Curriculum overview for BIOLOGY, HIGHER LEVEL, 3mn, School Year 2019/2020 Teacher: Mihaela Marceljak Ilić

Unit title / Month	Key concept(s)	Content	Objectives / Learning outcomes	Assessment tasks	ATL skills	Sources	Links to other subjects
Unit 1, Molecular biology (Core) Sep, Oct, Nov 2019	Living organisms control their composition by a complex web of chemical reactions -Water is the medium for life -Compound of carbon, hydrogen and oxygen are used to store and supply energy -Proteins have a very wide range of functions in living organisms -Enzymes control cell metabolism -The structure of DNA allows efficient storage of genetic information - Cell respiration supplies energy -Photosynthesis uses light energy to produce chemical energy needed for life	Molecules to metabolism -Structure of water molecule, polarity -Carbohydrates & lipids: structure and function in living beings -Formation of polypeptides; variability of polypeptides; uniqueness of the proteome, denaturation of proteins -Enzymes as biocatalysts; factors affecting enzymatic activity -Nucleic acids = nucleotide polymers; DNA vs.RNA -DNA replication, transcription and translation	All processes inside org are coordinated, and interconnected -Water has properties that make it useful for life maintenance -Carbohydrate and lipids functions -Proteins functions -Lock and key model of enzymatic activity; Understand how the DNA and RNA structure enables efficient storage of genetic information Understand how the precision of the DNA coping accounts for stability of genetic info; the expression of genes -Recognise basic steps along cell respiration; advantages and disadvantages of aerobic and anaerobic respiration	Practical work: testing water thermal properties; debate: testing claims about use of saturated & trans fats in diet -Modelling polypeptide struct.variability -Using molecular software -experiment: testing the rate of enzymatic reaction -Experiment: DNA isolation from plant tissue -Models, DNA, -Experiment: constructing respirometer and monitoring cell respiration rate; Experiment: Quizzes End of topic exam	Thinking skills Research skill Social skills Scientific writing skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	Physics: Topic 2.3 Work, energy and power Physics: Topic 8.1 Energy sources Topic 8.2 Thermal energy transfer Chemistry: Topic C.2 Fossil fuels Topic C.5 Environmental impact global warming

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Unit 2. Nucleic acids (AHL) Nov 2019	Genetic information in DNA can be accurately copied and can be translated to make proteins needed for the cell, it can be also inhibited from those processes Or lost proper performance of it	DNA structure DNA replication, transcription and translation (details) and its control Methylation of DNA as a method of gene inactication Lac operon model Cancer developing	Understanding DNA structure DNA replication, transcription and translation (details) Understanding of methylation Understanding the way the cancer cells develop	DNA modelling Modeling lac operon model Quizzes End of topic exams	Thinking skills Research skill Social skills Scientific writing skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press	
Unit 3: <u>Cells</u> Dec. 2019.	The evolution of multicellular organisms allowed cell specialization and cell replacement Eukaryotes have a much more complex cell structure than prokaryotes	Cell theory; cell specialization and cell replacement Basic features of pro- and eukaryotic cell;	Understanding and questioning the cell theory and functions of life; understanding the limits to the cell size; importance of the stem cells Knowing the differences between pro- and eukaryotic cell and between animal and plant cell	Experiment: microscoping living cells Observing micrographs and determination of the cell type Plasma membrane model	Thinking skills Observations Practical skills Social skills Scientific writing skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014	Chemistry: lipids Carbohydrets Protein

	The structure of plasma membrane 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	Organisation and composition of plasma membrane Passive and active transport Hypothesis about the origin of cell; abiogenesis vs biogenesis Mitosis and the control of the cell cycle	Understanding how different components of the plasma membrane account for it function Comparing and distinguishing between the 2 types of transport in relation to the environment and type of the substance Endosymbiotic theory; importance of the Pasteur's experiment on our understanding of the origin of life Stages of mitosis; carcinogenesis	Experiment: investigation into the relationship between the SA and V of the cell Experiment : osmolarity Experiment : Mitotic index in healthy and tumor cells Quizzes End of unit test		Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	Psychology: core, biological level of analysis
Unit 3: <u>Genetics Jan, Feb</u> 2020.	Every living organism inherits a blueprint for life from its parents Chromosomes carry genes in a linear sequence that is shared by the members of a species	What is a gene (and allele) and its location on the chromosome? Mutations; Human genome Prokaryotic vs eukaryotic genome (and chromosomes);	Linking the chromosome and DNA structure to the term "gene" and "allele" developments in scientific research follow improvements in technology: gene sequencers used for the sequencing genes	Modelling gel electrophoresis Compering the genome sizes-making diagram	Research skills **Social skills**	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion,	Physics: electrical condictivity Chemistry: Topic C6 Electrochemistry Psychology: core, biological level of analysis

	Alleles segregate during meiosis allowing new combinations to be formed by the fusion of gametes The inheritance of genes follows patterns Biologists have developed techniques for artificial manipulation of DNA, cells and organisms	2n and n number of chromosomes; karyogram and karyotype; sex determination Process of meiosis Classical (Mendel's) genetics Genetic modification and biotechnology	Comparison of genome sizes among species Understanding the importance of meiosis in relation to the sexual reproduction Doing monohybrid and test cross; crossing involving multiple genes; heritable disorders in humans Understanding the principle of DNA manipulation (PCR, gel electrophoresis, cloning…)			Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	
Unit 4 Genetics and evolution (AHL)	Detailed alleles segregate during meiosis allowing new combinations to be formed by the fusion of gametes Reproductive and other isolation of population that can lead to speciation	Meiosis as a method of creating variations Gametes as a source of variation Importance of gene pool and divergence of species Isolation and speciation	Understanding the importance of meiosis in relation to the sexual reproduction And differing process in male and female organism Understanding that changing of allel frequencies can lead in change in population	Modelling phases of meiosis Modelling different type of septations Quizzes End of unit test	Thinking skills Observations Practical skills Social skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014	Chemistry: Topic C6 Electrochemistry Psychology: core, biological level of analysis

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Unit 5 Ecology Feb. May 2020.	The continued survival of living organisms depends on sustainable communities Ecosystems require a continuous supply of energy to fuel life processes Continued availability of carbon in ecosystems depends on carbon cycling Concentrations of gases in the atmosphere affects climates	Species communities and ecosystems Energy flow and trophic levels Carbon cycle and fossil fuels Climate change	Looking for patterns, trends and discrepancies (example: plants are mostly autotrophic but some are not) Use theories to explain natural phenomena (example: the concept of energy flow explains limited length of food chains) Making accurate, quantitative measurements (example: the concentration of gases in the atmosphere)	Practical work: setting up sealed mesocosms to try to establish sustainability G4 project: quadrat sampling End of unit test	Thinking skills Research skill G4 project: self-management skills (organization and affective skills), communication and social skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	Physics: Topic 2.3 Work, energy and power Physics: Topic 8.1 Energy sources Topic 8.2 Thermal energy transfer Chemistry: Topic C.2 Fossil fuels Topic C.5 Environmental impact global warming
Unit 6: Evolution and biodiversity April 2019	There is overwhelming evidence for the evolution of life on Earth The diversity of life has evolved and continues to evolve by natural selection	Evidence for evolution Natural selection Classification, determination and naming of species	Looking for patterns (example: common features in the bone structure of vertebrate limbs despite their varied use) Cooperation in science (example: scientists	Comparison of the pentadactyl limb of mammals, birds, amphibians and reptiles Construction of dichotomous keys for use in	Thinking skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course	Physics: Topic 7.1 Discrete energy and radioactivity

	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	Modern cladistics and changes in classification	use the binomial system rather than many different local names) Falsification of theories (example: plant families have been reclassified as a result of evidence from cladistics)	identifying specimens Creation of booklet about recognition features of four main phyla of plants and seven large phyla of animals Analysis of cladograms to deduce evolutionary relationships End of unit test		companion, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	
Unit 7 Metabolism (AHL) Apr. 2020.	Photosynthesis as source of energy and food Light dependent and independent processes	Energy conversion performed in chlorophyll; 2 stages of photosynthesis; rate of photosynthesis	Understanding steps of photosynthesis and limiting factors to its performance Understand processes involved in photosynthesis and it importance to living environment	Quizzes Experiment: pigment separation by TLC	Thinking skills Observations Practical skills Social skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014	Topic C.5 Environmental impact global warming

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Unit 8 Plants (AHL) Apr. may 2020.	Process of transpiration Structure of plant vessels in correlation to their structure Transport of water and food in palnts and it importance to food web Growth and flowering of the plat	Transpiration Tharnsport of water and nutrience in plants Tissue structure and function in plants Germination Flowering	Understanding hoe transpiration is connected to water transport in plants . Be able to corelate structure and function of plat vessels Develop understanding and respect to insect importance i plant pollination Deduce effect of day length onto flowering	Experiment: constructing potometar to test and monitor rate of water uptake caused by photosynthesis in different environment condition Quizzes End topic test Experiment: effect of water content onto seed germination	Thinking skills Observations Practical skills Social skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	Topic C.5 Environmental impact global warming

Curriculum overview for BIOLOGY, HIGHER LEVEL, 4mn, School Year 2019/2020 Teacher: Biljana Agotić Smital

Unit title / Month	Key concept(s)	Content	Objectives / Learning outcomes	Assessment tasks	ATL skills	Sources	Links to other subjects
Unit 1 Methabolism (AHL)	Cell respiration as source of energy	The detail processes of Aerobic and anaerobic cell respiration	Understanding the processes and importance of cell respiration for living organism	G4 project: Group collaboration	G4 project: self-management skills (organization and affective skills), communication and social skills	Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014	Topic C.5 Environmental impact global warming
Unit 2: <u>Human physiology</u> <u>December 2019,</u> January, February 2020	The structure of the digestive system allows it to move, digest and absorb food The blood system transports substances to cells and collects waste products The human body has mechanisms that resist the continuous threat of invasion by pathogens The lungs are actively ventilated to ensure that gas	The main structure of the digestive system and enzymes produced by it The blood system: arteries, veins, capillaries The heart Immunity (specific and non-specific) Gas exchange and lungs Neurons, synapses and nerve impulses (action potential) Hormones, diabetes and glucose in blood	Use models (example: dialysis tubing can be used to model absorption in the intestine) Theories are regarded as uncertain (example: William Harvey overturned theories on movement of blood in the body) Obtain evidence for theories (example: epidemiological studies have contributed to our understanding of the causes of lung cancer)	Design an experiment to model absorption of digested food in the intestine Practical task: identification of tissue layers viewed with a microscope Monitoring of ventilation in humans at rest and after mild and vigorous exercise (practical work) End of unit test	Research skills Social skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Allott, A., Mindorff, D. : Biology course companion, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	Chemistry: Topic D2 Aspirin and penicillin Physics: Topic 3.2 Modelling a gas Chemistry: Topic C6 Electrochemistry Psychology: core, biological level of analysis

	exchange can occur passively Neurons transmit the message, synapses modulate the message Hormones are used when signals need to be widely distributed	Hormones and appetite control: obesity, hormones and circadian rhythms, jet lag, hormones + reproductive system, puberty and menstrual cycle	Risk associated with scientific research (ex.: Florey and Chain's tests on the safety of penicillin would not be compliant with current protocol on testing)	End of unit test	Thinking skills Observations Practical skills Social skills		
Unit 4 <u>Animal physiology</u> (AHL) March 2020.	Antibody production and importance of vaccination Aid of antibodies in destruction of phagocytes Developing allergies Synergy of bones , muscles, nerves and minerals in motion of organism Importance of osmoregulation Sexual reproduction and	Immune systems Antibody production Bones and muscles structures and function Urinary system Reproductive system; oogenesis and spermatogenesis	Immune system task and the way it function in the development of protection against pathogens. Debate about pro and contra effect of vaccination. Understand importance of synergy between skeletal, muscular and nerve system in body motion. Understand pattern of reproductive cells development	Quizzes Micro scoping blood cells End of unit test	Thinking skills Observations Practical skills Social skills		

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Unit 5: Option D: Human physiology March 2020	A balanced diet is essential to human health Digestion is controlled by nervous and hormonal mechanisms The chemical composition of the blood is regulated by the liver Internal and external factors influence heart function	Nutrients and obesity, Digestive juices, acid indigestion, ulcers Structure and function: how is the small intestine adapted for the absorption of food liver structure + functions The heart: structure, stimulation of ventricular contractions, heart sounds, causes and consequences of hypertension and thrombosis	Serendipity and scientific discov. (ex.: the role of gastric acid established by W. Beaumont) Educating the public on scient. claims (ex.: HDL could be 'good' cholesterol) Developments in science followed imp. in techn. (ex.: stethoscope invention led to improved knowledge of the workings of the heart)	Task:databases use of nutritional content of foods + software to calculate intakes of essential nutrients from a daily diet, analyse normal ECG trace Identification of exocrine gland cells, villus epithelium + other tissues of digestive system from electron micrograph End of unit test	Thinking skills Communication skills	Allott, A.: Biology for the IB diploma, study guide, Oxford University Press, 2014 Walpole, Brenda: Biology for the IB Diploma, Cambridge University Press, 2014	Chemistry: Topic B.5 Vitamins Topic D4 pH regulation of stomach

Aditional Sources:

https://questionbank.ibo.org/
http://bioknowledgy.weebly.com
http://ib.bioninja.com.au/
http://i-biology.net
https://www.youtube.com/user/SCScienceVid
https://quizlet.com/
http://highered.mheducation.com/
https://learn.genetics.utah.edu/
https://new.edmodo.com/home
http://jmol.sourceforge.net/
http://highered.mheducation.com/sites/0072421975/pter19/multiple_choice_quiz.html
https://quickquiz.me/
www.kahoot.com
https://www.youtube.com/
https://www.ncbi.nlm.nih.gov/genome/