

Year 9 Biology Curriculum Overview

Topic	Timing	Key knowledge and skills	Progression and links	SEND/ More able	Assessment & recording; factual recall checks
Cell Biology	Autumn term	<p>Students should:</p> <ul style="list-style-type: none"> • Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells • Describe the features of bacterial (prokaryotic) cells • Demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, inc standard form • Recall the structures found in animal and plant (eukaryotic) cells inc algal cells • Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures • Required practical 1: use a light microscope to observe, draw and label a selection of plant and animal cells. • Describe the functions of the structures in animal and plant (eukaryotic) cells • Describe what a specialised cell is, including examples for plants and animals • Describe what differentiation is, including differences between animals and plants • Define the terms magnification and resolution • Compare electron and light microscopes in terms of their magnification and resolution • Carry out calculations involving magnification using the formula: magnification = size of image/ size of real object -inc standard form • Bio ONLY: Describe how bacteria reproduce and the conditions required • Bio ONLY: Describe how to prepare an uncontaminated culture • Bio ONLY: Calculate cross-sectional areas of colonies or clear areas around colonies using πr^2 • Bio ONLY: Calculate the number of bacteria in a population after a certain time if given the mean division time • Bio & HT ONLY: Express answers for last two points in standard form 	<p>Numeracy</p> <ul style="list-style-type: none"> • Graph drawing • Standard Form • Ratios <p>Literacy</p> <ul style="list-style-type: none"> • Use of tier three words • Extended writing opportunities <p>CEIAG</p> <p>Gatsby 4 - Science and careers in Biomedical science and medical research</p>	<p>Challenge:</p> <ul style="list-style-type: none"> • Conversion between units and/or standard form • Link to A-level specification on organelle structure and function. • Link to A-level specification on the structure of the cell membrane • Ethical consideration of the use of stem cells • Advanced microscopy techniques <p>Scaffold:</p> <ul style="list-style-type: none"> • Pre prepared results tables • Knowledge organisers • Scaffold for extended writing • Prepared slides for microscopy 	<ul style="list-style-type: none"> • 5 questions to start – recall activity every lesson. • Close the gap questions • Self and peer feedback on tasks completed • Structure strip • Past paper exam Qs. • Summative assessment at the end of the unit

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Cell Biology	Autumn term / Spring Term	<ul style="list-style-type: none"> • Required practical 2: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition • Describe the process of diffusion, including examples • Explain how diffusion is affected by different factors • Define and explain "surface area to volume ratio", and how this relates to single-celled and multicellular organisms (inc calculations) • Explain how the effectiveness of an exchange surface can be increased, inc examples of adaptations for small intestines, lungs, gills roots & leaves • Describe the process of osmosis (inc calculation of water uptake & percentage gain and loss of mass of plant tissue) • Required practical 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue • Describe the process of active transport, Including examples - gut and roots • Explain the differences between diffusion, osmosis and active transport • Describe how genetic information is stored in the nucleus of a cell (inc genes & chromosomes) • Describe the processes that happen during the cell cycle, including mitosis (inc recognise and describe where mitosis occurs) • Describe stem cells, including sources of stem cells in plants and animals and their roles • Describe the use of stem cells in the production of plant clones and therapeutic cloning • Discuss the potential risks, benefits and issues with using stem cells in medical research/treatments (inc diabetes and paralysis) 			

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Organisation/ Animal Tissues and the Digestive System	Spring/ Summer Term	<p>Students should:</p> <ul style="list-style-type: none"> • Be able to develop an understanding of size and scale in relation to cells, tissues, organs and systems. • Know that the digestive system is an example of an organ system in which several organs work together to digest and absorb food. • Be able to relate knowledge of enzymes to Metabolism. • Be able to describe the nature of enzyme molecules and relate their activity to temperature and pH changes. • Be able to carry out rate calculations for chemical reactions. • Know that enzymes catalyse specific reactions in living organisms due to the shape of their active site. • Be able to use the 'lock and key theory' as a simplified model to explain enzyme action. • Be able to recall the sites of production and the action of amylase, proteases and lipases. • Be able to understand simple word equations but no chemical symbol equations are required. • Know that digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream. • Know that carbohydrases break down carbohydrates to simple sugars. • Know that amylase is a carbohydrase which breaks down starch. • Know that proteases break down proteins to amino acids. Lipases break down lipids (fats) to glycerol and fatty acids. • Know that the products of digestion are used to build new carbohydrates, lipids and proteins. Some glucose is used in respiration. 	<p>Numeracy</p> <ul style="list-style-type: none"> • Graph drawing • Data interpretation <p>Literacy</p> <ul style="list-style-type: none"> • Use of tier three words • Extended writing opportunities <p>CEIAG</p> <p>Gatsby 4 - Science and careers Careers in medicine, care, nutrition and laboratory studies.</p>	<p>Challenge:</p> <ul style="list-style-type: none"> • Explain why groups of cells work together to form tissues • Explore the impact of lifestyle choice on cardiovascular health • Conversation of seconds to minutes during data analysis. <p>Scaffold:</p> <ul style="list-style-type: none"> • Pre prepared results tables • Knowledge organisers • Scaffold for extended writing 	<ul style="list-style-type: none"> • Required practical investigations into: enzymes, heart dissection, blood microscopy, counting stomata (stomata peel), conducting food tests. • 5 questions to start – recall activity every lesson. • Close the gap questions • Self and peer feedback on tasks completed • Structure strip • Past paper exam Qs. • Summative assessment at the end of the unit

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Organisation/ Animal Tissues and the Digestive System	Spring/ Summer Term	<ul style="list-style-type: none"> • Know that bile is made in the liver and stored in the gall bladder. It is alkaline to neutralise hydrochloric acid from the stomach. It also emulsifies fat to form small droplets which increases the surface area. The alkaline conditions and large surface area increase the rate of fat breakdown by lipase. • Know the structure and functioning of the human heart and lungs, including how lungs are adapted for gaseous exchange. • Know that the heart is an organ that pumps blood around the body in a double circulatory system. • Know that the right ventricle pumps blood to the lungs where gas exchange takes place. • Know that the left ventricle pumps blood around the rest of the body. Knowledge of the blood vessels associated with the heart is limited to the aorta, vena cava, pulmonary artery, pulmonary vein and coronary arteries. • Knowledge of the lungs is restricted to the trachea, bronchi, alveoli and the capillary network surrounding the alveoli. • Know that the natural resting heart rate is controlled by a group of cells located in the right atrium that act as a pacemaker. • Know that artificial pacemakers are electrical devices used to correct irregularities in the heart rate. • Know that the body contains three different types of blood vessel: Arteries, veins and capillaries. • Be able to explain how the structure of these vessels relates to their functions • Be able to use simple compound measures such as rate and carry out rate calculations for blood flow 			

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Organisation/ Animal Tissues and the Digestive System	Spring/ Summer Term	<ul style="list-style-type: none"> • Know that blood is a tissue consisting of plasma, in which the red blood cells, white blood cells and platelets are suspended. • Know the functions of each of these blood components. • Be able to recognise different types of blood cells in a photograph or diagram, and explain how they are adapted to their functions. • Be able to evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs, mechanical devices or transplant. • Know that in coronary heart disease layers of fatty material build up inside the coronary arteries, narrowing them. This reduces the flow of blood through the coronary arteries, resulting in a lack of oxygen for the heart muscle. • Know that stents are used to keep the coronary arteries open. • Know that statins are widely used to reduce blood cholesterol levels which slows down the rate of fatty material deposit. • Know that in some people heart valves may become faulty, preventing the valve from opening fully, or the heart valve might develop a leak. • Understand the consequences of faulty valves. Faulty heart valves can be replaced using biological or mechanical valves. • Know that in the case of heart failure a donor heart, or heart and lungs can be transplanted. • Know that artificial hearts are occasionally used to keep patients alive whilst waiting for a heart transplant, or to allow the heart to rest as an aid to recovery. • Be able to describe the relationship between health and disease and the interactions between different types of disease. • Know that health is the state of physical and mental well-being. • Know that diseases, both communicable and non-communicable, are major causes of ill health. Other factors including diet, stress and life situations may have a profound effect on both physical and mental health. • Know that different types of disease may interact. • Defects in the immune system mean that an individual is more likely to suffer from infectious diseases. • Viruses living in cells can be the trigger for cancers. • Immune reactions initially caused by a pathogen can trigger allergies such as skin rashes and asthma. 			

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Organisation/ Animal Tissues and the Digestive System	Spring/ Summer Term	<ul style="list-style-type: none"> • Severe physical ill health can lead to depression and other mental illness. • Be able to translate disease incidence information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables. • Understand the principles of sampling as applied to scientific data, including epidemiological data • Be able to discuss the human and financial cost of these non-communicable diseases to an individual, a local community, a nation or globally • Be able to explain the effect of lifestyle factors including diet, alcohol and smoking on the incidence of non-communicable diseases at local, national and global levels • Know that risk factors are linked to an increased rate of a disease. They can be: aspects of a person’s lifestyle, substances in the person’s body or environment. A causal mechanism has been proven for some risk factors, but not in others. • The effects of diet, smoking and exercise on cardiovascular disease. • Obesity as a risk factor for Type 2 diabetes. • The effect of alcohol on the liver and brain function. • The effect of smoking on lung disease and lung cancer. • The effects of smoking and alcohol on unborn babies. • Carcinogens, including ionising radiation, as risk factors in cancer. • Know that many diseases are caused by the interaction of a number of factors • Be able to understand the principles of sampling as applied to scientific data in terms of risk factors. • Be able to translate information between graphical and numerical forms; and extract and interpret information from charts, graphs and tables in terms of risk factors. • Be able to use a scatter diagram to identify a correlation between two variables in terms of risk factors. 			

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Organisation/ Animal Tissues and the Digestive System	Spring/ Summer Term	<ul style="list-style-type: none"> • Be able to describe cancer as the result of changes in cells that lead to uncontrolled growth and division. • Know that benign tumours are growths of abnormal cells which are contained in one area, usually within a membrane. They do not invade other parts of the body. • Know that malignant tumour cells are cancers. They invade neighbouring tissues and spread to different parts of the body in the blood where they form secondary tumours. • Scientists have identified lifestyle risk factors for various types of cancer. • Know that there are also genetic risk factors for some cancers. • Be able to explain how the structures of plant tissues are related to their functions. • Know that plant tissues include: epidermal tissues, palisade mesophyll, spongy mesophyll, xylem and phloem, meristem tissue found at the growing tips of shoots and roots. • Know that the leaf is a plant organ. • Be able to explain how the structure of root hair cells, xylem and phloem are adapted to their functions. • Be able to explain the effect of changing temperature, humidity, air movement and light intensity on the rate of transpiration. • Be able to understand and use simple compound measures such as the rate of transpiration. • Be able to: translate information between graphical and numerical form, plot and draw appropriate graphs, selecting appropriate scales for axes, extract and interpret information from graphs, charts and tables. • Know that the roots, stem and leaves form a plant organ system for transport of substances around the plant. • Be able to describe the process of transpiration and translocation, including the structure and function of the stomata. • Know that root hair cells are adapted for the efficient uptake of water by osmosis, and mineral ions by active transport. • Know that xylem tissue transports water and mineral ions from the roots to the stems and leaves. It is composed of hollow tubes strengthened by lignin adapted for the transport of water in the transpiration stream. • Know the role of stomata and guard cells are to control gas exchange and water loss. • Know that phloem tissue transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage. • Know that the movement of food molecules through phloem tissue is called translocation. • Know that phloem is composed of tubes of elongated cells. • Know that cell sap can move from one phloem cell to the next through pores in the end walls. 			