West Kirby Grammar School

Curriculum Map – Year 10 – Biology (23-24)

Topic Name	Term	Skills Developed	Link to NC Subject Content	Next link in curriculum	Other Notes
4.1 Cell biology	Autumn	**4.1.1 Cell structure** Use prefixes centi, milli, micro and nano. Use of standard form. Recognise, draw and interpret images of cells. Images of cells in videos, bioviewers, photographs and micrographs can be used as comparison for students own drawings. **Required practical activity 1:** use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included. AT skills covered by this practical activity: AT 1 and 7. **4.1.2 Cell division** Use models and analogies to develop explanations of how cells divide. Evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments. **4.1.3 Transport in cells** Recognise, draw and interpret diagrams that model diffusion. Use of isotonic drinks and high energy drinks in sport. Recognise, draw and interpret diagrams that model osmosis. Students should be able to: • use simple compound measures of rate of water uptake • use percentages • calculate percentage gain and loss of mass of plant tissue. Students should be able to plot, draw and interpret appropriate graphs. **Required practical activity 3:** investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. AT skills covered by this practical activity: AT 1, 3 and 5.	• 4.1.1 Cell structure • 4.1.2 Cell division • 4.1.3 Transport in cells Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells 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 at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells.	KS5 AQA A-level Biology 3.2 Cells 3.2.1 Cell structure 3.2.3 Transport across cell membranes 3.2.2 All cells arise from other cells	**Links from KS3:** KS3 Y7 – Cells, Tissues and Organs **Links with KS4 topics:** 4.1.3.3 Active transport - There are links with this content to Cell specialisation.

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4.2 Organisation	Autumn	**4.2.1 Principles of organisation** Understand size and scale in relation to cells, tissues, organs and systems. **4.2.2 Animal tissues, organs and organ systems** Rate calculations for chemical reactions. Use other models to explain enzyme action. **Required practical activity 4:** use qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein. **Required practical activity 5:** investigate the effect of pH on the rate of reaction of amylase enzyme. Students should use a continuous sampling technique to determine the time taken to completely digest a starch solution at a range of pH values. Iodine reagent is to be used to test for starch every 30 seconds. Temperature must be controlled by use of a water bath or electric heater. Use simple compound measures such as rate and carry out rate calculations for blood flow. Observe and draw blood cells seen under a microscope. Recognise different types of blood cells in a photograph or diagram and explain how they are adapted to their functions. Evaluate risks related to use of blood products. Evaluate methods of treatment bearing in mind the benefits and risks associated with the treatment. 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,	• 4.2.1 Principles of organisation • 4.2.2 Animal tissues, organs and organ systems • 4.2.3 Plant tissues, organs and systems In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water	KS5 AQA A-level Biology 3.1 Biological molecules 3.1.4 Proteins 3.3 Organisms exchange substances with their environment 3.3.3 Digestion and absorption 3.3.2 Gas exchange (plant tissues & interpreting data on disease link) 3.3.4 Mass transport 3.3.4.1 Mass transport in animals 3.3.4.2 Mass transport in	**Links from KS3:** KS3 Y7 – Cells, Tissues and Organs KS3 Y8 – Photosynthesis KS3 Y9 – Health and disease

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		including epidemiological data. Students should be able to: • discuss the human and financial cost of these non-communicable diseases to an individual, a local community, a nation or globally • explain the effect of lifestyle factors including diet, alcohol and smoking on the incidence of non-communicable diseases at local, national and global levels Interpret data about risk factors for specified diseases. Understand the principles of sampling as applied to scientific data in terms of risk factors. Use a scatter diagram to identify a correlation between two variables in terms of risk factors. **4.2.3 Plant tissues, organs and systems** Observe and draw a transverse section of leaf. Measure the rate of transpiration by the uptake of water. Investigate the distribution of stomata and guard cells. Process data from investigations involving stomata and transpiration rates to find arithmetic means, understand the principles of sampling and calculate surface areas and volumes. Students should 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.	and carbon dioxide that they need for photosynthesis.	plants	

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4.3 Infection and response	Spring	**4.3.1 Communicable diseases** Evaluate the global use of vaccination in the prevention of disease. Explain the use of antibiotics and other medicines in treating disease. Understand that the results of testing and trials are published only after scrutiny by peer review. **4.3.2 Monoclonal antibodies (biology only) (HT only)** Appreciate the power of monoclonal antibodies and consider any ethical issues. Evaluate the advantages and disadvantages of monoclonal antibodies. **4.3.3 Plant disease (biology only)** The everyday application of scientific knowledge to detect and identify plant disease. The understanding of ion deficiencies allows horticulturists to provide optimum conditions for plants. **Required practical activity 2:** investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition. Calculate cross-sectional areas of colonies or clear areas around colonies using πr^2. Calculate the number of bacteria in a population after a certain time if given the mean division time. Express the answer in standard form.	• 4.3.1 Communicable diseases • 4.3.2 Monoclonal antibodies (biology only) (HT only) • 4.3.3 Plant disease (biology only) Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics.	KS5 AQA A-level Biology 3.2 Cells 3.2.4 Cell recognition and the immune system	**Links from KS3:** KS3 Y7 – Cells, Tissues and Organs (specialised cells – WBC only) **Links with KS4 topics:** There are links with this content to Culturing microorganisms (biology only). There are links with this content to Resistant bacteria. There are links with this content to Adaptations.

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4.4 Bioenergetics	Summer	**4.4.1 Photosynthesis** Describe photosynthesis as an endothermic reaction in which energy is transferred from the environment to the chloroplasts by light. Solve simple algebraic equations. measure and calculate rates of photosynthesis •extract and interpret graphs of photosynthesis rate involving onelimiting factor • plot and draw appropriate graphs selecting appropriate scale for axes • translate information between graphical and numeric form. (HT only) Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses. (HT only) understand and use inverse proportion – the inverse square law and light intensity in the context of photosynthesis. (HT only) Limiting factors are important in the economics of enhancing the conditions in greenhouses to gain the maximum rate of photosynthesis while still maintaining profit. **Required practical activity 6:** investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism	• 4.4.1 Photosynthesis • 4.4.2 Respiration In this section we will explore how plants harness the Sun's energy in photosynthesis in order 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 to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue.	**KS5 AQA A-level Biology** 3.5 Energy transfers in and between organisms 3.5.1 Photosynthesis 3.5.2 Respiration	**Links from KS3:** KS3 Y8-Photosynthesis KS3 Y8-Respiration

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		such as pondweed. Tests to identify starch, glucose and proteins using simple qualitative reagents. **4.4.2 Respiration** Investigations into the effect of exercise on the body.			