



Biology Scheme of Learning

Year 9 – Term 1 and 2/Unit 1

Intent – Rationale

Students learn about the basic building blocks of all living things, cells. They consider the variety and function of cells and parts of cells and how to study cells using a microscope. Students learn about how substances are transported into and out of cells enabling them to function. They extend this to how cells and tissues are specifically adapted for this function.

Students learn how cells divide to produce identical copies. Then how the cells develop to become differentiated. They consider the role of different types of stem cells in animals and plants. They move on to consider how some stem cells can be used in the treatment of diseases through therapeutic cloning and the ethics surrounding this.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
<p>KS3 Topic B7.1 Cells and Tissues</p> <p>KS3 Topic B7.2 Reproduction</p>	<ul style="list-style-type: none"> GCSE Unit 3 Organisation and the digestive system, 8 Photosynthesis, 9 Respiration, 10 The Human Nervous System, 13 Reproduction. A Level 1 Biological Molecules, 2 Cells and Transport.
What are the links with other subjects in the curriculum?	What are the links to SMSC, British Values and Careers?
<ul style="list-style-type: none"> Base the content here on what you already know but there will be time in future to liaise further as part of our collaborative work 	<ul style="list-style-type: none"> B1 L4 GB4g, B2 L3 and 4 GB4abdgh B2 L3 and L4 SMSC SO, M
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	What are the opportunities for developing mathematical skills?
<p>FROM THE LIBRARY</p> <p><i>Cell Division and Genetics</i>; Robert Sneddon-571</p> <p><i>Animals Multi Celled Life</i>; Robert Sneddon-571</p> <p><i>Cloning and Stem Cells</i>; Cara Acred-282</p> <p><i>DNA and Genetic Engineering</i>, Roberts Sneddon-660.6</p> <p><i>World of the Cell</i>; Robert Sneddon-556</p> <p><i>Cloning</i>; Sally Morgan-660</p> <p><i>The Cloning Debate</i>; Lisa Firth-176</p> <p><i>Human and Animal Cloning</i>; Issues series-174</p>	<ul style="list-style-type: none"> Calculating and rearranging magnification equation Convert units Calculate percentage increase/decrease Surface area Volume Surface area: volume



Biology Scheme of Learning
Year 9 – Term 1 and 2/Unit 1
Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?					
<p style="text-align: center;"><u>Know</u></p> <ul style="list-style-type: none"> Describe the differences in magnification and resolution of light and electron microscopes. Label diagrams of animal and plant cells. Label a diagram of a prokaryotic cells. Identify features of specialised cells and their function. Identify features of specialised plant cells and their function. Define the term 'diffusion'. Define the term 'osmosis'. Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. Define the term active transport. How the surface area to volume ratio varies depending on the size of an organism. Describe the role of chromosomes in cells. Compare and contrast differentiation in plants and animals. Describe differences between embryonic, adult and plant stem cells. Explain the process of therapeutic cloning organism. <p style="text-align: center;"><u>Apply</u></p> <ul style="list-style-type: none"> Explain how electron microscopy has increased understanding of organelles. Convert values for the units: cm, mm, µm and nm. Explain how the main structures of prokaryotic cells are related to their function. Be able to suggest the function of an unknown specialised cell based on its structure. Give examples of substances that diffuse into and out of cells. Be able to use the terms isotonic, hypotonic or hypertonic to explain the movement of water across a cell membrane. Apply knowledge of osmosis to unfamiliar situations and make predictions. Suggest how a cell that carries out active transport is adapted to this function. Give examples of exchange surfaces in multicellular organisms and how they are adapted for this function. Explain the importance of the cell cycle. Carry out a practical accurately and safely in order to successfully clone a plant. Explain why plant clones are produced in the agriculture industry. <p style="text-align: center;"><u>Extend</u></p> <ul style="list-style-type: none"> Rearrange the equation to calculate image size or magnification. Eg Magnification = size of image ÷ real size. Describe the function of the main organelles. Describe the differences between eukaryotic and prokaryotic cells in terms of structure and size. Explain the need for differentiation in a multicellular organism. Describe the differences between differentiation in plants and in animals. Explain how temperature, concentration gradient and surface area affect the rate of diffusion. State the difference between osmosis and diffusion. Calculate percentage increase/decrease. Describe how active transport takes place. Why large multicellular organisms need special systems for exchanging materials with the environment. Describe mitosis. Explain the production and use of plant clones. Explain how treatment with stem cells may be used to treat people with different medical conditions. Explain the reasons for ethical and religious objections against stem cells. 					
What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?				
	<ul style="list-style-type: none"> B1 L1 and 2 Magnification questions B1 L6 Long answer question on diffusion B1 mid topic test B1 L8 Long answer question osmosis required practical B1 L8 graph drawing B2 L1 long answer question, mitosis. 				
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%; text-align: center;">Word</th> <th style="text-align: center;">Definition</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">active transport</td> <td style="padding: 5px;">molecules are moved in and out of a cell using energy. This process is used when transport needs to happen faster than diffusion and when molecules are</td> </tr> </tbody> </table>	Word	Definition	active transport	molecules are moved in and out of a cell using energy. This process is used when transport needs to happen faster than diffusion and when molecules are	
Word	Definition				
active transport	molecules are moved in and out of a cell using energy. This process is used when transport needs to happen faster than diffusion and when molecules are				



	being moved from a region where they are at low concentration to where they are at high concentration.
algae	Simple aquatic organism (Protista) that make their own food by photosynthesis.
cell wall	rigid outer layer of plant cells and bacteria.
cellulose	the chemical that makes up most of the fibre in food. The human body cannot digest cellulose.
Cell membrane	The membrane around the contents of a cell that controls what moves in and out of the cell.
Cell wall	The rigid structure around plant and algal cells. It is made of cellulose and strengthens the cell
chlorophyll	a green pigment found in chloroplasts. Chlorophyll absorbs energy from sunlight for photosynthesis.
chloroplast	an organelle found in some plant and animal cells where photosynthesis takes place.
cytoplasm	The water-based gel in which the organelles of all living cells are suspended and most of the chemical reactions of life take place
diffusion	movement of particles from a region of high concentration to a region of lower concentration.
dilute	the concentration of a solution depends on how much dissolved chemical (solute) there is compared with the solvent. A dilute solution contains a low level of solute to solvent.
Eukaryotic cells	Cells from eukaryotes that have a cell membrane, cytoplasm and genetic material in a nucleus
Guard cells	Surround the stomata in the leaves of plants and control their opening and closing.
mitochondria	The site of aerobic respiration in a cell
osmosis	The diffusion of water through a partially permeable membrane from a dilute solution (which has a high concentration of water) to a concentrated solution (with a low concentration of water) down a concentration gradient.
Partially permeable membrane	A membrane that allows only certain substances to pass through
phloem	Living tissue in plants that carries dissolved sugars around the plant
Prokaryotic cells	From prokaryotic organisms have a cytoplasm surrounded by a cell membrane, and a cell wall that does not contain cellulose. The genetic material is a DNA loop that is free in the cytoplasm.
Resolving power	A measure of the ability to distinguish between two separate points that are very close together.
ribosomes	The site of protein synthesis in a cell
starch grains	microscopic granules of starch forming an energy store in plant cells.
vacuole	a membrane bound sac found in a cell. It contains molecules such as glucose and salts dissolved in water.
xylem	The non-living transport tissue in plants that transports water

adult stem cells

stem cells that are found in adults that can differentiate and form a limited number of cells

cell cycle

the three-stage process of cell division in a body cell that involves mitosis and results in the formation of two identical daughter cells

cloning

the production of identical offspring by asexual reproduction

differentiate

the process where cells become specialised for a particular function



embryonic stem cells

stem cells from an early embryo that can differentiate to form the specialised cells of the body

mitosis

part of the cell cycle where one set of new chromosomes is pulled to each end of the cell forming two identical nuclei during cell division

stem cells

undifferentiated cells with the potential to form a wide variety of different cell types

therapeutic cloning

a process where an embryo is produced that is genetically identical to the patient so the cells can then be used in medical treatments

zygote

the single new cell formed by the fusion of gametes in sexual reproduction



Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
B1 L1 Microscopes	Can I describe the differences in magnification and resolution of light and electron microscopes?	Can I rearrange the equation to calculate image size or magnification. Eg Magnification = size of image ÷ real size?	
B1 L2 Plant and Animal Cells	Can I label diagrams of animal and plant cells?	Can I describe the function of the main organelles?	
B1 L3 Eukaryotic and prokaryotic cells	Can I label a diagram of a prokaryotic cell?	Can I describe the differences between eukaryotic and prokaryotic cells in terms of structure and size?	
B1 L4 Specialised cells	Can I identify features of specialised cells and their function?	Can I explain the need for differentiation in a multicellular organism?	
B1 L5 Specialised plant cells	Can I identify features of specialised plant cells and their function?	Can I describe the differences between differentiation in plants and in animals?	
B1 L6 Diffusion	Can I define the term 'diffusion'?	Can I explain how temperature, concentration gradient and surface area	



		affect the rate of diffusion?	
Mid topic test	Summative test		
B1 L7 Osmosis	Can I define the term 'osmosis'?	Can I state the difference between osmosis and diffusion?	
B1 L8 Osmosis practical	Can I investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue?	Can I calculate percentage increase/decrease?	
B1 L9 Active transport	Can I define the term active transport?	Can I describe how active transport takes place?	
B1 L10 Exchanging Substances	Can I describe how the surface area to volume ratio varies depending on the size of an organism?	Can I explain why large multicellular organisms need special systems for exchanging materials with the environment?	
B2 L1 Cell division	Can I describe the role of chromosomes in cells?	Can I describe mitosis?	
B2 L2 Growth and differentiation	Can I compare and contrast differentia	Can I explain the production and use of plant clones?	

