Unit 1: Principles and Applications of Biology

Unit overview

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| Principles and Applications of Biology | |
| **Assessment type: External** | |
| **Content Area** | **Topics** |
| A1 Structure and function of cells and tissues | A1 Structure and function of cells and tissues  A2 Structure and function of specialised cells in multicellular organisms  A3 Structure and function of biological tissues |
| B: Structure and function of biological molecules | B1 Structure and function of water  B2 Structure and function of carbohydrates  B3 Structure and function of proteins  B4 Structure and function of nucleic acids  B5 Structure and function of lipids |
| C: Cellular transport and enzyme activity | C1 Cell transport mechanisms  C2 Enzymes as biological catalysts  C3 Homeostasis |
| Assessment overview  The unit will be assessed through one examination of 50 marks lasting 1 hour.  The paper will include a range of question types, including multiple choice, calculations,  short answer and extended open response. These question types will assess knowledge  and understanding of the content in this unit. Students will need to explore and relate to  contexts and data presented.  The assessment availability is twice a year in January (starting in 2027) and May/June. The first assessment availability is May/June 2026.  Sample assessment materials will be available to help centres prepare students for  assessment | |

Common student misconceptions

Below are some common misconceptions related to the content of this unit by students and ideas for how you can help your learners to avoid and overcome these.

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| What is the misconception? | How to help learners overcome it |

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| All cells are the same, except for their function | Highlight the differences in cell structure and how that enables its specific function. |
| Respiration and breathing are the same | Respiration is a chemical reaction that transfers energy in cells, while breathing is the process of moving air into and out of the lungs. Plants respire, but they don't have lungs, so they don't breathe. |
| All bacteria are pathogenic | We need healthy gut flora.  Our skin is covered in millions of bacteria (fungi and viruses), but these are essential in the protection against pathogens. |
| Proteins are only for building muscles | Match the protein to the function, e.g. enzymes, hormones, haemoglobin, etc to explain the range of functions.  Highlight the different proteins involved in the biological processes throughout the unit. |
| Active transport and facilitated diffusion are the same | Give full definitions of both processes and which molecules are transported through the cell membrane by each process. |
| Concentration gradients only affect active transport | Discuss concentration gradients with the definition of different types of cell transport- In active transport, the molecules move against the concentration gradient whereas in passive transport, the molecules move along the concentration gradient. |

Learning Activities and Resources

This section offers a starting point for delivering the unit by outlining a logical sequence through the unit topics and suggesting practical activities and teacher guidance for covering the main areas of content during guided learning time. Transferable skills are integrated into various activities, with those embedded in a unit indicated by an acronym in square brackets. The acronym combines the letters from the broad skill area and the specific transferable skill, e.g., **[IS-WC]**.

Please note that the activities provided below are suggestions and not mandatory.

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| Learning Topic | Activities and guidance for unit content delivery | Resources |
| A: Structure and function of cells and tissues | | |
| A1 Structure and function of cells and tissues | * Whole class teaching and learning - Introduction   Make jelly cells to illustrate subcellular structures of eukaryotic cells using different types of sweets as organelles for both plant and animal cells to distinguish specific structures.   * Small group activity –Similarities and differences between animal and plant cells * Groups will produce a card game or board game based on the similarities and differences between the structure and function of plant cells and animal cells. * Students could create a pair matching game, where the cards contain the names of the organelles and definitions, turning two cards over to make a match. * Whole class and individual activity – identifying different cell organelles * Provide students with high-resolution diagrams or electron micrographs of both animal and plant cells to label the organelles in each diagram and write a brief description of their functions. * Task students with creating Venn diagram to visually organise the similarities and differences between animal and plant cells. Include aspects such as: * cell structure * organelles * functions * cell type * Laboratory Activity – Using a microscope and preparing slides * Students will use a microscope and examine prepared slides of animal (e.g. cheek cells stained with methyl blue) and plant cells (e.g. onion skin cells stained with iodine). * Students to complete annotated drawings * Students can calculate the size of cells using ‘I AM’ calculations from direct viewing using an optical microscope, using the microscope eyepiece graticule. * Students can compare their observations to identify similarities and differences. * Whole class and individual activity – Subcellular features of prokaryotes * Provide students with electron micrographs of prokaryotes and ask them to label the subcellar structures * Calculate the size of cells using ‘I AM’ calculations from the images of electron micrographs, carrying out the relevant conversions * Individual activity – Knowledge check * Consolidate student learning by testing their knowledge of key terminology relevant to cell structure using interactive quiz tools such as Quizizz, Quizlet, Kahoot, or similar and providing a glossary of key terms. | stem.org – This website contains a library of resources, which can be used as an introduction to cell organelles. <https://www.stem.org.uk/resources/elibrary/resource/34589/cell-suitable-home-teaching>  Wordwall – virtual cell organelle matching game  [Cell Organelle Matching Game - Find the match](https://wordwall.net/resource/5544211/biology/cell-organelle-matching-game)  Histology Guide – Examples of TEM cell structures  [The Cell | Histology Guide](https://histologyguide.com/EM-atlas/01-introduction.html)  STEM Learning – cheek cell practical methodology sheet  [| STEM](https://www.stem.org.uk/resources/elibrary/resource/417532/cheeky-cells#:~:text=In%20this%20activity%2C%20students%20look%20at%20cheek%20cells,a%20slide%2C%20staining%20a%20sample%20and%20making%20observations.)  IB Guides – Prokaryotic cells electron micrographs  [IB Biology Notes - 2.2 Prokaryotic cells](https://ibguides.com/biology/notes/2.2-prokaryotic-cells/)  Quizlet – Cell structure  [Cell Structure Flashcards | Quizlet](https://quizlet.com/57013/cell-structure-flash-cards/) |
| A2 Structure and function of specialised cells in multicellular organisms | * **Whole class teaching and learning - Introduction** * Explain the concept of stem cells * Discuss the differentiation of cells. This can be done using the video resource supplied. * Small group activity – Ethical considerations of stem cells * Provide the class with recent news articles about stem cell research as a stimulus for discussion. * Ethical considerations could be discussed as well as the potential as treatments. * Small group activity – Specialised cell * Each student is given a specialised cell * Students circulate the room asking questions about each cell type and record information. * Students try to guess the specialised cell that each person has been allocated. * Laboratory Activity – Investigating plant tissues * Students dissect a plant and display its parts, including the roots, stem and flower. * For each part the student is to discuss the function and how the cells may be specialised. * Laboratory activity – Investigating transpiration * Students to investigate transpiration in celery * Cut a short piece of celery with the leaves still on * Place it in a few centimetres of food colouring in water. * Leave for a day and then carefully cut into the celery to see where the colour has reached to indicate transpiration. * Whole class teaching and learning – White blood cells * Share with students a video on white blood cell’s structure and function. * Ask students produce a cartoon strip on the action of the different white blood cells when encountering foreign pathogens. * Students could personify different types of white blood cells and through drawings and/or speech bubbles demonstrate their understanding of white blood cells, e.g. a large phagocyte that eats everything it sees. * Whole class and individual activity - Sex cells * Introduce the structure and function of sex cells to students using a video of slide presentation * Ask students to create 3D models of sex cells using modelling clay, paper and other modelling materials to show size and each of the major structures. * Students could produce a stop motion video of fertilisation with the models, which includes the following information. * the tail, * midpiece, * acrosome in the sperm * the zona pellucida * corona radiata in the egg * **Individual activity – knowledge check** * Consolidate student learning by testing their knowledge of key terminology relevant to specialised cells using interactive quiz tools such as Quizizz, Quizlet, Kahoot, or similar and providing a glossary of key terms. | Stem cells video clip – Discussing the concept of stem cells  <https://youtu.be/-uno7Uj2cjk>  Articles on Stem cell use – Stem cell-based therapy for human diseases. <https://www.nature.com/articles/s41392-022-01134-4> ,  Specialised cells – Flash cards on cell types that could be used.  [Flashcards BTEC level 3 Specialised cells | Quizlet](https://quizlet.com/301694108/flashcards?funnelUUID=43048e61-6663-4cd9-b9b2-0174347af422)  Science-sparks – Dissection of a flower  [Plant Science - Dissect a flower and more plant experiments](https://www.science-sparks.com/dissecting-flowers-and-more-plant-experiments/)  Science on the Shelves – How plants transport water activity <https://www.york.ac.uk/res/sots/activities/celery.htm>  DIY Rainbow Roses - Colour changing rose experiment  <https://homegrownfriends.com/home/color-changing-rose-experiment-little-blue-little-yellow-activity/>  What are white blood cells? – Overview video of white blood cell’s structure and function  <https://youtu.be/qWSWWPZYGHU>  Sperm and Egg cells – Introduction to structure and function of sperm and egg cells  <https://youtu.be/CuxaXghfyeE>  Quizlet – Specialised cells  [SPECILISED CELLS Flashcards | Quizlet](https://quizlet.com/gb/794980673/specilised-cells-flash-cards/) |
| A3 Structure and function of biological tissues | * Whole class teaching and learning - Introduction * Recap with the students the concept of cell theory, including the full definitions of * Cell * Tissue * Organ * Organ system * Organism * Whole class teaching and learning activity – anatomy of the lungs * Teacher to demonstrate a pluck to illustrate the microstructure of the lungs and focus on goblet cells, ciliated cells and alveoli * Laboratory activity – epithelial tissue * Individual learners can use prepared microscope slides of squamous cells, goblet cells and ciliated cells can be used to view details. * Students can discuss cell specialism to link into previous topics * Students draw annotated diagrams to reflect the differences and similarities between the two types of tissue. * Small group activity – respiratory and cardiovascular diseases * Allocate students into groups and ask them to research and prepare a slide presentation on respiratory and cardiovascular diseases due to smoking tobacco. * Students can share their presentations with the class in the form of peer teaching. * Laboratory Activity –Structure and function of muscles * Introduction to the concept of gross muscular structure. This could be done using the video resource. * Chicken wing dissection- to explore the structure and function of muscles, bones and joints. * Whole class teaching and learning – Introduction to microscopic muscle structure * Teacher led discussion of the microscopic structure of muscular tissue. The video resource could be used. * Teacher led animation to explain the action of fast and slow twitch muscle fibres. * Students to produce a quick table of comparison summarising the key differences between slow twitch and fast twitch muscle fibres. * Whole class teaching and learning – Introduction to the structure and function of nervous tissue * Teacher led overview of the differences between myelinated and non-myelinated neurones. * Students to use information sheet provided to produce flash cards of key similarities and differences between myelinated and non-myelinated neurones. * Students to peer teach using flash cards produced. * Students to compare graphs of speed of impulse from myelinated and non-myelinated neurones. * Whole class and individual activity – Conduction of a nerve impulse * Using the animation on nerve impulses as stimulus, discuss how a nerve impulse is conducted along an axon. * Students could note down any key terms that are not known and discuss what these may mean. * Students to perform further research and complete a flow chart or animation of the steps involved in nerve impulse through the axon. * Whole class and small group activity – Synaptic transmission * Teacher to introduce the concept of the synapse, this may be done using a video resource. * Students review the structure of the synapse and annotate a suitable diagram. * Students to work in small groups to use modelling clay or other suitable resource to construct a series of snapshots of key events in synaptic transmission. * Students to combine snapshots to create stop animation of the synaptic transmission process. * Small group Activity- The nervous system * Student should research the action of different neurotransmitters at the synapse * Students apply their knowledge of nerve conduction to interpret ECG traces that can be sourced from local hospitals or the internet. * Students should try to identify normal versus abnormal patterns. A normal ECG showcases consistent wave shapes and intervals, indicating a healthy heart rhythm. Deviations from these norms may indicate potential issues, such as arrhythmias or other cardiac abnormalities. * Learners could “diagnose” the patient based on the ECG trace with reasoning. | BBC Bitesize History of the cell <https://bitesizebio.com/166/history-of-cell-biology/>  Pluck dissection - Instructions and a video of a pluck dissection, <https://www.stem.org.uk/resources/elibrary/resource/34598/pluck-dissection>  Examining epithelial tissue under the microscope – key points of epithelial tissue and visualisation under the microscope  [3.1: Examining epithelial tissue under the microscope - Medicine LibreTexts](https://med.libretexts.org/Bookshelves/Anatomy_and_Physiology/Human_Anatomy_Laboratory_Manual_2021/03%3A_Histology/3.01%3A_Examining_epithelial_tissue_under_the_microscope)  NHS Cardiovascular diseases – Students can use websites such as these for information  <https://www.nhs.uk/conditions/cardiovascular-disease/#:~:text=Smoking,and%20narrow%20your%20blood%20vessels>.  Ash Smoking and Respiratory Disease - Students can use websites such as these for information  [Smoking and Respiratory Disease - ASH](https://ash.org.uk/resources/view/smoking-and-respiratory-disease)  Overview of Muscular System – This video provides an overview of the muscular system  <https://youtu.be/rMcg9YzNSEs>  Performing a chicken wing dissection – Instructions and safety information for chicken wing dissection  <https://assist.asta.edu.au/sites/assist.asta.edu.au/files/SOP%20Performing%20a%20chicken%20wing%20dissection.pdf>  Muscles Part 1 – Muscle Cells – Video explaining overview of muscle structure  <https://youtu.be/Ktv-CaOt6UQ>  Types of Skeletal Muscle – This video details different types of muscle fibres  <https://youtu.be/phhnNL_ijqI>  Introduction to Myelinated and Unmyelinated Axons – This webpage gives key similarities and differences of different types of neurones.  [Myelinated And Unmyelinated Axons | Structure, Importance](https://alevelbiology.co.uk/notes/myelinated-and-unmyelinated-axons/#0-introduction-to-myelinated-and-unmyelinated-axons)  Action potential – Video explaining steps in nerve impulse conduction  <https://youtu.be/nV_OEvln9Xs>  The mechanism of nerve impulse transmission – Key points in nerve impulse transmission  [42.2: The Mechanism of Nerve Impulse Transmission - Biology LibreTexts](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Map%3A_Raven_Biology_12th_Edition/42%3A_The_Nervous_System/42.02%3A_The_Mechanism_of_Nerve_Impulse_Transmission)  The nervous system part 3 – Key overview of synapse animation  <https://youtu.be/VitFvNvRIIY>  ECG Trace bank – Life in the fast lane website has a library of ECG traces, <https://litfl.com/ecg-library/>  <https://www.parkinsons.org.uk/> |
| B: Structure and function of biological molecules | | |
| B1 Structure and function of water | * **Whole class teaching and learning/peer teaching – Structure and function of water** * Teacher to discuss the link to chemistry and chemical bonding, this may be done using animations. * Students to prepare 5 minute micro-teach on the structure and function of water to give in groups using chemistry knowledge. * Students to use molymods/ chemical modelling kits to discuss the chemical bonding in water * Laboratory Activity – Investigating the properties of water * Students to carry out a carousel of practical activities to investigate the properties of water. * Students should rotate around the activities at each activity considering the property of water and how this relates to the structure. * Activities include;   - Surface tension with soap and pepper  - Making a paper clip float  - Cohesion of water on a penny  - Polarity of water using food colouring  - Capillary action using a paper towel   * Once students have completed all of the activities they should draw conclusions and discuss the outcomes that they have found and how they relate to the structure of water molecules. | Structure of water -  Video animation of structure and function of water  <https://youtu.be/A88ih2PQDNs>  Testing the properties of water – Practical activity instructions for carousel of properties <https://thehomeschoolscientist.com/testing-the-properties-of-water/> |
| B2 Structure and function of carbohydrates | * Whole class teaching and learning – Introduction to carbohydrates * Teacher led discussion and mind map activity on what students can recall about carbohydrates. * Teacher could use video resource as a stimulus material for further discussion around carbohydrate function and an introduction of structure. * Students can use this information to fill in further information into their mind map. * Small group activity – Structure of carbohydrates * Students to create models of carbohydrates using sweets or other modelling materials. * Students should show the chemical bonding and structures of carbohydrates. * Students could provide a key to indicate which element is presented by the different colours of the sweets should be produced based on the sweets available. * Toothpicks can be used to represent the bonds. A single toothpick represents a single bond, two toothpicks represent a double bond, and three toothpicks represent a triple bond. * Students should show monosaccharides, disaccharides and polysaccharides, with glucose or cellulose as examples. * Laboratory Activity - Testing for carbohydrates * Students could perform a practical activity to test for simple sugars and carbohydrates * Students should test known and unknown samples for the presence of simple sugars and carbohydrates, using Benedict’s solution and iodine * Students can then summarize their findings and relate them to the structures of the different carbohydrates. This could be done using interactive quizzes. | Carbohydrate and sugars biochemistry – Brief video introduction on structure and function of carbohydrates  [Carbohydrates & sugars - biochemistry - YouTube](https://www.youtube.com/watch?v=jQi84TnstI4)  BBC bitesize, Food test practical outlines the practical procedures  <https://www.bbc.co.uk/bitesize/guides/z88hcj6/revision/5>  Biomolecule quizzes – Questions that can be input into interactive quizzes  <https://quizizz.com/admin/quiz/5c9d5baab2e4c6001afc0f9f/biomolecules> |
| B3 Structure and function of proteins | * Whole class and individual activity - Protein Models * Teacher can demonstrate the structure of proteins through modelling using pipe cleaners and coloured beads. * Students can build different proteins using pipe cleaners and coloured beads from amino acids * Students can use the pipe cleaner to form alpha helices, beta strands, and link to different protein structures. * Different colours or shapes of pipe cleaners and beads are great for showing the variety in amino acids. | Hands-on Biochemistry: Practical activity to teach protein structure <https://www.scienceandmathwithmrslau.com/2014/09/hands-on-biochemistry-beads-pipe-cleaners-and-the-clearest-way-to-teach-monomers-and-polymers/> |
| B4 Structure and function of nucleic acids | * Whole class teaching and learning - Introduction * Teacher to lead a discussion around the steps in DNA discovery * Students could discuss the article on Rosalind Franklin’s role and possible controversy over the discover of DNA      * Whole class and individual activity – DNA structure * Use of virtual lab stimulation to visualise the structure of DNA and discuss the different components and bond types. * Students to create annotated drawings of the structure of DNA.          * Whole class and small group activity - DNA model * Students to create a 3D double helix model from moylmods/sweets or from a DNA paper chain * Students should use their models to discuss mutations and the consequences in small groups.      * **Laboratory Activity - Extract DNA from fruit** * Students to perform an experiment highlighting how DNA can be isolated from cells. * Students should consider the purpose of each step of the method, * why is the fruit mashed? * Why is detergent added? * Why is it heated? | Nature: What Rosalind Franklin truly contributed to the discovery of DNA’s structure, <https://www.nature.com/articles/d41586-023-01313-5>    DNA structure - a virtual lab stimulation, <https://www.illumina.com/content/dam/illumina-marketing/apps/dnaday/index.html>        STEM education – Making DNA with sweets <https://www.youtube.com/watch?v=5-f1ja_xn1U>      Experiment: DNA Extraction from Fruit,  Practical procedure steps  <https://www.futurelearn.com/info/courses/biochemistry/0/steps/21618> |
| B5 Structure and function of lipids | * **Whole class teaching and learning - Introduction** * Discussion around lipid structure and function using the video resource as a starting point. * Students to compose a table of the properties of triglyceride, phospholipids, and cholesterol * Students should include in their table which of the following applies to each molecule. * Contains only the elements carbon hydrogen and oxygen * Insoluble in water * Contains glycerol * Contains ester bonds * Important in membrane structure * Contains fatty acids        * Small group activity – Structure of lipids * Students produce paper models of lipids- highlighting key parts, such as; * bonding types * glycerol, * fatty acids, * phosphate groups        * Whole class teaching and learning/ small group activity – Function of lipids * Students to use resource bank to research the following functions of lipids * Students to produce slide deck presentation on key functions. This should include * Energy storage * Insulation – thermal and electrical * Formation of membranes * Protect organs * Source of steroid hormones * Source of vitamin D * Waterproofing * Students use slide presentation to discuss functions and why these may be important.      * Whole class activity – Class discussion about reindeers * Whole class discussion around ‘Why would cells in reindeer hooves have more unsaturated fatty acids in their membranes compared to those found in their upper legs?’ * Students can be given time to prepare their response, using key information previously covered. * Students discuss potential answers and agree on which response they feel is the most correct from those given. * Students may like to consider the following points. * Where would fatty acids be found within a membrane? * What’s the difference between saturated and unsaturated fatty acids? * How does the level of saturation affect the packing ability of the chains? * What’s the difference in environment between the hoof & upper leg of a reindeer?      * **Individual activity – knowledge check** * Consolidate student learning by testing their knowledge of key biological molecules using interactive quiz tools such as Quizizz, Quizlet, Kahoot, or similar and providing a glossary of key terms. | Lipid overview – Short video on structure and function of lipids  <https://youtu.be/Ezp8F7XJHWE>              Using lipids: Lipid paper models and a slide presentation about lipids, <https://behindthebiologylessons.wordpress.com/2023/12/27/using-lipids-as-the-basis-of-a-synoptic-lesson/>    Functions of Lipids,  Key facts about lipids resource bank  <https://med.libretexts.org/Courses/Metropolitan_State_University_of_Denver/Introduction_to_Nutrition_(Diker)/05%3A_Lipids/5.3%3A_Functions_of_Lipids>                                                    Quizlet – Biological Molecules  [Biological Molecules Flashcards | Quizlet](https://quizlet.com/55760579/biological-molecules-flash-cards/) |
| C: Cellular transport and enzyme activity | | |
| C1 Cell transport mechanisms | * Whole class teaching and learning - Introduction * Discussion around what components are in a cell surface membrane. * Students can identify which components they recognise and recall information about structure and functions of those components.      * Whole class teaching and individual activity * Students to identify key components of cell surface membrane * Students to make a presentation of the fluid mosaic model of a cell surface membrane including. * Phospholipids * Glycoproteins * Channel proteins * Glycolipids * Cholesterol * Channel proteins      * Laboratory activity – Membrane permeability * Students investigate the effect of temperature on membrane permeability * Students to use known sizes of beetroot cylinder in a volume of water for a set period of time * Each cylinder would be left at varying temperatures * A colorimeter can then be used to identify where most betalain has been released * Students to analyse results and relate to membrane structure      * **Laboratory activity – Diffusion** * Students to investigate the rate of diffusion in agar cubes * Students to create cubes of varying sizes out of agar * Place agar cubes in concentrations of acid (HCl) * Use an indicator to identify the end point of the reaction. * Students to evaluate how the variance in size of the agar cubes impacted the rate of reaction.        * Laboratory activity- Investigating Osmosis * Students to investigate the process of osmosis using potato and a variety of solute concentrations. * Students to place known mass of potato into different solute concentrations * These will be left for a known time (overnight is best) * Students will then retake the mass and calculate percentage mass change * Student will plot this information on a graph * Student will use the graph to explain how and why the mass changed at different solute concentrations.     **OR**   * Laboratory activity – Investigating Osmosis * Students will Investigate osmosis using eggs with the shells removed (using vinegar) * Students then place the de-shelled egg into a high glucose solution and leave overnight * Students will then explain the changes in the egg * Then place the egg into coloured water and leave overnight * Students will then explain the outcome again and relate to process of osmosis.        * Whole class and small group activity - Research Cell Transport Mechanisms * Students should be placed in small groups and given a cell transport mechanism to include * Facilitated diffusion * Active transport * Endocytosis * Exocytosis * Each student group will research their transport mechanisms in terms of * The process * The energy requirement * Example of use * Each group will peer teach their mechanism to the rest of the group.      * **Whole class activity** – **Discussion about aquatic animals regulating their salt levels** * Student to discuss the question ‘How do sea dwelling creatures undergo active transport, and how does this impact salt regulation? * Students to be given time to make notes on the question and refer to prior learning * Students then to debate the answer to agree on the most suitable answer      * Individual activity – knowledge check * Consolidate student learning by testing their knowledge of key cell transport mechanisms using interactive quiz tools such as Quizizz, Quizlet, Kahoot, or similar and providing a glossary of key terms. | Inside the cell membrane – Brief overview video of the cell membrane  <https://youtu.be/qBCVVszQQNs>    The National Human Genome Research Institute – Cell membrane structure <https://www.genome.gov/genetics-glossary/Cell-Membrane-Plasma-Membrane>        SNAB Biology – The effect of temperature on cell membranes  [The Effect of Temperature on Cell Membranes - Snab Biology](https://snabbiology.co.uk/the-effect-of-temperature-on-cell-membranes/)            Royal Society of Biology, Nuffield Foundation - Effect of size on uptake by diffusion, <https://practicalbiology.org/exchange-of-materials/diffusion/effect-of-size-on-uptake-by-diffusion>    Data Classroom – Potato Osmosis Lab  [Potato Osmosis Lab — DataClassroom](https://about.dataclassroom.com/ready-to-teach/potato-osmosis-lab)                    The Sci Guys - The naked Egg and Osmosis  <https://www.youtube.com/watch?v=SrON0nEEWmo>                    BiologyInsights – Cell Transport Mechanisms: An In-Depth Guide  [Cell Transport Mechanisms: An In-Depth Guide - BiologyInsights](https://biologyinsights.com/cell-transport-mechanisms-an-in-depth-guide/)                                  Quizlet – Cell transport  [Cell Transport Flashcards | Quizlet](https://quizlet.com/79787500/cell-transport-flash-cards/) |
| C2 Enzymes as biological catalysts | * Laboratory activity - Explore how enzyme activity changes in different conditions**.** * Students to discuss what they can recall about enzyme structure and function, the video resource can be used as a stimulus * Students to carry out a carousel of practical activities to investigate the factors affecting enzyme reactions. * Students may complete each investigation over multiple sessions * Or students can be grouped, and each do a different activity * Students would then need to present results and findings as a ‘science fair’ type activity. * Investigations could include * Investigate the effect of pH on amylase activity * Investigating effect of temperature on the activity of lipase * Investigating the effect of concentration on the activity of trypsin * Investigating an enzyme-controlled reaction: catalase and hydrogen peroxide concentration | Make Science Easy: Basic Biology Enzymes, <https://www.youtube.com/watch?v=TLhBJQ2Q4QQ>      Royal Society of Biology, Nuffield Foundation - Factors affecting enzyme activity, <https://practicalbiology.org/bio-molecules/factors-affecting-enzyme-activity> |
| C3 Homeostasis | * Whole class teaching and learning - Introduction * Discuss the definition of homeostasis and explore why it is important; you could use the video resource as stimulus to discuss. * Students are to list all the different ways in which the body can maintain an environment, share areas and generate a collaborative mind map * Whole class teaching and pair peer teaching activity – Systems under homeostatic control * Students can discuss the list of ways in which the body maintains a constant internal environment * In pairs students can each take a system and research why it is important for that environment to be maintained * Pairs can present ideas to the rest of the group in the format of peer teaching. * Students can explore this virtually with a body simulator to emphasise the importance of a quick response.        * **Laboratory activity and small group activity – Keep a constant temperature** * Students are given a beaker of water, a Bunsen set up and some ice. * Students are asked to maintain the water as a set temperature (determined by the teacher) * Students can heat with a Bunsen and cool with ice, but they cannot use any other materials. * Students to record the temperature over time. * Students to discuss their results in small groups – how easy/difficult was the temperature to maintain. * Students evaluate how this may relate to the human body and what aspects changes in temperature may affect. * Students can reflect on video resource as stimulus if required.      * **Whole class and individual activity – Negative and positive feedback loops** * Students could be given a series of scenarios where homeostasis is required and they would need to suggest the corrective measure, this could include * Student too hot when playing a sport * Student too cold in an exam hall * Student eats large volumes of birthday cake * Students drinks a large bottle of squash at break time * Students could discuss the difference between positive and negative feedback loops, the video resource could be used as stimulus material. * Students could use the information to create flow diagrams of the different corrective mechanisms used in homeostasis.      * **Small group Activity – Discussion about homeostasis** * Students should be presented with the case study video (Guardsman collapsing) * Students should discuss what caused this to happen, what environments were not being maintained? * Students should discuss what corrective mechanisms should have occurred? * How could this incident have been prevented?      * Guest speaker – Diabetes specialist nurse or cardiovascular clinician * Invite a specialist nurse or cardiovascular clinician to come in either remote or face to face to discuss homeostasis * Invite in a guest speaker in the form a diabetic to discuss how the condition is controlled.      * Individual activity – knowledge check * Consolidate student learning by testing their knowledge of homeostasis using interactive quiz tools such as Quizizz, Quizlet, Kahoot, or similar and providing a glossary of key terms. | Fuse School - What is homeostasis?  <https://youtu.be/quQr6X1Q58I>    WebMD - What is homeostasis? <https://www.webmd.com/a-to-z-guides/what-is-homeostasis>    PBS learning media - body control simulation, <https://www.pbslearningmedia.org/resource/tdc02.sci.life.reg.bodycontrol/body-control-center/>      Thermoregulation – Overview of homeostasis and temperature control  <https://youtu.be/qcFRZ-xvQSA>                      Amoeba sisters -homeostasis and negative/positive feedback <https://www.youtube.com/watch?v=Iz0Q9nTZCw4>                Royal Guard Faints – video case study of homeostatic event  <https://youtu.be/_Wqulwx5Tdk>                            Physics and maths tutor – Homeostasis  [Flashcards - Topic 5.1 Homeostasis - AQA Biology GCSE - PMT](https://www.physicsandmathstutor.com/biology-revision/gcse-aqa/homeostasis-and-response/homeostasis-flashcards/) |
| Unit 1 Exam practice | Unit 1 is assessed through one examination of 50 marks lasting 1 hour. The assessment availability is twice a year in January and May/June. The first assessment availability is May/June 2026.    Alongside unit content delivery, sample assessment material exam papers (available on the qualification page [here](https://qualifications.pearson.com/en/qualifications/btec-nationals/applied-science-aaq.html)) can be used to help students understand the format of the exam paper, command words and how the mark scheme is applied.  As each learning topic is delivered it is recommended students practice exam skills, timing and applying their learning to a wide variety of exam style questions. | Pearson – Sample Assessment Materials and past papers  [Applied Science (AAQ) | Pearson qualifications](https://qualifications.pearson.com/en/qualifications/btec-nationals/applied-science-aaq.coursematerials.html#%2FfilterQuery=category:Pearson-UK:Category%2FSpecification-and-sample-assessments)    Pearson – Exam Wizard  [examWizard | Pearson qualifications](https://qualifications.pearson.com/en/support/Services/examwizard.html?utm_source=guide&utm_medium=print&utm_campaign=GBSEMA0618GQA16&utm_content=makingastart) |

Delivering signposted transferable skills

Signposted transferable skills are not mandatory for the delivery of the unit, and it is therefore your decision to deliver these skills as a part of the qualification. Below we have provided some ideas of teaching and learning activities that you could use to deliver these skills if you chose to.

|  |  |
| --- | --- |
| Transferable skills | Ideas for delivery |
| SP-CT –Critical Thinking | * Whole class teaching and learning – demonstrating critical thinking skills * Explain to students the concept of critical thinking using examples from debating questions, such as the discussion around homeostasis. Students would need to demonstrate. * Questioning relevance of information * Challenging own biases * Breaking information into parts and identifying relationships and connections * Identifying strengths or weaknesses of information and why information is significant * Drawing conclusions supported by structured reasoning * Students would also need to consider arguments from other perspectives where this was applicable. |
| SP - PS | * Practical activity - Explore how enzyme activity changes in different conditions**.** * Explain to students the common ‘pitfalls’ in enzymic experiments, and the resultant consequence they could expect. * Discuss ways around these errors and how they could be prevented. Students may wish to consider * What equipment is available * What time is available * What impact the ‘problem’ would have on results * What solutions may be available * What impact the solutions may have. |

Resources

This section has been created to provide a range of links and resources that are publicly   
available that you might find helpful in supporting your teaching and delivery of this unit in the qualification. We leave it to you, as a professional educator, to decide if any of these resources are right for you and your students, and how best to use them.

Pearson is not responsible for the content of any external internet sites. It is essential that you preview each website before using it to ensure the URL is still accurate, relevant, and appropriate. We’d also suggest that you bookmark useful websites and consider enabling students to access them through the school/college intranet.

### Websites

A-level Biology Revision Resources (Free access) — Online A level Biology Tutor  
Student revision resources, quizzes, exam tips, organised by topic  
<https://www.a-levelbiology.co.uk>

Health A to Z - NHS – National Health Service UK  
Provides information on a variety of health conditions covered in the specification  
<https://www.nhs.uk/conditions/>

Home | Wellcome – Wellcome Trust  
Offers 5-minute articles associated with modern medicine and science topics for developing a wider application of the specification  
<https://wellcome.org>

Homepage - Science & Plants for Schools – Science and Plants for Schools  
Practical procedures and related real-life contexts, inclusive of guidance for technicians  
<https://www.saps.org.uk>

KS5 Lesson Resources – Evolution of a Biology Teacher- Biology Teacher  
Lesson resources inclusive of slide presentations and resource booklets arranged by topic  
<https://www.evolutionofabiologyteacher.com>

Pearson (Edexcel) A Level Biology (A) Revision - Curriculum Press – Curriculum Press  
Factsheets, articles, slide decks and notes separated by Biology topic  
<https://curriculum-press.co.uk>

Practical Biology – Royal Society of Biology  
Practical procedures and related real-life contexts, inclusive of guidance for technicians https://www.rsb.org.uk/education/teaching-resources/practical-biology

Secondary teaching resources | RSC Education – Royal Society of Chemistry  
Teaching resources – a variety of teaching resources to assist with delivery of biochemistry topics and associated practical activities

<https://edu.rsc.org/resources>

STEM – STEM Learning Big Picture  
Big Picture magazine is aimed at post-16 students to explore contemporary issues in biology and medicine. It contains articles, activity sheets, and presentations  
<https://www.stem.org.uk/big-picture>

The Biologist – Royal Society of Biology  
Student magazine exploring recent developments in Biology, with features, interviews and opinion articles  
<https://www.rsb.org.uk/biologist>

### Textbooks

Orchard, G., Nation, B., Cell Structure & Function (Fundamentals of Biomedical Science), OUP Oxford, 2014

Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V., and Orr, R., Campbell Biology 12th Edition, Pearson, 2020

Vologodskii, A., The Basics of Molecular Biology, Springer, 2022

### Pearson paid resources also available

* Pearson Student book
* ActiveBook (a digital version of the Learner Book, via ActiveLearn Digital Service)
* Digital Teacher Pack (via ActiveLearn Digital Service)

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