2	Investigating Mitosis 1 - Using an optical Microscope (RP).	Why and how do cells divide accurately?	This investigation involves preparing slides of actively dividing cells, staining chromosomes	2. Preparation of stained squashes of cells from plant root tips; setup and use of an optical microscope to identify the stages of mitosis in these stained squashes and calculation of a mitotic index.	
			3	Investigating Mitosis 1 - Calculating mitotic index (RP).	How can you calculate mitotic index in a sample?	This investigation involves calculating the mitotic index under a microscope.		
			4	Cell Membrane -basics	How can models be use to descibe cell membrane?	The cell membrane is composed of a phospholipid bilayer with proteins and controls the movement of substances in and out of cells.	3. Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue.	
			5	Investigating Cell membrane Permeability(RP).	How does temperature affect permeability of beetroot cell membrane?	In this practical, the permeability of membranes (e.g. in beetroot) is tested under varying conditions like temperature or solvents by measuring pigment leakage.	4. Investigation into the effect of a named variable on the permeability of cell-surface membranes.	
5 -Cell Membrane		How does a cell regulate what passes through its membrane?	1	Diffusion	What is diffusion in cell?	Diffusion is the passive movement of molecules from a region of high to low concentration down a concentration gradient.		
			2	Osmosis	How does water move in and out of cells?	Osmosis is the diffusion of water across a selectively permeable membrane from a region of higher water potential to lower water potential.		

	2		**3**	Osmosis-Investigating Water Potental (RP).	How can you use potato cylinders to determine water potential of plant tissue?	This experiment uses plant tissue (like potato cylinders) placed in solutions of different concentrations to determine water potential by observing mass changes.		
			4	Active Transport	How does active and passive form of transport occur in cell membrane?	Active transport uses energy from ATP to move substances against their concentration gradient via carrier proteins in the membrane.		
			5	Antigen	How does the structure of antigen link to immune sytem?	Antigens are molecules, typically proteins, on the surface of pathogens or cells that are recognized by the immune system as foreign.		
6 -Cells & The Immune System.		How do vaccines provide protection and immunity ?	**1**	The Immune Response	What is the role of T cells & B cells in immune response?	The immune system defends the body using non-specific and specific responses involving phagocytes, T cells, and B cells.		
			2	Immunity & Vaccines/Antigenic Variation	How does vaccination lead to immunity?	Vaccination introduces antigens to stimulate the production of memory cells, providing long-term immunity without causing disease.		
			3	Antibodies in Medicine.	How are monoclonal antibodies used?	Monoclonal antibodies can be designed to bind specifically to antigens for use in diagnostics (e.g., pregnancy tests) or targeted drug treatments.		
			4	Data on Vaccine &Antibodies.	How can scientific data on vaccines be used ?	Analysing data from clinical trials helps assess vaccine effectiveness, antibody levels, and immune response in different populations.		
			5	HIV & Viruses.	How does HIV affect the immune system?	HIV is a virus that targets helper T cells, weakening the immune system and potentially leading to AIDS; viruses replicate by hijacking host cell machinery.		
7 Transport In Plants	**3**	How do plants obtain and utilise essential products to ensure respiration can take place?	**1**	Xylem	How do Xylem and Phloem differ in function?	Structure and function of xylem and phloem.	Potometers	**Activity 1:** Diagram the process of transpiration and explain how water moves through a plant. **Activity 2:** Research and explain how plants control water loss through stomata.
			2	Phloem	How do Xylem and Phloem differ in function?	Structure and function of xylem and phloem.		
			3	Transport in Plants	How is sucrose transported in plants?	Phloem transport: translocation and the source-to-sink mechanism		
			4	Transpiration in Plants	How does the rate of transpiration impact plant processes?	Water and mineral transport in plants: root pressure, transpiration, cohesion, and adhesion.		
			5	Arrangement of plant structures	What are the differences in Xylem and Phloem arrangment in various parts of the plant?	Plant mass transport dissection, critical thinking: why is the arragement different.		
8 Transport In Animals			**1**	The Heart	How does the structure of the heart relate to its function?	Structure of the heart and dissection	Heart dissection	**TBC**
			2	The Circulatory System	How does the cardiac cycle ensure efficient blood circulation?	The role of the circulatory system in transport: oxygen, nutrients, hormones, and waste products.		
			3	Blood Vessels	How is blood carried around the body?			
			4	Haemoglobin	How can Cardiovascular disease impact health?	The cardiac cycle, blood pressure, and the role of hemoglobin in oxygen transport.		

		How are substances transported around animals?	**5**	Cardiovvascular Disease	How can Cardiovascular disease impact health?	Identification and disscussion of different disease and how they impact the body		
9 - Exchange Surfaces		TBC	**1**	Size and surface area	What makes an exchange surface effective?	Features of efficient exchange surfaces: large surface area, thin membranes, good blood supply, and ventilation.	Dissecting Gas Exchange Systems	**Activity 1:** Draw and label the structure of alveoli and describe how they maximize gas exchange. **Activity 2**: Compare the gas exchange mechanisms in fish and humans.
			2	Gas Exchange in Humans	How do the alveoli in the lungs facilitate efficient gas exchange?	The need for specialized exchange surfaces (e.g., lungs, gills, villi).		
			3	How are Alveoli adapted to function.	Why do multicellular organisms need specialized exchange systems?	The role of alveoli in gas exchange in the lungs.		
			4	The Effects of Lung Disease	How can lung disease impact cellular respiration?	TBC		
			5	Interpreting Lung Diesease Data	Why do multicellular organisms need specialized exchange systems?	TBC		
10 - Genetic Information and DNA		TBC	**1**	DNA	How does the structure of DNA relate to its function?	The structure of DNA and how genetic information is stored.	TBC	TBC
			2	Genes & Chromosones	What is the significance of complementary base pairing in DNA replication?	DNA replication and the role of enzymes.	TBC	TBC
			3	RNA & Protein Synthesis	How does mRNA help in protein synthesis?	TBC	TBC	TBC
			4	Transription & Translocation	What is the role of ribosomes in translation?	Transcription and translation: the process of protein synthesis.	TBC	TBC
			5	The Genetic code & Nucleic Acids	TBC	The role of mRNA, tRNA, and ribosomes.	TBC	TBC
11 - Diversity & Selection	**4**	TBC	**1**	Meiosis & Genetic Variation	TBC	Mutations and their effects on genetic variation.	TBC	TBC
			2	Mutations	How do mutations affect genetic variation?	TBC	TBC	TBC
			3	Genetic Diversity	TBC	TBC	TBC	TBC
			4	Natural Selection	What is the theory of evolution by natural selection?	TBC	TBC	TBC
			5	The Effects of Selection	How does natural selection drive evolution?	TBC	TBC	TBC
			6	Investigating Selection	TBC	TBC	TBC	TBC
12 - Evolution and Relationships between Organisms		TBC	**1**	Classifications Of Orgnisms	How are organisms classified based on their evolutionary relationships?	TBC	TBC	TBC
			2	Classification of Using Courtship behaviour	TBC	TBC	TBC	TBC
			3	Classification Using DNA or Proteins	TBC	TBC	TBC	TBC
			4	Using Gene Technologies to Asses Genetic Diversity	TBC	TBC	TBC	TBC
			5	Investigating Variation	TBC	TBC	TBC	TBC
			6	Biodiversity	TBC	TBC	TBC	TBC
			7	Agriculture and Biodiversity	TBC	TBC	TBC	TBC