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## Subject: BIOLOGY (Trilogy Foundation) Year 9 Curriculum Map 2020 – 2021

### Resources:

| Week Commencing            | Topic (including links to additional resources)   | Assessment Window |
|----------------------------|---|-------------------|
| 1 <sup>st</sup> September  | <p><b>TOPIC 4.1 CELLS</b></p> <p><b><u>Lesson 1 - Animal and plant cells</u></b><br/>Describe that plant and animal cells are eukaryotic and contain organelles such as cell membrane, cytoplasm and a nucleus</p>  |                   |
| 7 <sup>th</sup> September  | <p><b><u>Lesson 2 – Eukaryotic and prokaryotes</u></b><br/>Bacterial cells (prokaryotic cells) are much smaller in comparison. They have cytoplasm and a cell membrane surrounded by a cell wall.<br/>The genetic material is not enclosed in a nucleus. It is a single DNA loop and there may be one or more small rings of DNA called plasmids. Students should be able to explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, chloroplasts in plant cells and plasmids in bacterial cells are related to their functions.</p> |                   |
| 14 <sup>th</sup> September | <p><b><u>Lesson 3 – Animal Cells</u></b><br/>Most animal cells have the following parts:</p> <ul style="list-style-type: none"> <li>•a nucleus, which controls the activities of the cell</li> <li>•cytoplasm, in which most of the chemical reactions take place</li> <li>•a cell membrane, which controls the passage of substances into and out of the cell</li> <li>•mitochondria, which is where aerobic respiration takes place</li> <li>•ribosomes, which are where protein synthesis occurs.</li> </ul>   |                   |
| 21 <sup>st</sup> September | <p><b><u>Lesson 4 – Plant Cells</u></b><br/>In addition to the parts found in animal cells, plant cells often have:</p> <ul style="list-style-type: none"> <li>•chloroplasts, which absorb light to make food by photosynthesis</li> <li>•a permanent vacuole filled with cell sap.</li> </ul> <p>Plant and algal cells also have a cell wall made of cellulose, which strengthens the cell.</p>  |                   |
| 28 <sup>th</sup> September | <p><b><u>Lesson 5 – Cell Specialisation</u></b><br/>Explain how the structure of different types of cells relate to their function in a tissue, an organ or organ system, or the whole organism.<br/>Cells may be specialised to carry out a particular function:</p> <ul style="list-style-type: none"> <li>•sperm cells, nerve cells and muscle cells in animals</li> <li>•root hair cells, xylem and phloem cells in plants.</li> </ul>  |                   |
| 5 <sup>th</sup> October    | <p><b><u>Lesson 6 – Cell differentiation</u></b><br/>As an organism develops, cells differentiate to form different types of cells. Most types of animal cell differentiate at an early</p>   |                   |

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|  | stage whereas many types of plant cells retain the ability to differentiate throughout life. In mature animals, cell division is mainly restricted to repair and replacement. As a cell differentiates it acquires different sub-cellular structures to enable it to carry out a certain function. It has become a specialised cell.   |                  |
| 12 <sup>th</sup> October                                     | <b><u>Lesson 7 – Microscopy (required practical)</u></b><br>An electron microscope has much higher magnification and resolving power than a light microscope. This means that it can be used to study cells in much finer detail. This has enabled biologists to see and understand many more sub-cellular structures.   |                  |
| 19 <sup>th</sup> October<br>(inset Friday 22 <sup>nd</sup> ) | <b><u>Lesson 8 - Chromosomes</u></b><br>The nucleus of a cell contains chromosomes made of DNA molecules. Each chromosome carries a large number of genes. In body cells the chromosomes are normally found in pairs.  |                  |
| Half Term  |  |                  |
| 2 <sup>nd</sup> November                                     | <b><u>Lesson 9 – Mitosis and the cell cycle</u></b><br>Cells divide in a series of stages called the cell cycle. One of these stages is mitosis where the DNA, which has already been copied, divides. During the cell cycle the genetic material is doubled and then divided into two identical cells. Before a cell can divide it needs to grow and increase the number of sub-cellular structures such as ribosomes and mitochondria. The DNA replicates to form two copies of each chromosome. One set of chromosomes is pulled to each end of the cell and the nucleus divides. Finally the cytoplasm and cell membranes divide to form two identical cells. Students should be able to recognise and describe situations in given contexts where mitosis is occurring.   |                  |
| 9 <sup>th</sup> November                                     | <b><u>Lesson 10 – Stem Cells</u></b><br>A stem cell is an undifferentiated cell of an organism which is capable of giving rise to many more cells of the same type, and from which certain other cells can arise from differentiation.<br>Stem cells from human embryos and adult bone marrow can be cloned and made to differentiate into many different types of human cells.<br>Treatment with stem cells may be able to help conditions such as diabetes and paralysis.<br>In therapeutic cloning an embryo is produced with the same genes as the patient. Stem cells from the embryo are not rejected by the patient's body so they may be used for medical treatment.<br>The use of stem cells has potential risks such as transfer of viral infection, and some people have ethical or religious objections. |                  |
| 16 <sup>th</sup> November                                    | <b><u>Lesson 11 – Stem Cells in plants</u></b><br>Stem cells from meristems in plants can be used to produce clones of plants quickly and economically.<br>•Rare species can be cloned to protect from extinction.<br>•Large numbers of identical crop plants with special features such as disease resistance<br>•the surface area of the membrane.   |                  |
| 23 <sup>rd</sup> November                                    | AR1 Assessment<br>DDI Wave 1   | AR 1 ASSESSMENTS |
| 30 <sup>th</sup> November                                    | DDI Wave 2   | AR 1 ASSESSMENTS |

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| 7 <sup>th</sup> December                                      | Reassessment<br>Consolidation lesson   |  |
| 14 <sup>th</sup> December                                     | <p><b><u>Lesson 12 – Surface area to volume ratio</u></b></p> <p>A single-celled organism has a relatively large surface area to volume ratio. This allows sufficient transport of molecules into and out of the cell to meet the needs of the organism.</p> <p>Students should be able to explain how the small intestine and lungs in mammals, gills in fish, and the roots and leaves in plants, are adapted for exchanging materials.</p> <p>In multicellular organisms the smaller surface area to volume ratio means surfaces and organ systems are specialised for exchanging materials. This is to allow sufficient molecules to be transported into and out of cells for the organism's needs. The effectiveness of an exchange surface is increased by:</p> <ul style="list-style-type: none"> <li>•having a large surface area</li> <li>•a membrane that is thin, to provide a short diffusion path</li> <li>•(in animals) having an efficient blood supply</li> <li>•(in animals, for gaseous exchange) being ventilated.</li> </ul> |  |
| Christmas Holiday   |  |  |
| 4 <sup>th</sup> January                                       | <p><b><u>Lesson 13 Osmosis</u></b></p> <p>Water may move across cell membranes via osmosis. Osmosis is the diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane.</p>  |  |
| 11 <sup>th</sup> January                                      | <p><b><u>Lesson 14 – Active transport</u></b></p> <p>Active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). This requires energy from respiration.</p> <p>Students should be able to link the structure of a root hair cell to its function.</p> <p>Active transport allows mineral ions to be absorbed into plant root hairs from very dilute solutions in the soil. Plants require ions for healthy growth. It also allows sugar molecules to be absorbed from lower concentrations in the gut into the blood which has a higher sugar concentration.</p> <p>Sugar molecules are used for cell respiration.</p>   |  |
| 18 <sup>th</sup> January                                      | <p><b><u>TOPIC 4.2 ORGANISATION</u></b></p> <p><b><u>Lesson 1- Principles of organization</u></b></p> <p>Cells are the basic building blocks of all living organisms. A tissue is a group of cells with a similar structure and function. Organs are aggregations of tissues performing specific functions.</p> <p>Organs are organised into organ systems, which work together to form organisms.</p>   |  |
| 25 <sup>th</sup> January                                      | <p><b><u>Lesson 2 - The human digestive system</u></b></p> <p>The digestive system is an example of an organ system in which several organs work together to digest and absorb food.</p>   |  |
| 1 <sup>st</sup> February                                      | <p><b><u>Lesson 3 - Required practical - Food tests</u></b></p> <p>To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein.</p>   |  |
| 8 <sup>th</sup> February<br>(Inset 12 <sup>th</sup> February) | <p><b><u>Lesson 4 -Enzymes</u></b></p> <p>The 'lock and key theory' is a simplified model of enzyme action.</p> <p>Enzymes:</p> <ul style="list-style-type: none"> <li>•are biological catalysts that speed up chemical reactions in living organisms</li> <li>•are large proteins</li> <li>•catalyse a specific reaction due to the shape of the active site</li> </ul>   |  |

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|                           | <ul style="list-style-type: none"> <li>•are denatured by high temperature and extremes of pH due to changes in the shape of the active site</li> <li>•have an optimum temperature</li> <li>•have an optimum pH.</li> </ul>  |  |
| February Half Term        |   |  |
| 22 <sup>nd</sup> February | <p><b><u>Lesson 5 – Digestive enzymes</u></b></p> <p>Recall the sites of production and the action of amylase, proteases and lipases.</p> <p>Digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream.</p> <p>Carbohydrases break down carbohydrates to simple sugars.</p> <p>Amylase is a carbohydrase which breaks down starch.</p> <p>Proteases break down proteins to amino acids.</p> <p>Lipases break down lipids (fats) to glycerol and fatty acids.</p> <p>The products of digestion are used to build new carbohydrates, lipids and proteins. Some glucose is used in respiration.</p>  |  |
| 1 <sup>st</sup> March     | <p><b><u>Lesson 6 – Required practical to investigate the effect of pH on the rate of reaction of amylase enzyme</u></b></p> <p>Students should use a continuous sampling technique to determine the time taken to completely digest a starch solution at a range of pH values. Iodine reagent is to be used to test for starch every 30seconds. Temperature must be controlled by use of a water bath or electric heater</p>   |  |
| 8 <sup>th</sup> March     | <p><b><u>Lesson 7 – complete required practical</u></b></p>   |  |
| 15 <sup>th</sup> March    | <p><b><u>Lesson 8 - Bile</u></b></p> <p>Bile is made in the liver and stored in the gall bladder. It is alkaline to neutralise hydrochloric acid from the stomach. It also emulsifies fat to form small droplets which increases the surface area. The alkaline conditions and large surface area increase the rate of fat breakdown by lipase.</p>   |  |
| 22 <sup>nd</sup> March    | <p><b><u>Lesson 9 - Heart and lungs</u></b></p> <p>Describe the structure and functioning of the human heart and lungs, including how lungs are adapted for gaseous exchange.</p> <p>Knowledge of the lungs is restricted to the trachea, bronchi, alveoli and the capillary network surrounding the alveoli.</p> <p>The heart is an organ that pumps blood around the body in a double circulatory system. The right ventricle pumps blood to the lungs where gas exchange takes place. The left ventricle pumps blood around the rest of the body.</p> <p>Knowledge of the blood vessels associated with the heart is limited to the aorta, vena cava, pulmonary artery, pulmonary vein and coronary arteries.</p> <p>Knowledge of the names of the heart valves is not required.</p> <p>The natural resting heart rate is controlled by a group of cells located in the right atrium that act as a pacemaker. Artificial pacemakers are electrical devices used to correct irregularities in the heart rate.</p> |  |
| 29 <sup>th</sup> March    | <p><b><u>Lesson 10 – Blood vessels</u></b></p> <p>The body contains three different types of blood vessel:</p> <ul style="list-style-type: none"> <li>• arteries</li> <li>• veins</li> <li>• capillaries.</li> </ul> <p>Students should be able to explain how the structure of these vessels relates to their functions.</p>   |  |

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| Easter Holiday         |   |  |
| 19 <sup>th</sup> April | <p><b><u>Lesson 11 - Blood</u></b><br/>Blood is a tissue consisting of plasma, in which the red blood cells, white blood cells and platelets are suspended.</p> <ul style="list-style-type: none"> <li>•Plasma transports proteins and other chemical substances around the body.</li> <li>•Red blood cells contain haemoglobin which binds to oxygen to transport it from the lungs to the tissues.</li> <li>•White blood cells help to protect the body against infection.</li> <li>•Platelets are fragments of cells which initiate the clotting process at wound sites.</li> </ul> <p>Students should be able to recognise different types of blood cells in a photograph or diagram, and explain how they are adapted to their functions.</p>  |  |
| 26 <sup>th</sup> April | <p><b><u>Lesson 12 Coronary heart disease</u></b><br/>In coronary heart disease layers of fatty material build up inside the coronary arteries, narrowing them. This reduces the flow of blood through the coronary arteries, resulting in a lack of oxygen for the heart muscle.</p> <p>Stents are used to keep the coronary arteries open.<br/>Statins are widely used to reduce blood cholesterol levels which slow down the rate of fatty material deposit.<br/>In some people heart valves may become faulty, preventing the valve from opening fully, or the heart valve might develop a leak.</p> <p>Students should understand the consequences of faulty valves. Faulty heart valves can be replaced using biological or mechanical valves.<br/>In the case of heart failure a donor heart, or heart and lungs can be transplanted. Artificial hearts are occasionally used to keep patients alive whilst waiting for a heart transplant, or to allow the heart to rest as an aid to recovery.</p>   |  |
| 3 <sup>rd</sup> May    | <p><b><u>Lesson 13 Health Issues</u></b><br/>Students should recall that many non-communicable diseases are caused by the interaction of a number of factors (to include cardiovascular disease, some lung and liver diseases and diseases influenced by nutrition, including Type 2 diabetes).<br/>Risk factors are linked to an increased rate of a disease.<br/>They can be:</p> <ul style="list-style-type: none"> <li>•aspects of a person's lifestyle</li> <li>•substances in a person's body or environment.</li> </ul> <p>A causal mechanism has been proven for some risk factors, but not in others:</p> <ul style="list-style-type: none"> <li>•The effects of diet, smoking and exercise on cardiovascular disease.</li> <li>•Obesity as a risk factor for Type 2 diabetes.</li> <li>•The effect of alcohol on the liver and brain function.</li> <li>•The effect of smoking on lung disease and lung cancer.</li> <li>•The effects of smoking and alcohol on unborn babies.</li> <li>•Carcinogens, including ionising radiation, as risk factors in cancer.</li> </ul> |  |
| 10 <sup>th</sup> May   | <p><b><u>Lesson 14 – Cancer</u></b><br/>Benign tumours and malignant tumours result from uncontrolled cell division.</p>  |  |

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|                       | <p>Malignant tumour cells are cancers. They invade neighbouring tissues and spread to different parts of the body in the blood where they form secondary tumours.</p> <p>Scientists have identified lifestyle risk factors for various types of cancer, including smoking, obesity, common viruses and UV exposure.</p> <p>There are also genetic risk factors for some cancers.</p>   |                  |
| 17 <sup>th</sup> May  | AR2 Assessment<br>DDI Wave 1   | AR 2 ASSESSMENTS |
| 24 <sup>th</sup> May  | DDI Wave 2<br>Reassessment   | AR 2 ASSESSMENTS |
|                       |  |                  |
| 7 <sup>th</sup> June  | <p><b><u>Lesson 15 - Plant tissues and organs</u></b></p> <p>. Plant tissues include:</p> <ul style="list-style-type: none"> <li>•epidermal tissues, which cover the plant</li> <li>•palisade mesophyll, which carries out photosynthesis</li> <li>•spongy mesophyll, which has air spaces for diffusion of gases</li> <li>•xylem and phloem, which transport substances around the plant</li> <li>•meristem tissue found at the growing tips of shoots and roots which will differentiate into different plant cells.</li> </ul> <p>The leaf is a plant organ. The structures of tissues in the leaf are related to their functions.</p> <p>Knowledge limited to epidermis, palisade and spongy mesophyll, xylem and phloem and guard cells.</p>  |                  |
| 14 <sup>th</sup> June | <p><b><u>Lesson 16 – Plant organ system – the stem</u></b></p> <p>Students should be able to explain the effect of changing temperature, humidity, air flow and light intensity on the rate of transpiration.</p> <p>Xylem tissue transports water and mineral ions from the roots to the stems and leaves. It is composed of hollow tubes strengthened by lignin adapted for the transport of water in the transpiration stream.</p> <p>Phloem tissue transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage. The movement of food through phloem tissue is called translocation.</p> <p>Phloem is composed of tubes of elongated cells. Cell sap can move from one phloem cell to the next through pores in the end walls. Detailed structure of phloem tissue or the mechanism of transport is not required.</p> |                  |
| 21 <sup>st</sup> June | <p><b><u>Lesson 17 – The roots</u></b></p> <p>Root hair cells are adapted for the efficient uptake of water by osmosis and mineral ions by active transport.</p>   |                  |
| 28 <sup>th</sup> June | <p><b><u>Lesson 18 - Stomata</u></b></p> <p>The role of stomata and guard cells is to control gas exchange and water loss</p>  |                  |
| 5 <sup>th</sup> July  | <p><b><u>TOPIC 4.3 INFECTION AND RESPONSE</u></b></p> <p><b><u>Lesson 1 Communicable diseases</u></b></p> <p>Students should be able to explain how diseases caused by viruses, bacteria, protists and fungi are spread in animals and plants.</p> <p>Pathogens are microorganisms that cause infectious disease. Pathogens may be viruses, bacteria, protists or fungi. They may infect plants or animals and can be spread by direct contact, by water or by air.</p> <p>Bacteria and viruses may reproduce rapidly inside the body.</p>   |                  |

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| 12 <sup>th</sup> July   | <p><b><u>Lesson 2 – Preventing the spread of disease</u></b></p> <p>The spread of diseases can be reduced or prevented by:</p> <ul style="list-style-type: none"> <li>•simple hygiene measures</li> <li>•destroying vectors</li> <li>•isolation of infected individuals</li> <li>•vaccination</li> </ul> |  |
| 19 <sup>th</sup> July<br>(School closed from 22 <sup>nd</sup> ) | Consolidation and review   |  |

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