

Course Overviews DP , UWC Thailand 2017-2018

All units taught in grades 11 and 12 are continuously being developed and improved to best meet the needs of the students at UWCT. Therefore, the following overview is only a reflection of current plans for the course. Some changes to these course overviews may occur as a result of planning done throughout the academic year.

Grade	Time Frame	Topic number and title	Approaches To learning skills taught / learnt / developed in this unit	Content (topics / knowledge/ subject specific skills)	Connections to TOK	Summative assessment
11		1.1 Introduction to cells 1.2 Ultrastructure of cells 1.3 Membrane structure 1.4 Membrane transport 1.5 The origin of cells 1.6 Cell Division	Thinking and Research: - The study of cells has given the scientific world a lot of power to manipulate these cells. - Thinking about the possible negative outcomes of failing to have checks and balances on this research may have long lasting implications. - Understanding the cell processes through experiments and research is invaluable in the cell study of cell biology.	<ul style="list-style-type: none"> The evolution of multicellular organisms allowed cell specialization and cell replacement. Eukaryotes have a much more complex cell structure than prokaryotes. The structure of the biological membranes makes them fluid and dynamic. Membranes control the composition of cells by active and passive transport. There is an unbroken chain of life from the first cells on Earth to all cells in organisms alive today. Cell division is essential but must be controlled. 	- It is important to understand that current knowledge of biology is directly related to the scientific studies of past experiments. - Is there a distinction between knowledge gained by personal observation and knowledge gained with the help of technology? - Looking at biology through a systems approach may help to create a framework of understanding this subject.	- Quiz - End of unit test - IA on both cell ultrastructure and osmosis.
11		2.1 Molecules to metabolism 2.2 Water 2.3 Carbohydrates and lipids 2.4 Proteins 2.5 Enzymes	Self Management and Thinking: - This section has many diagrams to remember. Students will need to manage their time accordingly to allow time to memorize and understand the drawings. - Once the drawings are memorized, the students must think as to why the structure may affect the property of the molecule.	<ul style="list-style-type: none"> Living organisms control their composition by a complex web of chemical reactions. Water is the medium for life. Compounds of carbon, hydrogen, and oxygen are used to supply and store energy. Proteins have a very wide range of functions in living organisms. Enzymes control the metabolism of the cell. 	- The structure of molecules continually get shared and this sharing allows for further growth in the understanding of how molecules interact with one another. - There are conflicting views as to the harms and benefits of fats in diets. How do we decide between competing views? - Development of some techniques benefits particular human populations more than others. For example, the development of lactose-free milk available in Europe and North America would have greater benefit in	- Quiz - Test - IA on both the properties of water and on the function of enzymes.

					Africa/Asia where lactose intolerance is more prevalent. The development of techniques requires financial investment. Should knowledge be shared when techniques developed in one part of the world are more applicable in another?	
11		<p>2.6 Structure of DNA and RNA</p> <p>2.7 DNA Replication, Transcription, and Translation</p> <p>7.1 DNA structure and replication</p> <p>7.2 Transcription and gene expression</p> <p>7.3 Translation</p>	<p>Communication and Thinking:</p> <ul style="list-style-type: none"> - Students will need to understand how the simplicity of DNA can create the complexity of protein molecules. - Students will learn how communication among many scientists allowed the discovery of the structure of the DNA molecule. 	<ul style="list-style-type: none"> • The structure of DNA allows efficient storage of genetic information. • Genetic information in DNA can be accurately copied and can be translated to make the proteins needed by the cell. • The structure of DNA is ideally suited to its function. • Information stored as a code in DNA is copied onto mRNA. • Information transferred from DNA to mRNA is translated into an amino acid sequence. 	<p>- The story of the elucidation of the structure of DNA illustrates that cooperation and collaboration among scientists exists alongside competition between research groups. To what extent is research in secret 'anti-scientific'? What is the relationship between shared and personal knowledge in the natural sciences?</p> <p>- Highly repetitive sequences were once classified as "junk DNA" showing a degree of confidence that it had no role. To what extent do the labels and categories used in the pursuit of knowledge affect the knowledge we obtain?</p> <p>- The nature versus nurture debate concerning the relative importance of an individual's innate qualities versus those acquired through experiences is still under discussion. Is it important for science to attempt to answer this question?</p>	<p>Quiz</p> <p>Test</p> <p>Diagrams of nucleic acids and processes</p>

11		<p>2.8 Cell Respiration 2.9 Photosynthesis 8.1 Metabolism 8.2 Cell Respiration 8.3 Photosynthesis</p>	<p>Thinking, Collaboration, and Research - In small groups, students will use a photosynthesis or respiration lab as their first lab to complete a full IA from start to finish. This will take many ATL skills to complete successfully.</p>	<ul style="list-style-type: none"> • Metabolic reactions are regulated in response to the cell's needs. • Cell respiration is a series of Redox Reactions which eventually uses the electrons from the reactions to run an electron transport chain. This chain is the main creator of energy. • The different parts of cellular respiration occur in different parts of the cell and in different parts of the mitochondria. • Oxygen is important because it is the final electron receptor in cellular respiration. • Photosynthesis is the basis of most food webs. • Photosynthesis has light dependent and light independent reactions. Light is needed to break down water into oxygen gas, Hydrogen ions, and electrons. • Different areas of the chloroplast are responsible for different pathways. 	<p>- Many metabolic pathways have been described following a series of carefully controlled and repeated experiments. To what degree can looking at component parts give us knowledge of the whole? - Peter Mitchell's chemiosmotic theory encountered years of opposition before it was finally accepted. For what reasons does falsification not always result in an immediate acceptance of new theories or a paradigm shift?</p>	<p>Quiz Test IA on both respiration and photosynthesis</p>
11		<p>3.1 Genes 3.2 Chromosomes 3.3 Meiosis 10.1 Meiosis 3.4 Inheritance 10.2 Inheritance 3.5 Genetic Modification and biotechnology</p>	<p>Thinking and Research Skills How reliable is DNA analysis for convictions as the only evidence for conviction? Cancer is caused by genetic mutations. How is research changing to understand how much of the genetic mutations are caused by environmental vs. natural causes?</p>	<ul style="list-style-type: none"> • A gene is made up of two alleles and each allele codes for a protein. • The genome is the whole of the genetic information of an organism. • Homologous chromosomes carry the same gene sequence but not necessarily the the same alleles of those genes. When these homologous chromosomes come together, they cross over and this leads to variation. • Many genetic diseases are caused by two recessive alleles coming together. Reproduction between two similar individuals leads to a higher chance of the disease to be expressed. • Genetic modification is one of the most powerful biotechnology subjects in science and rules are needed when this is used. • Meiosis leads to independent assortment of chromosomes and unique composition of alleles in daughter cells. • Genes may be linked or unlinked and are inherited accordingly. 	<p>- There is a link between sickle cell anemia and prevalence of malaria. How can we know whether there is a causal link in such cases or simply a correlation? - In 1922 the number of chromosomes counted in a human cell was 48. This remained the established number for 30 years, even though a review of photographic evidence from the time clearly showed that there were 46. For what reasons do existing beliefs carry a certain inertia? - Mendel's theories were not accepted by the scientific community for a long time. What factors would encourage the</p>	<p>Quiz Test Punnett Squares and Pedigree charts</p>

					<p>acceptance of new ideas by the scientific community?</p> <ul style="list-style-type: none"> - The use of DNA for securing convictions in legal cases is well established, yet even universally accepted theories are overturned in the light of new evidence in science. What criteria are necessary for assessing the reliability of evidence? - The law of independent assortment was soon found to have exceptions when looking at linked genes. What is the difference between a law and a theory in science? 	
11		<p>5.1 Evidence for evolution 5.2 Natural Selection 5.3 Classification of biodiversity 5.4 Cladistics 10.3 Gene pools and speciation</p>	<p>Collaboration Skills - working together at an aquarium field trip to identify organismal classification</p> <p>Thinking skills - Science and its theories are always changing as new knowledge is gained from experimentation. How can this be seen as a strength of science and not a weakness?</p>	<ul style="list-style-type: none"> • There is overwhelming evidence for the evolution of life on Earth. • The diversity of life has evolved and continues to evolve by natural selection. • Species are named and classified using an internationally agreed system. • The ancestry of groups of species can be deduced by comparing their base or amino acid sequences. • Gene pools change over time 	<p>- Evolutionary history is an especially challenging area of science because experiments cannot be performed to establish past events or their causes. There are nonetheless scientific methods of establishing beyond reasonable doubt what happened in some cases. How do these methods compare to those used by historians to reconstruct the past?</p> <p>- Punctuated equilibrium was long considered an alternative theory of evolution and a challenge to the long established paradigm of Darwinian gradualism. How do paradigm shifts proceed in science and what factors are involved in their success?</p>	<p>Quiz Test Classification Activity with field trip</p>

11		<p>4.1 Species, Communities, and Ecosystems 4.2 Energy Flow 4.3 Carbon Recycling 4.4 Climate Change</p>	<p>Students will need to build connections between humans' need for resources and the environmental implications of getting these resources unsustainably.</p> <p>Students will need to research what should be used in the mesocosm to make it sustainable.</p>	<ul style="list-style-type: none"> • The continued survival of living organisms including humans depends on sustainable communities. • Ecosystems require a continuous supply of energy to fuel life processes and to replace energy lost as heat. • Continued availability of carbon in ecosystems depends on carbon cycling. • Concentrations of gases in the atmosphere affect climates experienced at the Earth's surface. 	<p>- The precautionary principle is meant to guide decision-making in conditions where a lack of certainty exists. Is certainty ever possible in the natural sciences?</p>	<p>Quizzes Tests Mesocosm IA</p>
11		<p>9.1 Transport in the xylem of plants 9.2 Transport in the phloem of plants 9.3 Growth in plants 9.4 Reproduction in plants</p>	<p>Thinking, Communication, and Self management: This unit requires a lot of time in the lab. Students will need to be able to design experiments, gather data, and analyze the data all while learning about the biology of plants.</p>	<ul style="list-style-type: none"> • The structure and function of the xylem. • The structure and function of the phloem. • Plants adapt their growth to environmental conditions using the meristems and hormones. • Reproduction in plants is influenced by the environment and mutualism with animals is typically necessary. 	<p>Plants have been shown to communicate with each other using a network of fungi. Do different species of plant have different ways to communicate?</p>	<p>Lab on plant transpiration Quiz Tests</p>
12		<p>6.1 Digestion and absorption 6.2 The blood system 6.3 Defense against infectious diseases 6.4 Gas exchange 6.5 Neurons and synapses 6.6 Hormones, homeostasis and reproduction</p>	<p>Thinking: Students will need to think about cellular processes to understand organs and systems. Thinking: Students will have to think on how models can be used to help understand each of the systems. Research: Students will also have to do a lot of their own research to better learn about the systems using library resources.</p>	<ul style="list-style-type: none"> • The structure of the wall of the small intestine allows it to move, digest, and absorb food. • The blood system continuously transports substances to cells and simultaneously collects waste products. • The human body has structures and processes that resist the continuous threat of invasion by pathogens. • The lungs are actively ventilated to ensure that gas exchange can occur passively. • Neurons transmit the message, synapses modulate the message. • Hormones are used when signals need to be widely distributed. 	<p>- Our current understanding is that emotions are the product of activity in the brain rather than the heart. Is knowledge based on science more valid than knowledge based tuition?</p>	<p>Quizzes Tests</p>
12		<p>11.1 Antibody production and vaccination 11.2 Movement 11.3 The kidney and osmoregulation 11.4 Sexual reproduction</p>	<p>Self Management: This section on animal physiology is difficult to add labs and activities to help understand the topic. Thinking: Students will need to think about lessons learned in unit 6 (human physiology) to understand organs and systems.</p>	<ul style="list-style-type: none"> • Immunity is based on recognition of self and destruction of foreign material. • The roles of the musculoskeletal system are movement, support and protection. • All animals excrete nitrogenous waste products and some animals also balance water and solute concentrations. 	<p>How can it be proven that mother's breast milk will prove to be much better for a growing child than powdered product?</p>	<p>Quizzes Tests</p>

			Thinking: Students will have to think on how models can be used to help understand each of the systems.	<ul style="list-style-type: none">Sexual reproduction involves the development and fusion of haploid gametes.		
		Add PSOW - have labe in overview Add ATL Add TOK link				