Year 11 Biology 2020 **Unit 1: Topic 1 Cells as the basis of Life & Topic 2: Multicellular Organisms**

Term 1

Week	Topic	Unit Goals	Resources
W1	Day 1		
	Day 2 Year 11 Induction		
	Day 3 Year 11 Introduction and Book Handout		
W2	Day 1 **T1-Lesson 1**:Requirements of life	-**recognise** the requirements of all cells for survival including: • energy sources (light or chemical) • matter (gases such as carbon dioxide and oxygen) • simple nutrients in the form of monosaccharides, disaccharides, polysaccharides, amino acids, fatty acids, glycerol, nucleic acids, ions and water • removal of wastes (carbon dioxide, oxygen, urea, ammonia, uric acid, water, ions, metabolic heat) • understand that metabolism describes all of the chemical reactions involved in sustaining life and is either catabolic or anabolic.	**OBI Chapters**: 2.1; 2.2; 2.4 **Important vocabulary**: Chemical energy p.54 Adenosine triphosphate (ATP) p. 62 Adenosine diphosphate (ADP) p.62 Potential energy p.54 Light energy p.54 Heat energy p.54 Heterotroph p.54, p.125 Autotroph p.54; 125 Carbon dioxide Oxygen Monomer p.42 Polymer p.42 Carbohydrates (starch, glycogen) p.43 Saccharides (mono, poly) p.43 Glucose Protein p.44 Polypeptide p.44 Amino acids p. 44 Lipids p.46 Fatty acids p.46 Glycerol p.46 Polar p.46 Non polar p.46 Hydrophobic p.46 Hydrophilic p.46 Phospholipid p.47 Nucleic acid p.48 Ion Water Urea p.199 Ammonia p.199 Uric Acid p.200 Metabolism p.55 Catabolism p. 55 Anabolism p. 55 **Important diagrams/tables**: Fig 4 amino acids p.44 Fig 6 lipids p.46 Fig 8 phospholipids p.48 Table 3 building blocks p.52 Fig 2 energy transfer p.55 Fig 1 ATP p.62
	Day 2 **T1-Lesson 2**: Prokaryotic v Eukaryotic Cells	• recognise that prokaryotic and eukaryotic cells have many features in common, which is a reflection of their common evolutionary past • recall that prokaryotic cells lack internal membrane bound organelles, do not have a nucleus, are significantly smaller than eukaryotes, usually have a single circular chromosome and exist as single cells	**OBI Chapter**: 3.2 **Important vocabulary**: Micrometre p.74 Nanometre p.74 Unicellular p.74 Multicellular p.74 Abiogenesis p.75 Prokaryote p.75 Murein p.87 Chromosome p.75 Eukaryote p.76

		• understand that eukaryotic cells have specialised organelles to facilitate biochemical processes -Compare the structure of prokaryotes and eukaryotes	Organelle Nucleus p. Nucleoplasm p.76 Cytoplasm p.76 Endosymbiotic hypothesis p.76 **Important diagrams/tables**: Fig 1 cell size p. 74 Fig 3 prokaryote p.76 Fig 4 endosymbiosis p.76 Fig 6 eukaryote p.77 Table 1 Pro v Euk p.78 Table 5 Pro v Euk p.87
	Day 3 **T1-Lesson 3**: Eukaryotic cell: Animal cell organelle structure and function (general)	- understand that eukaryotic cells have specialised organelles to facilitate biochemical processes: • photosynthesis (chloroplasts) • cellular respiration (mitochondria) • synthesis of complex molecules including proteins (rough endoplasmic reticulum) - identify the following structures from an electron micrograph: chloroplast, mitochondria, rough endoplasmic reticulum and lysosome	**OBI Chapter**: 3.2, 3.3 **Important Vocabulary** Cytoplasm p.444 Nucleus p.80 Mitochondria p.81, 117 Matrix p. 81, 117 Cristae p.81, 117 Cellular Respiration(basic) p.81, 116 Inner membrane p.81, 117 Outer membrane p. 81, 117 Protein p.44 Rough Endoplasmic reticulum p.80 Golgi Body p.81 Ribosome p.80 Vesicle p.81 Lysosome p.81 **Important diagrams/tables** Table 1 (parts) p.80-81 Fig 1 animal electron microscope p. 82 Fig 3 animal cells p. 84 Fig 2 mitochondria p.117
W3	Day 1 **T1-Lesson 4**: Eukaryotic cell: Plant organelle structure and function (general) Comparing Animal v Plant DATA TEST SKILLS DIAGNOSTIC TEST	-understand that eukaryotic cells have specialised organelles to facilitate biochemical processes: • photosynthesis (chloroplasts) • cellular respiration (mitochondria) • synthesis of complex molecules including proteins (rough endoplasmic reticulum) -	**OBI chapter**: 3.3; 4.1; 4.2; 4.3 **Important vocabulary** Photosynthesis (basic) p.54; 112 Chloroplasts p.82, p.112 Chlorophyll p. 110 Stroma p.85 Thylakoids p.85 Granum p.85 Vesicle p.81 Vacuole p.81 Cell Wall p.82 **Important Diagrams/Tables** Fig 2 plant electron microscope p.83 Table 1 P v E cells p.78 Fig 3 animal and plant cells p. 84-85 Table 4 plant v animal v fungi p.87 Fig 1 chloroplast p.112 Fig 2 chloroplast p.113 Fig 3 photosynthesis p.113
	Day 2 **T1-Lesson 5**: Prepare for Mandatory Prac: Microscopes, magnification and Field of view EXPLICIT TEACHING OF RELATED DATA TEST SKILLS **Day 3** **T1-Lesson 6: Mandatory Prac – Wet Mount slides (Prac. 3.3B)**	- Prepare wet mount slides and use a light microscope to observe cells in microorganisms, plants and animals to identify nucleus, cytoplasm, cell wall, chloroplasts and cell membrane. The student is required to calculate total magnification and field of view **Manipulative skills:** Construct a wet mount slide; use a light microscope.	**OBI chapter**: 3.1; 3.2; Manipulative skill 3.3A; Mandatory prac 3.3B **Important vocabulary:** Light microscope p.72 Electron microscope p.72 Electron micrograph p.71 Millimetre p.74 Micrometre p.74 Magnification field of view diameter p.414 Cell length p.413 Cell width Microscope ocular/eyepiece lens p.410/414 Microscope objective lens p.410 **Important diagrams/tables**

			Fig 1. Cell under light v electron microscopes P.82 Formula box p.414
W4	Day 1 **T1-Lesson 7:** Cell Membrane Structure & Lipids; Fluid mosaic model Passive v Active movement across the membrane (general) Cell Membrane Function: Passive diffusion Movement of chemicals in and out of cells Day 2 **T1-Lesson 8**: Cell Membrane Function: Passive osmosis Movement of water in and out of cells	- describe the structure of the cell membrane (including protein channels, phospholipids, cholesterol and glycoproteins) based on the fluid mosaic phospholipid bilayer model -describe how the cell membrane maintains relatively stable internal conditions - via the passive movement (diffusion, osmosis) of some substances along a concentration gradient and - via the process of active transport of a named substance against a concentration gradient - predict the direction of movement of materials across cell membranes based on factors such as concentration, physical and chemical nature of the materials	**OBI chapters:** 3.4, 3,5 **Important vocabulary:** Cell membrane p.90 Extracellular fluid p.90 Phospholipid p.47 Phospholipid bilayer p.90 Hydrophilic p.90 Hydrophobic p.90 Fluid mosaic model p.91 Integral protein p.91 Peripheral protein p.91 Protein channel p.91 Glycoprotein p.93 Cholesterol p.93 Passive transport p. 94 Active transport p. 94 Water soluble p.94 Lipid soluble p.94 Ions p.94 Solute Solvent Selectively permeable membrane p.94 Diffusionp.95 Concentration Concentration gradient p.95 Brownian motion p.95 Simple diffusion p.95 Protein channel p.95 Facilitated diffusion p.95 globular proteins p.96 Dynamic equilibrium p.96 Osmosis p.96 Osmotic potential p.96 Tonicity Hypertonic p.96 Hypotonic p.97 Isotonic p.97 Vacuole p.83 **Important diagrams/tables:** Fig 1. Phospholipid/bilayer p.90 Fig 3. Fluid mosaic model p.92 Fig 1 Passive v Active transport p.94 Fig 2 cell membrane transport p.95 Fig 3 Diffusion p.96 Table 1 osmotic potential p.97 Fig 4 Types of extracellular solution p.97 Fig 5 osmosis p.98
	Day 3 **T1-Lesson 9**: Cell Membrane Function: **Active transport** of chemicals in and out of cells Passive v Active movement across the membrane (in depth)	describe how the cell membrane maintains relatively stable internal conditions via the process of **active transport** of a named substance against a concentration gradient - understand that endocytosis is a form of active transport that usually moves large polar molecules that cannot pass through the hydrophobic cell membrane into the cell - recognise that phagocytosis is a form of endocytosis	**OBI chapters**: 3.5 **Important Vocabulary**: Active Transport p. 94 Carrier protein p.95 Exocytosis p.100 Endocytosis p. 100 Polar molecules p.46 Hydrophobic p.90 Phagocytosis p.100 Pinocytosis p.100 Vacuole p 100 Vesicle p.100 Lysosome p.81 **Important diagrams**: Fig 2 cell membrane transport p.95 Fig 8b phagocytosis p.100

W5	Day 1 **T1-Lesson 10**: Surface Area:Volume Ratio and Cell Size Preparing for Mandatory Prac EXPLICIT TEACHING OF RELATED DATA TEST SKILLS	- Explain how the size of a cell is limited by the relationship between surface area to volume ratio and the rate of diffusion.	**OBI chapter**: 3.2; 3.2 Mandatory Prac **Important Vocabulary**: Surface area Volume Surface Area : Volume Ratio Cube p.79 p.402 Rectangular prism p.79 p.402 Microvilli p.78 **Important diagrams:** Fig. 7 SA:V p. 79 RESOURCES NEEDED
	Day 2 **T1-Lesson 11: Mandatory Prac – SA : Vol ratios (Prac. 3.2)**	-Investigate the effect of surface area to volume ratio on cell size.	
	Day 3 **T1-Lesson 12** Sources of energy and matter Photosynthesis	recognise the requirements of all cells for survival, including energy sources (light or chemical), matter (gases such as carbon dioxide and oxygen), removal of wastes (carbon dioxide, oxygen, urea, ammonia, uric acid, water, ions, metabolic heat) -recall that the process of photosynthesis is an enzyme-controlled series of chemical reactions that occurs in the chloroplast in plant cells and uses light energy to synthesise organic compounds (glucose), and the overall process can be summarised in a balanced chemical equation *carbon dioxide + water glucose + oxygen + water* *6CO2 + 12H2O C6H12O6 + 6O2 + 6H2O* -**summarise** the process of photosynthesis in terms of the light-dependent reactions and light independent reactions -**demonstrate** the relationship between the light –dependent reactions and light –independent reactions (Each process of photosynthesis (light-dependent reactions and light-independent reactions, should only be summarised in terms of total inputs and outputs and how they are interrelated.)	**OBI chapters**: 4.1; 4.2; 4.5 **Important Vocabulary**: Autotrophs p.125 Heterotrophs p.125 Chemosynthesis p.108 Photosynthesis p.108 Light energy p.109 Chemical energy p.109 Pigment p. 110 Chlorophyll p.110 Absorption spectrum p.110 Action spectrum p.111 Chloroplast p.112 Stroma p.112 Thylakoid p.112 Granum p.112 Photosynthesis equation p.112 Light dependent reactions p.113 Light independent reactions p.114 Calvin-Benson cycle p.114 Enzyme p.56 **Important diagrams:** Fig. 6 Absorption and Action spectrum p.111 Fig 1 Chloroplast p.113 Fig 2 Chloroplast p.113 Fig 3 Photosynthesis graphic p.113 Fig 4 Summary photosynthesis rxns p.114 Fig 5 Photosynthesis process p.115
W6	Day 1 **T1-Lesson 13:** Cellular Respiration (Aerobic)	-recognise that cellular respiration is an enzyme-controlled series of chemical reactions and that the reaction sequence known as *aerobic respiration* (glycolysis, Krebs cycle and electron transfer chain) requires oxygen - recognise the requirements of all cells for survival including Matter (gases such as **oxygen**), **removal of wastes (carbon dioxide**, oxygen, urea, ammonia, uric acid, **water**, ions, **metabolic heat**)	OBI Chapters: 4.3; **Important vocabulary**: Cellular Respiration p.116 Exergonic p.116 Endergonic p.116 Aerobic Respiration p.116 Anaerobic Respiration p.116 Mitochondria p.117 Cristae p.117 Matrix p.117 Ribosome p.117 Adenosine Triphosphate (ATP) p.62 Adenosine Diphosphate (ADP) p.62 Enzyme p. 56 Activation energy p.118 Aerobic respiration

		-summarise the reactions of aerobic respiration by the chemical equation *glucose + oxygen carbon dioxide + water + energy* *C6H12O6 + 6O2 6CO2 + 6H2O + 36–38 ATP* -recall that organisms obtain the energy needed to recycle ATP from glucose molecules in the process of cellular respiration. (**Each process of cellular respiration, glycolysis, Krebs cycle, and electron transport chain should only be summarised in terms of total inputs and outputs and how they are interrelated**.) (Recognise that glycolysis is the first stage of cellular respiration occurring in the cytoplasm and the second stage occurs in the mitochondria.)	Glycolysis p.117 CoEnzymeA p.118 Krebs cycle p.117, 118 Electron transport chain p.117, 119 Pyruvate p.118 **Important diagrams** Fig 1 Cellular respiration overview p.116 Fig 2 Mitochondria p. 117 Fig 3 Glycolysis p.118 Fig 4 Aerobic respiration p.118
	Day 2 **T1-Lesson 14:** Cellular Respiration (Aerobic) Connecting Cellular Respiration and Photosynthesis	-summarise the reactions of aerobic respiration by the chemical equation *glucose + oxygen carbon dioxide + water + energy* *C6H12O6 + 6O2 6CO2 + 6H2O + 36–38 ATP* -recall that organisms obtain the energy needed to recycle ATP from glucose molecules in the process of cellular respiration. - recall that the process of photosynthesis is an enzyme-controlled series of chemical reactions that occurs in the chloroplast in plant cells and uses light energy to synthesise organic compounds (glucose), and the overall process can be summarised in a balanced chemical equation *carbon dioxide + water glucose + oxygen + water* *6CO2 + 12H2O C6H12O6 + 6O2 + 6H2O*	
	Day 3 **T1-Lesson 15**: Gas Exchange and Transport- Plant Systems: Photosynthesis Respiration leaf structure	-describe the role of stomata and guard cells in controlling the movement of gases (oxygen, carbon dioxide and water vapour) in leaves • explain how the leaf facilitates that gas exchange (oxygen, carbon dioxide and water vapour) in plants • explain the relationship between photosynthesis and the main tissues of leaves (spongy and palisade mesophyll, epidermis, cuticle and vascular bundles)	**OBI Chapter**: 8.1, 8.2, 8.3(part), 8.6 (part) **Important Vocabulary** Petiole p.212 Xylem p.212 Phloem p.212 Epidermis p.212 Cuticle p.212 Stomata p.212, 230 Guard Cell p.230 Photosynthesis p.212 Mesophyll p.213 Spongy mesophyll p.213 Palisade mesophyll p.213 Cytoplasmic steaming p.213 Compensation point p.217 Compensation period p.217

			Important Diagrams Fig 1 leaf structure p.213 Table 1 leaf adaptations p.214 + 218 Fig 2 photosynthesis – respiration p.216 Fig 3 compensation point p.217 Fig 4 Guard cell p.230
W 7	Day 1 **T1-Lesson 16**: Gas Exchange and Transport-Plant Systems: Transpiration and factors	-describe and contrast the structure and function of xylem and phloem tissue (sieve tubes, sieve plates, companion cells) • explain how water and dissolved minerals move through xylem via the roles of root pressure, transpiration stream and cohesion of water molecules -identify and explain the various mechanisms that maintain water balance in plants in terms of structural features (stomata, vacuoles, cuticle) -discuss the factors (light, temperature, wind, humidity) that influence the rate of transpiration **Suggested practical:** Use different diameter capillary tubes to demonstrate cohesion and adhesion forces in water. **Suggested practical:** Investigate the factors affecting the rates of transpiration using a potometer. ONLINE SIMULATION????	**OBI Chapter** 8.4, 8.5, 8.6; 8.7 **Important Vocabulary** Transport systems p.221 Transpiration p.222 Transpiration stream p.222 Root pressure p.226 Xylem p.227 Cohesion p.228 Adhesion p.228 Guard cell p.230 Stoma p. 230 **Important Diagrams** Fig 1 transpiration p.221 Fig 5 Water movement into root p.226 Fig 1 Xylem p.227 Fig 3 water movement thru plant p.229 Fig 4 Guard cell p.230
	Day 2 **T1-Lesson 17** Enzymes	-recognise that biochemical processes are controlled and regulated by a series of specific enzymes -describe the structure and role of the active site of an enzyme -explain how reaction rates of enzymes can be affected by factors, including temperature, pH, the presence of inhibitors, and the concentrations of reactants and products. -explain why changes in metabolic activity alter the optimum conditions for catalytic activity of enzymes (tolerance limits).	**OBI Chapter**: 2.2, 2.3, 2.4 **Important Vocabulary** Metabolism (review) p.55 Catabolism (review) p.55 Anabolism (review) p.55 Endergonic (review) p.55 Activation Energy p.55 Catalyst Enzyme p.56 Lock and Key hypothesis p.58 Induced fit hypothesis p.58 Active Site p.58 Optimal temperature p.407 Denatured p.407 Inactivated p.407 pH **Important Diagrams** Fig 3 activation energy p.56 Fig 2 enzyme action p.58 Fig 1 Enzymes as catalysts p.57 Fig 4 Effects on enzymes p.60 Fig 2 Metabolism, enzymes & energy p.63
	Day 3 **T1-Lesson 18** **Mandatory Prac: enzyme**	**Mandatory practical:** Investigate the effect of temperature on the rate of reaction of an enzyme. Investigate the effect of pH on the rate of reaction of an Enzyme (e.g. catalase, lipase, amylase). The concentration of substrate could also be considered.	OBI chapter 7.2A

Wk 8	**Data Analysis and interpretation Methods & Revision Lesson1**		
	Data Analysis and interpretation Methods & Revision Lesson 2		
	Data Analysis and interpretation Methods & Revision Lesson 3		
W9	EXAM WEEK Data Test FIA1		
W10	Day 1 **T1-Lesson 19** Exchange of nutrients: Digestion	- describe the role of digestive enzymes (amylase, protease, lipase) in chemical digestion -identify the characteristics of absorptive surfaces within the digestive system and relate to the structure and function of the villi -	**OBI Chapter** 7.1, 7.2 **Important Vocabulary** Pancreatic enzymes p.194 Amylase p.190 Protease p.190 Pepsin p.194 Lipase p.190 Ingestionp.188 Mouth p.188, 195 Salivary glands p.195 Egestion p.188 Chunk feeders p.188 Physical Digestion p.189 Peristalsis p.189 Pancreases p,193 Bile p.19 Bile Salts p.194 Emulsify p.194 Stomach p.193-194 Duodenum p.193-194 Alimentary Canal p.189 Chemical Digestion p.190; 194 Absorption p.191; Polymer p.42 Monomer p.43 Ileum p.193 Villi p.195 Microvilli p.195 Hepatic portal vein p.195 Chylomicrons p.195 Lacteals p.195 Large intestine p.193 Assimilation p.191, p.195 Elimination p.191 **Important Diagrams** **Fig 4** peristalsis p.190 **Fig 3** Aquisiton of nutrients p.190 Table 1 key digestion enzymes p.194 Fig 4. 195 Villius
	Day 2 **T1-Lesson 20** **Analyse Prac results** **FIA2 – Student Experiment Preparatory Lesson 1** Handout; Exemplar and Scaffold		
	Day 3 **FIA2 – Student Experiment Preparatory Lesson 2** Understanding Validity Reliability and Limitations		