Year 10 Biology – Cell Biology

West Kirby Grammar School

Learning about this topic is important because: 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.

This builds on: Your knowledge of cells from Y7 'Cells, tissues & organs' and from Y9 'Cells and microscopes'.

This leads to: Key principles studied in this unit will underpin studies throughout GCSE biology, building on these ideas in unit 2 'organisation', cell differentiation in unit 3 'infection and response', where you will explore the role of white blood cells in the immune system. Knowledge of plant cells and their adaptations will link to the study of photosynthesis in the 'bioenergetics' unit, and role of sub-cellular structures is required for studying respiration, also part of the 'bioenergetic' unit. Work on the cell cycle and stems cells will be built upon in the 'inheritance, variation and evolution' unit of work in Y11. Further studies at A-level include links to cell biology.

We will learn:

- Cell structure and the difference between prokaryotic and eukaryotic cells
- Cell specialisation and differentiation
- Microscopy techniques including required practical 1: use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included.
- Cell division – mitosis, the cell cycle and stem cells
- Transport in cells – diffusion, osmosis and active transport including required practical 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.

We will develop/practise skills including:

- Practical skills – use of a light microscope and osmosis investigation, covering GCSE apparatus and technique skills:
  - Use of appropriate apparatus to make and record a range of measurements accurately, including length.
  - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
  - Measurement of rates of reaction.
  - Use of appropriate apparatus, techniques, and magnification, including microscopes, to make observations of biological specimens and produce labelled scientific drawings.
- Evaluate risks – complete risk assessments for practical work
- Make predictions using scientific knowledge and understanding
- Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience.
- Make and record observations and measurements using appropriate methods, including tables and graphs

Year 10 Biology – Cell Biology

	• Explaining data, using specific terminology confidently, in relation to predictions and hypotheses
	• Extended writing – Research and evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments. Learn how to reference.
	• Mathematical skills –
	  o Use prefixes centi, milli, micro and nano. Use of standard form
	  o use simple compound measures of rate of water uptake
	  o use percentages
	  o calculate percentage gain and loss of mass of plant tissue.
	  o carry out calculations involving magnification,
	• Creating – Use models and analogies to develop explanations of how cells divide. Recognise, draw and interpret diagrams that model diffusion. Recognise, draw and interpret diagrams that model osmosis.
	• Analysing data
	• Linking concepts and ideas

Some of the vocabulary that we will use includes: Eukaryotic, prokaryotic, differentiation, specialisation, stem cells, mitosis, chromosomes, replicate, cell cycle, diffusion, osmosis, hypertonic, hypotonic, isotonic, active transport	You could learn more about this topic by: Read: https://www.medicalnewstoday.com/articles/323343#controversy https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF (section 4.1 Cell Biology – use this as the basis for revision) Watch: https://www.youtube.com/watch?v=qHkUOlC8Nbo https://www.youtube.com/watch?v=RHyZVmbiA78 https://www.youtube.com/watch?v=LNLz7mswPkQ https://www.youtube.com/watch?v=fp5H3SslskQ (you can continue to watch all the Cognito videos for this unit) Listen: https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/ https://www.listennotes.com/podcasts/revise-a-level-and/gcse-biology-types-of-cells-OURIHQkShIJ/
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: • HOME LEARNING: Evaluate the use of light Vs electron microscopes, you must consider the differences in magnification & resolution. Explain how electron microscopy has increased our understanding of sub-cellular structures. Reference sources and include a bibliography. Teacher assessed. • TASK: Extended response examination question, transport in cells. Teacher assessed. • TASK: Required practical 3: results table, graph, and conclusion. Teacher assessed. • End of topic assessment. This is teacher assessed.	

Year 10 Biology – Organisation

West Kirby Grammar School

Learning about this topic is important because: The digestive system plays an important role in the digestion and absorption of nutrients, the circulatory system is involved in the transportation of nutrients, and uptake allows assimilation into the biological molecules required to sustain life. 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 the importance of plant transport systems and the dependence on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.

This builds on: Your knowledge of cells and the digestive system from Y7 'Cells, tissues & organs', digestive health and absorption from Y8 'Respiration, breathing and movement' and from Y9 'Cells and microscopes'.

This leads to: Key principles studied in this unit will be built on in unit 3 'infection and response', where you will explore the role of white blood cells in the immune system. Knowledge of plant tissues and their adaptations will link to the study of photosynthesis in the 'bioenergetics' unit. The role of glands will be explored further in Y11 in the 'Homeostasis and response' unit of work. Further studies at A-level include links to biological molecules, exchange surfaces and mass transport.

We will learn:

- The principles of organisation
- The digestive system – how organs work together to digest and absorb food
- How enzymes work so catalyse specific reactions in living organisms, including required practical activities 4 & 5; use qualitative reagents to test for a range of carbohydrates, lipids and proteins, and an investigation into the effect of pH on the rate of reaction of amylase enzyme
- The circulatory system – the role of the heart, including a heart dissection (optional), blood vessels and the blood
- The impact of lifestyle and risk factors on the incidence of coronary heart disease (CHD) and other health issues associated with non-communicable diseases
- Advantages and disadvantages of treatments of CHD.
- The structure of plant tissues, organs and systems, the role of a variety of plant tissues, including the role of the xylem vessel in transpiration and phloem vessel in translocation

We will develop/practise skills including:

- Practical skills – use of qualitative reagents and enzyme investigation, covering GCSE apparatus and technique skills:
  - Use of appropriate apparatus to make and record a range of measurements accurately, including time, temperature, and pH.
  - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
  - Measurement of rates of reaction – measure the rate of transpiration
  - Use of appropriate techniques and qualitative reagents to identify biological molecules
  - Use of appropriate apparatus, techniques and magnification, including microscopes, to make observations of biological specimens – observe and draw blood cells / draw a transverse section of a leaf
- Evaluate risks – complete risk assessments for practical work / evaluate risks related to the use of blood products / evaluate the methods of treatment for CHD
- Make predictions using scientific knowledge and understanding
- Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience.

Year 10 Biology – Organisation

West Kirby Grammar School

	• Make and record observations and measurements using appropriate methods, including tables and graphs
	• Explaining data, using specific terminology confidently, in relation to predictions and hypotheses – interpret data about risk factors for specific diseases
	• Mathematical skills –
	  o Recognise and use expressions in decimal form
	  o Use ratios, fractions and percentages
	  o Construct and interpret frequency tables and diagrams, bar charts and histograms
	  o Use a scatter diagram to identify a correlation between two variables
	  o Translate information between graphical and numeric form
	• Creating – Use models to explain enzyme action
	• Analysing data
	• Linking concepts and ideas

Some of the vocabulary that we will use includes: Cells, tissues, organs, oesophagus, stomach, liver, gall bladder, bile, pancreas, small intestine, large intestine, glands, enzyme, lock and key, amylase, protease, lipase, Benedict's, biuret, iodine, arteries, veins, capillary, ventricle, atrium, vena cava, pulmonary artery, pulmonary vein, aorta, red blood cell, white blood cell, platelets, plasma, coronary heart disease	You could learn more about this topic by: Read: https://www.insidescience.org/news/whats-stopping-scientists-making-viable-synthetic-blood https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF (section 4.2 Organisation – use this as the basis for revision) https://www.bbc.co.uk/bitesize/tags/z4x3y9q/jobs-that-use-biology/1 Watch: https://www.youtube.com/watch?v=MB6mE6weCS4 https://www.youtube.com/watch?v=vMI46qGQMDw https://www.youtube.com/watch?v=zU90AkcTJEs (you can continue to watch all the Cognito videos for this unit) Listen: https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/ https://www.listennotes.com/bn/podcasts/the-science-break/18-aqa-gcse-biology-coronary-aEV7li35tul/
Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are: • HOME LEARNING: Heart dissection risk assessment. Reference sources and include a bibliography. Teacher assessed. • TASK: Required practical 5: identification of variables, results table, graph, and conclusion. Teacher assessed. • TASK: Transpiration – data handling sheet. Teacher assessed. • End of topic assessment. This is teacher assessed.	

Year 10 Biology – Infection and response

Learning about this topic is important because: The study of immunology is **critical to human and animal health and survival**. It is at the cutting edge of medical science and has led to some key healthcare advances of recent times, including vaccination and cancer immunotherapy. It is important to understand how pathogens such as viruses and bacteria cause infectious diseases in animals and plants 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. When at risk from unusual or dangerous diseases our body's natural system can be enhanced using 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.

This builds on: Your knowledge of cells from Y7 'Cells, tissues & organs', and Y9 'Cells and microscopes'.

This leads to: The study of 'Inheritance, variation and evolution' in Y11, where you will look at the development of antibiotic resistance as evidence for evolution. Further studies at A-level include links to cell biology and cell recognition and the immune system.

We will learn:

- That pathogens are microorganisms that cause disease and how pathogens, such a viruses and bacteria cause disease, in plants and animals
- How specific communicable diseases (measles, HIV, TMV, *Salmonella*, gonorrhoea, rose black spot and malaria) are transmitted, their symptoms, treatments, and prevention
- How the human defence system defends against the entry of microorganisms
- How the immune system defends against disease, including the role of white blood cells
- How vaccination prevents illness and how the spread of pathogens can be reduced by immunising a large proportion of the population
- That antibiotics are used to treat bacterial infections, including required practical activity 2: investigate the effect of antibiotics on bacterial growth using agar plates and measuring zones of inhibition
- How drugs are development and trialled, as well as researching the discovery and origin of drugs
- About the development and use of monoclonal antibodies

We will develop/practise skills including:

- Practical skills – culturing microorganisms and antibiotics investigation, covering GCSE apparatus and technique skills:
  - Use of appropriate apparatus to make and record a range of measurements accurately, including length, area and volume of liquids.
  - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
  - Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment
  - Use of appropriate techniques and qualitative reagents to identify biological molecules and processes in more complex and problem-solving contexts including continuous sampling in an investigation
- Evaluate risks – complete risk assessments for practical work / evaluate the global use of vaccination in the prevention of disease / evaluate the advantages and disadvantages of monoclonal antibodies
- Make predictions using scientific knowledge and understanding
- Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
- Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience. Question ethical issues associated with the use of monoclonal antibodies
- Make and record observations and measurements using appropriate methods, including tables and graphs – using observations to diagnose plant disease and ion deficiencies

Year 10 Biology – Infection and response

	• Explaining data, using specific terminology confidently, in relation to predictions and hypotheses – interpret data about risk factors for specific diseases
	• Mathematical skills –
	  o Calculate cross-sectional areas of bacterial colonies
	  o Recognise and use expressions in decimal form
	  o Use an appropriate number of significant figures
	  o Make order of magnitude calculations
	  o Recognise and use expressions in standard form
	• Analysing data – understand that the results of testing and trials are published only after scrutiny by peer review
	• Linking concepts and ideas

Some of the vocabulary that we will use includes: Pathogen, microorganism, bacteria, virus, fungi, protist, white blood cell, phagocytosis, lymphocyte, antibody, antitoxin, vaccination, antibiotics, inhibition, monoclonal antibodies	You could learn more about this topic by: Read: https://www.bbc.co.uk/bitesize/guides/zgh96yc/revision/4 https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF (section 4.3 Infection and response – use this as the basis for revision) Watch: https://www.youtube.com/watch?v=dbd5iydu3EY https://www.youtube.com/watch?v=63XExOKWrqg Listen: https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/ https://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/targeted-cancer-drugs/types/monoclonal-antibodies

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

- HOME LEARNING: Extended response role of white blood cells examination question. Teacher assessed.
- TASK: Required practical 2: calculation of cross-sectional area, graph, and conclusion / evaluation. Teacher assessed.
- TASK: Production of monoclonal antibodies examination questions. Teacher assessed.
- End of topic assessment. This is teacher assessed.

Year 10 Biology – Bioenergetics

West Kirby Grammar School

Learning about this topic is important because: Photosynthesis is arguably the most important biological process on earth. 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.

This builds on: Your knowledge of cells from Y7 'Cells, tissues & organs', Y8 'Photosynthesis', Y8 'Respiration, breathing and movement', Y9 'Cells and microscopes' and Y10 'Cell biology'. Building on the knowledge of structure and function of specialised cells and tissues, as well as knowledge of photosynthesis and respiration from Y8.

This leads to: Studying ecology in Y11, where an appreciation and understanding of plants as producers is essential, as well as the knowledge of photosynthesis in the balance of atmospheric gases, linking to the delicate balance of the carbon cycle. Further studies at A-level include links to energy transfers in and between organisms, photosynthesis, and respiration, where the biochemistry of the reactions is studied in more detail.

We will learn:

- The word and symbol equation for photosynthesis and that it is an endothermic reaction
- Photosynthesis is affected by temperature, light intensity, carbon dioxide concentration and the amount of chlorophyll, including require practical activity 6: investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.
- The uses of glucose produced in photosynthesis, including practical work with qualitative reagents – testing a leaf for starch
- The word and symbol equation for aerobic respiration, and the word equation for anaerobic respiration in muscles and yeast
- How the body responds to exercise, including the principle of oxygen debt
- The importance of metabolic reactions in the synthesis and breakdown of biological molecules, and be able to provide examples

We will develop/practise skills including:

- Practical skills – testing a leaf for starch and light intensity and photosynthesis investigation, covering GCSE apparatus and technique skills:
  - Use of appropriate apparatus to make and record a range of measurements accurately, including length, time, volume of liquids and gases
  - Safe use of appropriate heating devices and techniques including use of a Bunsen burner and a water bath or electric heater
  - Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes
  - Safe and ethical use of living organisms (plants or animals) to measure physiological functions and responses to the environment
  - Measurement of rates of reaction by a variety of methods including production of gas
  - Use of appropriate techniques and qualitative reagents to identify biological molecules
- Evaluate risks – complete risk assessments for practical work
- Make predictions using scientific knowledge and understanding
- Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate – investigate the effect of exercise on the body
- Curiosity - ask questions and develop a line of enquiry based on observations of the real world alongside prior knowledge and experience.

Year 10 Biology – Bioenergetics

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Make and record observations and measurements using appropriate methods, including tables and graphs
Explaining data, using specific terminology confidently, in relation to predictions and hypotheses
Mathematical skills –

Measure and calculate rates of photosynthesis
Recognise and use expressions in decimal form
Use ratios, fractions, and percentages
Construct and interpret frequency tables and diagrams, bar charts and histograms
Translate information between graphical and numeric form
Plot two variables from experimental or other data

Analysing data – relate limiting factors to the cost of effectiveness of adding heat, light or carbon dioxide to greenhouses.
Linking concepts and ideas

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<tr><td>Some of the vocabulary that we will use includes:
Photosynthesis, endothermic, exothermic, glucose, chlorophyll, limiting factors, iodine, aerobic respiration, anaerobic respiration, lactic acid, oxygen debt, metabolism</td><td>You could learn more about this topic by:
Read: https://www.bbc.co.uk/bitesize/guides/zg8nrwx/revision/1
https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF (section 4.4 Bioenergetics – use this as the basis for revision)
Watch: https://www.youtube.com/watch?v=_hefhfxpECI
Listen: https://senecalearning.com/en-GB/blog/biology-gcse-podcasts-by-seneca/
https://podcasts.ox.ac.uk/photosynthesis-nature</td></tr>
<tr><td colspan="2">Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The key pieces of work in this topic are:

HOME LEARNING: Conclusion to testing a variegated leaf for starch. Teacher assessed.
TASK: Required practical 6: extended response examination question. Teacher assessed.
TASK: Aerobic and anaerobic respiration examination questions. Teacher assessed.
End of topic assessment. This is teacher assessed.

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