Science Year 9– Spring Term 2022

	What? **When?** **Why?**			
	BIOLOGY **B1 Key Concepts**	**CHEMISTRY** **C1&2 States & mixtures**	**PHYSICS** **P1 Motion**	**BIOLOGY** **B2 Cells & control**
Lesson 1 Learning intentions	**Microscopes** Explain how changes in microscope technology, including electron microscopy, have enabled us to see cells with more clarity and detail than in the past and increased our understanding of the role of sub-cellular structures. Demonstrate an understanding of number, size and scale, including the use of estimations and explain when they should be used. Demonstrate an understanding of the relationship between quantitative units in relation to cells, including a) milli (10^{-3}) b) micro (10^{-6})	**States of matter** Describe the arrangement, movement and the relative energy of particles in each of the three states of matter: solid, liquid and gas. Recall the names used for the interconversions between the three states of matter, recognising that these are physical changes: contrasted with chemical reactions that result in chemical changes. Explain the changes in arrangement, movement and energy of particles during these interconversions. Predict the physical state of a substance under specified conditions, given suitable data.	**Vectors & Scalars** Explain that a scalar quantity has magnitude (size) but no specific direction. Explain that a vector quantity has both magnitude (size) and a specific direction. Explain the difference between vector and scalar quantities. Recall vector and scalar quantities including: a) displacement / distance b) velocity / speed c) acceleration d) force e) weight / mass f) momentum g) energy. Recall that velocity is speed in a stated direction.	**Mitosis** Describe mitosis as part of the cell cycle including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis. Describe the importance of mitosis in growth, repair and asexual reproduction. Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes in the nucleus to the parent cell, and that this results in the formation of two genetically identical diploid body cells Describe that cancer is the result of changes in cells that lead to uncontrolled cell division.

	c) nano (10^{-9}) d) pico (10^{-12})			
Lesson 2 Learning intentions	**Plant & animal cells** Explain how the sub-cellular structures of eukaryotic … cells are related to their functions, including: a) animal cells – nucleus, cell membrane, mitochondria, and ribosomes b) plant cells – nucleus, cell membrane, cell wall, chloroplasts, mitochondria, and ribosomes Demonstrate an understanding of number, size and scale, including the use of estimations and explain when they should be used	**Mixtures** Explain the difference between the use of 'pure' in chemistry compared with its everyday use and the differences in chemistry between a pure substance and a mixture. Interpret melting point data to distinguish between pure substances which have a sharp melting point and mixtures which melt over a range of temperatures.	**Distance time graphs** Recall and use the equations: a) (average) speed (metre per second, m/s) = distance (metre, m) ÷ time (s) b) distance travelled (metre, m) = average speed (metre per second, m/s) × time (s) Analyse distance/time graphs including determination of speed from the gradient. Recall some typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems. Describe a range of laboratory methods for determining the speeds of objects such as the use of light gates	**Growth in animals** Describe growth in organisms, including: a) cell division and differentiation in animals. Explain the importance of cell differentiation in the development of specialised cells. Demonstrate an understanding of the use of percentiles charts to monitor growth.
Lesson 3 Learning intentions	**Specialised cells** Describe how specialised cells are adapted to their function, including: a) sperm cells – acrosome, haploid nucleus, mitochondria and tail b) egg cells – nutrients in the cytoplasm, haploid nucleus and changes in the cell membrane after fertilisation c) ciliated epithelial cells.	**Filtration & Crystallisation** Explain the experimental techniques for separation of mixtures by c) filtration d) crystallisation. Evaluate the risks in a practical procedure and suggest suitable precautions for a range of practicals including those mentioned in the specification.	**Acceleration** Recall and use the equation: acceleration (metre per second squared, m/s^2) = change in velocity (metre per second, m/s) / time taken (second, s) $a = (v - u)/t$ Use the equation: (final velocity)^2 ((metre/second)^2, $(m/s)^2$) – (initial velocity)^2 ((metre/second)^2, $(m/s)^2$) = 2 ×	**Growth in plants** Describe growth in organisms, including: b) cell division, elongation and differentiation in plants. Explain the importance of cell differentiation in the development of specialised cells.

	Demonstrate an understanding of number, size and scale, including the use of estimations and explain when they should be used		acceleration (metre per second squared, m/s^2) × distance (metre, m) $v^2 - u^2 = 2 \times a \times x$ Recall that the acceleration, g, in free fall is 10 m/s^2 and be able to estimate the magnitudes of everyday accelerations	
Lesson 4 Learning intentions	**Core Practical** Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations.	**Distillation** Explain the experimental techniques for separation of mixtures by b) fractional distillation c) filtration Evaluate the risks in a practical procedure and suggest suitable precautions for a range of practicals including those mentioned in the specification	**Velocity time graphs** Analyse velocity/time graphs to: a) compare acceleration from gradients qualitatively b) calculate the acceleration from the gradient (for uniform acceleration only) c) determine the distance travelled using the area between the graph line and the time axis (for uniform acceleration only)	**Stem Cells** Describe the function of embryonic stem cells, stem cells in animals and meristems in plants. Discuss the potential benefits and risks associated with the use of stem cells in medicine.
Lesson 5 Learning intentions	**Bacteria** Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: c) bacteria - chromosomal DNA, plasmid DNA, cell membrane, ribosomes and flagella.	**Paper Chromatography** Explain the experimental techniques for separation of mixtures by e) paper chromatography Describe paper chromatography as the separation of mixtures of soluble substances by running a solvent (mobile phase) through the mixture on the paper (the paper contains the stationary		**The nervous system** Explain the structure and function of sensory receptors, sensory neurones, relay neurones in the CNS, motor neurones and synapses in the transmission of electrical impulses including the axon, dendron, myelin sheath and the role of neurotransmitters.

	Demonstrate an understanding of the relationship between quantitative units in relation to cells, including a) milli (10^{-3}) b) micro (10^{-6}) c) nano (10^{-9}) d) pico (10^{-12}) **e) calculations with numbers written in standard form**	phase), which causes the substances to move at different rates over the paper. Interpret a paper chromatogram a) to distinguish between pure and impure substances b) to identify substances by comparison with known substances c) to identify substances by calculation and the use of R_f values		
Lesson 6 Learning intentions	**<u>Enzymes & nutrition</u>** Explain the importance of enzymes as biological catalysts in the synthesis of carbohydrates, proteins and lipids and their breakdown into sugars, amino acids and fatty acids and glycerol	**<u>Core Practical</u>** Core Practical: Investigate the composition of inks using simple distillation and paper chromatography		**<u>Neurotransmission speeds</u>** Explain the structure and function of sensory receptors, sensory neurones, relay neurones in the CNS, motor neurones and synapses in the transmission of electrical impulses including the … myelin sheath and the role of neurotransmitters. Explain the structure and function of a reflex arc including sensory, relay and motor neurones
Lesson 7 Learning intentions	**<u>Enzyme action</u>**	**<u>Drinking Water</u>** Describe an appropriate experimental technique to separate a mixture, knowing the		

	Explain the mechanism of enzyme action including the active site and enzyme specificity. Explain how enzymes can be denatured due to changes in the shape of the active site	properties of the components of the mixture. Evaluate the risks in a practical procedure and suggest suitable precautions for a range of practicals including those mentioned in the specification. Describe how: a) waste and ground water can be made potable, including the need for sedimentation, filtration, and chlorination b) sea water can be made potable by using distillation c) water used in analysis must not contain any dissolved salts		
Lesson 8 Learning intentions	**<u>Enzyme activity</u>** Explain the effects of temperature, substrate concentration and pH on enzyme activity Demonstrate an understanding of rate calculations for enzyme activity			
Lesson 9 Learning intentions	**<u>Core Practical</u>**			

	Core Practical: Investigate the effect of pH on enzyme activity.			
Lesson 10 Learning intentions	**Transport** Explain how substances are transported into and out of cells, including by diffusion, osmosis, and active transport.			
Lesson 11 Learning intentions	**Core Practical** Core practical: Investigate osmosis in potatoes. Calculate percentage gain and loss of mass in osmosis.			