Science Department - Biology

Department Overview:

Year 7			
Topic	**Time Allocated**	**Skills**	**End Point**
Cells	12 hours	**The Development of Scientific Thinking** • Understand that cells are the basic units of life • Describe and compare animal, plant, eukaryotic and prokaryotic cells • Explain how cell structures (organelles) are adapted to their functions • Understand how specialised cells are adapted for specific roles • Explain processes such as diffusion and osmosis using particle models	By the end of this unit, students should be able to confidently describe and compare animal, plant, eukaryotic and prokaryotic cells, explaining the function of key organelles and how their structures relate to their roles, including in specialised cells. They will be able to use a microscope effectively, prepare slides, and calculate total magnification accurately. Students will understand and apply the processes of diffusion and osmosis in a range of biological contexts.
Organisation within animals	12 hours	**Using Scientific Terminology and Communication** • Use key vocabulary accurately (e.g. inhalation, exhalation, organ system, antagonistic muscles) • Label diagrams clearly (respiratory system, skeleton, joints) • Construct clear written explanations of processes • Communicate ideas using appropriate scientific language	Students will understand how living organisms are organised, from cells to organ systems, and be able to describe the key life processes that define living things. They will be able to explain the structure and function of the respiratory system, including ventilation and gas exchange, and interpret how factors such as lifestyle and disease can affect it. Students will also explain how the musculoskeletal system works, including how muscles act in antagonistic pairs and how joints enable movement.
Reproduction	12 hours	**Analysis and Evaluation**	By the end of this unit, students will understand reproduction as a

		• Compare male and female reproductive systems • Explain the sequence of fertilisation and early development • Analyse how structures are adapted for reproduction (e.g. sperm, egg, flower parts) • Evaluate the importance of processes like pollination and seed dispersal	fundamental life process and be able to describe the physical and biological changes that occur during adolescence. They will explain the structure and function of the male and female reproductive systems, the process of fertilisation, and the role of the menstrual cycle in reproduction. Students will also describe how pregnancy supports the development of a foetus. In addition, they will understand reproduction in plants, including pollination, fertilisation, and seed dispersal, and be able to compare sexual and asexual reproduction.

Year 8			
Topic	**Time Allocated**	**Skills**	**End Point**
Bioenergetics	12 hours	**The Development of Scientific Thinking** • Understand that plants make their own food through photosynthesis • Explain the relationship between photosynthesis and respiration • Describe how plant structures (leaves, palisade cells) are adapted for their function • Explain the role of minerals (e.g. nitrates) in plant growth • Compare aerobic and anaerobic respiration in plants and animals • Understand how exercise affects the body and energy demands	By the end of this unit, students will understand how energy is transferred in living organisms through photosynthesis and respiration. They will be able to describe the structure of plants and explain how leaves and cells are adapted for photosynthesis, including the role of key minerals. Students will understand and use word equations for photosynthesis and both types of respiration, and be able to compare aerobic and anaerobic processes in plants and animals. They will apply their knowledge to explain the effects of exercise on the body, including why anaerobic respiration occurs and its consequences.

Lifestyle & health	12 hours	**Experimental Skills and Strategies** • Carry out food tests safely (starch, sugar, protein, fat) • Follow practical methods accurately • Observe and record results from chemical tests • Use appropriate equipment correctly • Identify variables in simple investigations	By the end of this unit, students will understand the importance of a balanced diet and the role of nutrients in maintaining health. They will be able to explain how the digestive system works, including the role of enzymes, and describe how the body processes food to release energy. Students will investigate and interpret the results of food tests and use mathematical skills to analyse nutritional information and energy requirements. They will understand how poor diet and lifestyle choices, including alcohol, smoking and drug use, impact the body and can lead to disease. Students will be able to analyse and evaluate data, make informed judgments about health, and communicate their understanding clearly using accurate scientific terminology, diagrams and structured explanations, applying their knowledge to real-life contexts.
Relying on each other	12 hours	**Mathematical Skills and Quantitative Reasoning** • Analyse data collected from sampling (e.g. quadrats) • Represent variation using graphs (continuous and discontinuous) • Interpret food chains, webs, and population data • Compare biodiversity between different areas • Identify patterns and trends in ecological data	By the end of this unit, students will understand how organisms rely on each other within ecosystems and the importance of biodiversity. They will be able to explain how competition, adaptation and variation influence survival, and distinguish between continuous and discontinuous variation. Students will use sampling techniques such as quadrats to collect and analyse ecological data, presenting their findings using graphs and tables. They will interpret food chains and food webs to explain interdependence and energy transfer within ecosystems. In

			addition, students will understand the causes and consequences of extinction and the importance of conservation strategies such as gene banks. They will analyse and evaluate ecological data, identify patterns and relationships, and communicate their understanding clearly using accurate scientific terminology.

Year 9			
Topic	**Time Allocated**	**Skills**	**End Point**
Biology key concepts	16 hours	**1. The Development of Scientific Thinking** • Use biological models (e.g. lock-and-key model for enzymes) to explain processes • Link structure to function in cells and organelles • Explain cause-and-effect relationships (e.g. temperature → enzyme activity) • Use experimental results to support explanations • Apply knowledge to unfamiliar contexts • Justify conclusions using scientific reasoning **2. Experimental Skills and Strategies** • Plan investigations by identifying independent, dependent, and control variables • Use equipment accurately (e.g. microscopes) • Record observations clearly (tables, labelled drawings)	Explain how the structure and function of cells, enzymes and transport processes underpin key biological systems, and apply quantitative skills to analyse biological data, investigate processes using practical methods, and interpret results scientifically.

		• Follow valid and safe methods	
Cells and control	12 hours	**Using Scientific Terminology and Communication** • Use correct biological terminology (e.g. diploid, cytokinesis, neurone types) • Construct clear written explanations • Label diagrams accurately (e.g. cell cycle, neurones, reflex arc) • Present information clearly in appropriate formats (graphs, tables, diagrams)	Students will be able to describe mitosis as part of the cell cycle, including its stages, and explain its role in growth, repair and asexual reproduction, producing two genetically identical diploid cells; explain how uncontrolled cell division leads to cancer; describe growth and differentiation in animals and plants and the role of stem cells, evaluating their medical uses and risks; apply mathematical skills to interpret growth data using percentiles, percentage change and graphical analysis; explain the structure and function of the nervous system, including neurones, synapses and reflex arcs; and plan, carry out and evaluate investigations into response and coordination, using accurate scientific terminology and clear communication throughout.

Genetics intro	8 hours	**Experimental Skills and Strategies**
		• Explain how DNA can be extracted from fruit
		• Follow a method involving:
		  ○ Breaking down cell membranes
		  ○ Filtering and separating components
		  ○ Precipitating DNA
		• Use appropriate equipment safely and accurately
			Students will be able to explain the role of meiosis in producing four genetically different haploid gametes and how this leads to variation; describe DNA as a double helix with two strands joined by complementary base pairs and explain how its structure relates to its function; define the genome as the entire DNA of an organism and a gene as a section of DNA coding for a specific protein; describe and carry out a method to extract DNA from fruit, explaining the purpose of each stage; evaluate the DNA extraction process by identifying sources of error and suggesting improvements; and use accurate scientific terminology to communicate

			their understanding through clear written explanations and labelled diagrams.

Year 10			
Topic	**Time Allocated**	**Skills**	**End Points**
Health, disease and development of medicine	16 hours	**1. Using Scientific Terminology and Communication** • Use accurate terminology (e.g. pathogen, antigen, antibody, immunity, BMI) • Communicate processes clearly (infection, immune response, vaccination) • Present data and conclusions using appropriate scientific formats **2. Analysis and Evaluation** • Interpret patterns and relationships in health and disease data • Analyse correlations between lifestyle factors and disease • Evaluate the effectiveness of treatments and interventions • Assess reliability and limitations of experimental data • Draw valid, evidence-based conclusions	Students will be able to define health using the WHO definition and distinguish between communicable and non-communicable diseases; explain how pathogens cause disease, how infections are spread and prevented, and how the body defends itself through physical, chemical and immune responses including vaccination; explain why antibiotics are only effective against bacteria and describe the stages in the development of new medicines; analyse how lifestyle factors influence non-communicable diseases and evaluate treatments such as those for cardiovascular disease; apply mathematical skills including calculating BMI and interpreting graphical and statistical data; and plan, carry out and evaluate investigations into microorganisms, communicating their understanding clearly using accurate scientific terminology and data presentation.
How we inherit characteristics	7 hours	**Mathematical Skills and Quantitative Reasoning** • Calculate probabilities, ratios and percentages in genetic crosses	Students will be able to explain how differences in alleles lead to variation in inherited characteristics; use and apply key genetic terminology accurately; explain and predict patterns of inheritance using genetic diagrams, Punnett squares and pedigrees, including the determination

		• Analyse outcomes from Punnett squares and pedigree diagrams • Use ratios and direct proportions in inheritance • Interpret data from graphs, tables and charts Use estimation appropriatel	of sex; calculate and analyse probabilities, ratios and percentages in monohybrid crosses; describe how most characteristics are influenced by multiple genes and how genetic and environmental factors cause variation; explain the role of mutations in creating genetic diversity; discuss the applications of the Human Genome Project; and analyse and interpret data from inheritance studies, communicating their understanding clearly using appropriate scientific language and representations.
Natural selection and genetic modification	10 hours	**Analysis and Evaluation** • Interpret evidence for evolution from fossils and artefacts • Analyse data showing changes over time (e.g. resistance, tool development) • Evaluate the reliability and limitations of evidence (e.g. fossil record) • Assess the impacts, benefits and risks of genetic technologies • Draw reasoned, evidence-based conclusions about evolutionary processes	Students will be able to explain Charles Darwin's theory of evolution by natural selection and describe how evidence from resistant organisms, fossils and stone tools supports this; explain how genetic analysis has refined classification systems; describe and evaluate selective breeding and genetic engineering, including their processes, applications and ethical implications; interpret and analyse data related to evolution and inheritance using appropriate mathematical skills; and evaluate the reliability of evidence and the risks and benefits of modern genetic technologies, communicating their understanding clearly using accurate scientific terminology.
Respiration intro	3 hours	**Using Scientific Terminology and Communication** • Use key terminology accurately (e.g. respiration, aerobic, anaerobic, exothermic, metabolic processes) • Communicate methods, results and conclusions clearly	Students will be able to describe cellular respiration as an exothermic process that releases energy for metabolic processes and compare aerobic and anaerobic respiration in terms of oxygen use, energy release and products; plan and carry out a practical investigation into the rate of respiration in living organisms, identifying variables and recording data accurately; analyse and interpret

		• Present data using appropriate scientific formats	results to identify patterns and draw valid conclusions, evaluating the reliability of methods and suggesting improvements; and communicate their understanding clearly using accurate scientific terminology and appropriate data presentation.

Year 11			
Topic	**Time Allocated**	**Skills**	**End Points**
Exchange and transport in animals	7 hours	**Using Scientific Terminology and Communication** • Use key terminology accurately (e.g. diffusion, alveoli, erythrocyte, artery, vein, capillary, cardiac output) • Clearly explain structure-function relationships • Present data and explanations using appropriate scientific formats (graphs, tables, diagrams)	Students will be able to explain the need for transport systems in multicellular organisms and describe how exchange surfaces such as alveoli are adapted for efficient diffusion; explain how the structure of blood, blood vessels and the heart relates to their function in the circulatory system; apply mathematical skills to calculate surface area to volume ratios and cardiac output, and interpret physiological data from graphs and charts; plan and carry out investigations into the effects of exercise on heart rate and breathing rate, analysing results and evaluating methods; and communicate their understanding clearly using accurate scientific terminology and appropriate data presentation. Provide your feedback on BizChat
Plant structures and their functions	7 hours	**The Development of Scientific Thinking** • Describe photosynthetic organisms as producers of biomass	Students will be able to describe photosynthesis as an endothermic process by which plants produce biomass and explain how limiting factors such as light intensity,

		• Explain photosynthesis as an endothermic reaction producing glucose and oxygen • Explain how light intensity, temperature and carbon dioxide act as limiting factors • Explain the interaction of limiting factors on the rate of photosynthesis • Apply the inverse square law to explain light intensity and distance • Explain how root hair cells are adapted for absorption • Explain how xylem and phloem are adapted for transport • Explain transpiration and the role of stomata • Describe translocation of sucrose in plants • Explain how environmental factors affect the rate of transpiration	temperature and carbon dioxide interact to affect its rate, including application of the inverse square law; explain how plant structures such as root hair cells, xylem, phloem and stomata are adapted for transport and how processes such as transpiration and translocation occur; apply mathematical skills to calculate rates and interpret graphical data related to photosynthesis and transpiration; plan and carry out investigations into factors affecting photosynthesis and water uptake, analysing results and evaluating methods; and communicate their understanding clearly using accurate scientific terminology and appropriate data presentation.
Animal coordination, control and homeostasis	7 hours	**Using Scientific Terminology and Communication** • Use key terminology accurately (e.g. hormone, endocrine gland, homeostasis, insulin, glucagon, negative feedback) • Clearly explain hormonal control systems and processes • Present explanations and data using appropriate scientific formats	Students will be able to describe how hormones are produced and transported in the endocrine system and explain their roles in processes such as the fight-or-flight response, metabolic rate regulation and the menstrual cycle, including the interactions of key hormones; explain how homeostasis is maintained through hormonal control of blood glucose by insulin and glucagon and describe the causes and management of diabetes; evaluate methods of contraception and the use of reproductive technologies; apply mathematical skills to calculate and interpret BMI and correlations between lifestyle factors and disease; plan and

			carry out investigations such as testing for glucose, analysing and evaluating results; and communicate their understanding clearly using accurate scientific terminology and appropriate data presentation.
Ecology	12 hours	**Analysis and Evaluation** • Interpret ecological data to identify patterns and trends • Analyse relationships between organisms and environmental factors • Evaluate the reliability and limitations of sampling methods • Identify anomalies and suggest improvements • Draw valid, evidence-based conclusions about ecosystems	Students will be able to describe levels of organisation within ecosystems and explain how biotic and abiotic factors, interdependence and species interactions affect communities; carry out fieldwork using quadrats and transects to investigate populations and distribution, applying sampling techniques and analysing data; explain the impact of human activities on ecosystems and evaluate the importance of maintaining biodiversity; describe and explain the cycling of materials including the carbon, water and nitrogen cycles; apply mathematical skills to process and interpret ecological data; and communicate their understanding clearly using accurate scientific terminology and appropriate data presentation.