Dallam School

Curriculum Overview

Department: Biology
Year Group: 12

Autumn		Spring		Summer	
Cell structure and function (7 lessons)	**Biological molecules and nucleic acids (15 lessons)**	**Biological membranes and Cell diversity (14 lessons)**	**Enzymes (8 lessons)**	**Exchange and transport (19 lessons)**	**Disease and biodiversity (22 lessons)**
Explain how the structure of cells relates to their function	**Explain the structure of macromolecules**	**Explain how molecules pass in and out of cells and explain how cells divide**	**Explain how metabolism relies on enzymes**	**Explain how surface area to volume ratio determines the need for ventilation**	**Explain how pathogens cause harm and how the body defends itself**
By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*
➢ Cells have many organelles that relate to their function. ➢ An example of a prokaryotic cell is a bacteria, they have plasmid DNA rather than DNA contained in a nucleus. ➢ Cells have a cytoskeleton which provides structure and support. ***Keywords*** ➢ organelle ➢ microtubule ➢ microfilament ➢ cytoskeleton ➢ intracellular ➢ prokaryote ➢ eukaryote	➢ Water has many important properties. ➢ Carbon containing compounds are the essential building blocks of life. ➢ There are many different types of proteins which are important for the functions of life. ➢ The nucleic acids are DNA and RNA. ***Keywords*** ➢ tension / adhesion ➢ monomer / polymer ➢ condensation ➢ hydrolysis ➢ ester bond ➢ peptide bond ➢ polynucleotide ➢ transcription ➢ translation	➢ Diffusion, facilitated diffusion and osmosis are methods of substances entering cells. ➢ Cell membranes have carrier proteins and channel proteins. ➢ Cells undergo the cell cycle, which includes interphase, prophase, metaphase, anaphase, telophase and cytokinesis. ***Keywords*** ➢ antigen ➢ permeable ➢ receptor ➢ plasmolysis ➢ supercoiling ➢ interphase ➢ homologous	➢ The specificity of an enzyme is determined by the shape of its active site. ➢ The activity of enzymes is determined by finding the rate at which a reaction proceeds. ➢ The stability of enzymes is affected by high temperatures and extremes of pH. ***Keywords*** ➢ cofactor ➢ coenzyme ➢ prosthetic group ➢ enzyme-substrate complex ➢ enzyme-product complex ➢ temperature coefficient	➢ Organisms have a range of specialised surfaces for gas exchange. ➢ The heart is specialised to coordinate the heartbeat. ➢ Insects have an open circulatory system. ➢ Plants have transport systems to carry nutrients through a vascular system. ***Keywords*** ➢ operculum ➢ mass flow ➢ hydrostatic pressure ➢ oncotic pressure ➢ dicotyledonous plant ➢ plasmodesma	➢ Pathogens can be transmitted in many ways including via a vector. ➢ The first line of defence protects humans from disease. ➢ The third line of defence protects us from disease through the use of B and T lymphocytes. ***Keywords*** ➢ parasite ➢ pathogen ➢ communicable disease ➢ non- communicable disease ➢ disease transmission ➢ retrovirus ➢ cytokines ➢ expulsive reflex

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They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*
➢ How the structure of a bacterial cell relates to its function. ➢ How the structure of some specialised eukaryotic cells, for example a red blood cell is related to its function. ➢ Why some cells have a cell wall and some cells don't need a cell wall.	➢ How the thermostable properties of water and water's ability to act as a solvent allow chemical reactions to take place within cells. ➢ How large molecules are built from small monomers and polymers. ➢ How proteins are organised at four different levels.	➢ How substances move into and out of cells using channel proteins, carrier proteins and simple diffusion. ➢ How to explain the step-by- step process of the cell cycle and mitosis. ➢ How variation is caused by independent assortment in meiosis.	➢ How cofactors and inhibitors interact with enzymes and affect their tertiary structure. ➢ How active sites are formed to accept non-polar substances. ➢ How cofactors, coenzymes and prosthetic groups interact with enzymes.	➢ How gas exchange systems are adapted in plants and animals. ➢ How optimum diffusion gradients are reached in the mammalian transport system. ➢ The structure, advantages and disadvantages of open and closed circulatory systems. ➢ How to detect and diagnose problems with the cardiac cycle.	➢ How to describe the transmission of pathogens including bacteria, viruses, protoctista. ➢ How inflammation and clotting helps to reduce damage caused by an infection. ➢ How Lymphocytes identify an antigen and produce antibodies for neutrophils to engulf.
They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*
➢ Prepare a microscope slide with cells such as plant cells and a blood smear. ➢ Use a light microscope to observe cells. ➢ Use a graticule to measure a cell. ➢ Calculate the total magnification using a scale bar.	➢ Investigate the Benedict's test for reducing sugars. ➢ Investigate the Benedict's test for non-reducing sugars. ➢ Investigate the iodine test for starch. ➢ Investigate the emulsion test for fats. ➢ Interpret biological tests using colorimetry. ➢ Investigate the biuret test for proteins.	➢ Use a colorimeter to determine how temperature affects the permeability of a cell membrane in a plant. ➢ Draw and label a cell undergoing mitosis or meiosis.	➢ Calculate temperature coefficient. ➢ Calculate the rate of an enzyme controlled reaction. ➢ Investigate the effect of enzyme concentration on an enzyme controlled reaction.	➢ Preform a heart dissection. ➢ Preform a Fish gill dissection. ➢ Calculate surface area: volume ratio. ➢ Calculate heart rate. ➢ Calculate water uptake in plants. ➢ Investigate phloem transport using radioactive tracers.	➢ Use aseptic technique to culture bacteria. ➢ Identify an effective antibiotic by measuring zones of inhibition.

	Dallam School Curriculum Overview	**Department: Biology** **Year Group: 13**

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Communication, homeostasis (10 lessons)	**Genetics, Cloning and evolution (19 lessons)**	**Plant and animal responses (10 lessons)**	**Neurones and hormones (7 lessons)**	**Photosynthesis and respiration (13 lessons)**	**Ecosystems (10 lessons)**
Explain how homeostasis is maintained in animals	**Explain how PCR and Electrophoresis can analyse a genome**	**Explain how plants and animals respond to their environments**	**Explain how hormones and endocrine systems work to maintain homeostasis**	**Explain the processes of photosynthesis and respiration**	**Explain how populations are affected by human interaction**
By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*	By the end of this topic pupils will know *(key knowledge, including tier 3 vocabulary)*
➢ Animals maintain constant internal environments. ➢ Cell signalling is used in animals. ➢ Endotherms and ectotherms maintain their body temperature in different ways. ➢ Excretion is an important part of homeostasis. ➢ Kidney failure can be treated by dialysis. ***Keywords*** ➢ homeostasis ➢ hormones ➢ endotherm ➢ ectotherm ➢ hepatocytes ➢ osmoregulation	➢ Cloning can be useful to humans. ➢ PCR and electrophoresis is used to observe entire genomes. This process has changed over time. ➢ Genetic engineering and gene therapy can be used to treat diseases. ***Keywords*** ➢ polymerase chain reaction ➢ genome ➢ genomics ➢ gel electrophoresis ➢ biotechnology ➢ synthetic biology ➢ restriction enzymes ➢ ligase	➢ Plants respond to their environments through tropisms and nastic movements. ➢ The brain coordinates responses in the body. ➢ Muscles contact antagonistically. ***Keywords*** ➢ hypothalamus ➢ pituitary ➢ reflex ➢ sliding filament model ➢ tropisms ➢ nastic movement ➢ abiotic stress ➢ germination ➢ dormancy	➢ Animals rely on their nervous and endocrine systems ➢ There are different types of neurones. ➢ A synapse is a gap between two neurones where neurotransmitters travel across. ***Keywords*** ➢ neurone ➢ synapse ➢ neurotransmitter ➢ vesicle ➢ insulin ➢ glucagon ➢ glycogen ➢ glycogenolysis ➢ gluconeogenesis ➢ glycogenesis	➢ Photosynthesis is a complex process where plants generate glucose. Many factors affect photosynthesis including carbon dioxide concentration. ➢ Respiration is a complex process in all living things. ***Keywords*** ➢ light dependent ➢ light independent ➢ coenzyme ➢ reduction ➢ oxidation ➢ respiratory substrate ➢ pigments ➢ link reaction ➢ krebs cycle ➢ glycolysis ➢ phosphorylation	➢ Carbon is cycled in the environment. ➢ Nitrogen is cycled in the environment. ➢ Biomass and energy decrease along a food chain. ➢ Predators and Prey are impacted by biotic and abiotic factors. ***Keywords*** ➢ ecosystem ➢ population ➢ community ➢ biotic factors ➢ abiotic factors ➢ edaphic factors ➢ biomass ➢ succession ➢ climax community

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They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*	They will understand *(key concepts)*
➢ How cell signalling and negative feedback are used to maintain homeostasis. ➢ Factors that affect body temperature. ➢ How the liver and kidneys remove waste from the body. ➢ How the kidneys control the amount of water in the blood. ➢ How kidney failure can be treated.	➢ How to evaluate the use of Gene therapy and cloning. ➢ How pathogens can be useful in gene therapy. ➢ How DNA profiling can be used in forensics ➢ How PCR works to produce copies of a DNA sample. ➢ How DNA research has given evidence for evolution	➢ How the brain coordinates responses. ➢ Compare reflexes with nervous responses. ➢ How muscles contract and what factors affect this. ➢ How to compare the types of plant responses and how humans can utilise these responses e.g. controlling dormancy.	➢ How the nervous systems and endocrine systems work together to maintain homeostasis and in response to varying environmental factors. ➢ How electrical impulses travel along neurones and explain factors affecting this. ➢ How diabetes can be controlled and explain factors affecting risk of diabetes	➢ How different factors affect the rates of respiration and photosynthesis and explain these changes. ➢ Explain how different respiratory substrates affect the rate of and energy output from respiration.	➢ How humans can conserve biodiversity through ex-situ and in-situ methods. ➢ How to describe how a named biotic or abiotic factor can impact on the abundance and distribution of a species. ➢ How to describe the differences between preservation and conservation.
They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*	They will know how to *(key skills)*
➢ Prepare and view tissue samples under the microscope e.g. hepatocytes, nephrons.	➢ Set up and conduct gel electrophoresis. ➢ Analyse Gel electrophoresis to determine how closely related DNA samples are. ➢ Use the Hardy-Weinberg equation.	➢ Plan a method to safely investigate tropisms in cress seeds.	➢ Investigate factors affecting heart rate. ➢ Conduct statistical tests e.g. t-tests.	➢ Investigate factors affecting respiration and photosynthesis. ➢ Preform a TLC of photosynthetic pigments. ➢ Calculate rate of oxygen produced in pondweed. ➢ Investigate different respiratory substrates.	➢ Use quadrats to randomly sample and to non-randomly sample using a transect. ➢ Calculate the total population of a species of a plant and animal. ➢ Safely capture and mark animal species to estimate population size.