

2019 Year Four Biology Curriculum Outline (IP)

Term/Week	Topic	Objectives	Assignments / Assessment / Website Resources
Term 1 Week 1 – Week 2	<p>11 Excretion</p> <p>Essential idea: All animals excrete nitrogenous waste products and some animals also balance water and solute concentrations.</p>	<ul style="list-style-type: none"> ▪ Define excretion as the removal of toxic materials and the waste products of metabolism from organisms ▪ Outline the function of kidney tubules with reference to ultra-filtration & selective reabsorption in the production of urine ▪ Outline the role of anti-diuretic hormone in the regulation of osmotic concentration ▪ Describe dialysis in kidney machines as the diffusion of waste products and salts (small molecules) through a membrane. Large molecules (e.g. protein) remain in the blood ▪ Describe the different types of nitrogenous wastes ▪ Discuss peritoneal dialysis and its preferred use in certain groups of people. ▪ Outline other factors affecting regulation of water potential in urine (alcohol, caffeine, aldosterone, increased blood pressure) ▪ Describe the formation and effect of kidney stones. 	<p>Worksheet Biology Matters Workbook Worksheet 10: Excretion</p> <p>Practical Practical 13 – Kidney dissection</p> <p>Website Resources</p> <p>youtube.com/watch?v=DNJosKX_PmA</p> <p>youtube.com/watch?v=PP--C18mMs0</p>

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<p>Term 4 Week 3 – Week 4</p>	<p>12 Homeostasis</p> <p>Essential idea: Human body actively maintain fairly stable conditions necessary for survival.</p>	<ul style="list-style-type: none"> ▪ Define homeostasis as the maintenance of a constant internal environment ▪ Explain the basic principles of homeostasis in terms of stimulus resulting from a change in the internal environment, a corrective mechanism & a negative feedback ▪ Identify on a diagram of the skin and name: hairs, sweat glands and blood vessels ▪ Describe the maintenance of a constant body temperature in Man in terms of the role of: temperature receptors in the skin, sweating, shivering, blood vessels near the skin surface and the co-ordinating role of the brain. 	<p>Theory</p> <p>Worksheet Biology Matters Workbook Worksheet 11: Homeostasis</p> <p>Practical Practical 14 – Temperature regulation</p> <p>TOK: Discuss if race or ethnicity is only skin-deep, based on the amount of melanin present</p>
<p>Term 1 Week 4 – Week 6</p>	<p>15 Hormones</p>	<ul style="list-style-type: none"> ▪ define a hormone as a chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs and is then destroyed by the liver ▪ explain what is meant by an endocrine gland, with reference to the islets of Langerhans in the pancreas ▪ state the role of hormone adrenaline in boosting blood glucose levels and give examples of situations in which this may occur ▪ explain how the blood glucose concentration is regulated by insulin and glucagon as a homeostatic mechanism ▪ describe the signs (increase blood glucose level, glucose in urine) and treatment (administration of insulin) of diabetes mellitus 	<p>Theory</p> <p>Level 1 W12 Biology Matters Workbook Section A: Q8-12 Section B: Q4, Q5</p> <p>Presentation – to give examples to relate the functions of various hormones in humans / animals / plants</p>

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<p>Term 1 Week 7 - Week 8</p>	<p>13 The Nervous System</p>	<ul style="list-style-type: none"> • State that the nervous system – brain, spinal cord and nerves, serves to coordinate and regulate bodily functions. • outline the functions of sensory neurones in relaying information from receptors to the brain and/or spinal cord, relay neurones in transferring information to other parts of the brain and/or spinal cord and motor neurones in relaying information to muscles and glands • discuss the function of the brain and spinal cord in producing a coordinated response as a result of a specific stimulus (reflex action & voluntary action) • state the relationship between receptors, the central nervous system and the effectors • IP: Discuss conditioned reflex using Pavlov’s Experiment. 	<p>Level 1 W12 Biology Matters Workbook Section A: Q1-4 Section B: Q 1 Section C: Q1, 2a</p> <p>IP: Conditioned reflex: Video: http://study.com/academy/lesson/conditioned-response-definition-examples.html</p>
<p>Term 1 Week 9 - Week 10</p>	<p>14 The Human Eye</p>	<ul style="list-style-type: none"> ▪ describe the gross structure of the eye as seen in front view and in horizontal section ▪ state the principal function of component parts of the eye in producing a focused image of near and distant objects on the retina ▪ describe the pupil reflex in response to bright and dim light ▪ IP: Explore eye medical conditions: Cataract, Glaucoma and retinal damage. 	<p>Theory</p> <p>Level 1 W12 Biology Matters Workbook Section A: Q5-7 Section B: Q2, Q3 Section C: Q2b, 2c</p> <p>Practical Level 1 Inv. 12.1 Inv. 12.2</p>

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Term 2 Week 1 - Week 3	<p>16 Cell Division: Mitosis & Meiosis</p> <p>Essential idea: Cell division is essential but must be controlled</p>	<ul style="list-style-type: none"> • State the importance of mitosis in growth, repair and asexual reproduction • Explain the need for the production of genetically identical cells and fine control of replication • Identify, with the aid of diagrams, the main stages of mitosis • State what is meant by homologous pairs of chromosomes • Identify, with the aid of diagrams, the main stages of meiosis (Names of sub-divisions of prophase are not required) • Define the terms haploid and diploid, and explain the need for reduction division process prior to fertilization in sexual reproduction • State how meiosis and fertilization can lead to variation <p>IP: Research on mutations due to ploidy conditions, cancerous tumors arise as a result of uncontrolled mitotic cell division and that these can occur in any organ and <i>to explore metastasis and formation of secondary cancers, e.g. brain and heart cancers; to explore how cancer kills its victim</i></p>	<p>Theory</p> <p>Q 1 - 4 Pg 351, TB.</p> <p>Level 1 W13 Biology Matters Workbook</p> <p>IP: mutations due to ploidy conditions: https://www.youtube.com/watch?v=GfxJi2BUvNI</p>

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Term 2 Week 3 - Week 5	17 Asexual Reproduction in Plants 17 Sexual Reproduction in Plants	<ul style="list-style-type: none"> • Define asexual reproduction as the process resulting in the production of genetically identical offspring from one parent • Define sexual reproduction as the process involving the fusion of nuclei to form the zygote and the production of genetically dissimilar offspring • Identify and draw, using a hand lens if necessary, the sepals, petals, stamens and carpels of one, locally available, named, insect-pollinated, dicotyledonous flower, and examine the pollen grains under a microscope • State the functions of the sepals, petals, anthers and carpels • Use a hand lens to identify and describe the anthers and stigmas of one, locally available, named, wind-pollinated flower, and examine the pollen grains under a microscope • Outline the process of pollination and distinguish between self-pollination and cross-pollination • Compare, using fresh specimens, an insect-pollinated and a wind-pollinated flower • Describe the growth of the pollen tube and its entry into the ovule followed by fertilisation (production of endosperm and details of development are not required) 	<p>Theory</p> <p>Assignment :</p> <p>Worksheet W16 – Reproduction in Plants</p> <p>Q 1 – 3 Pg 310, TB.</p> <p>TOK: The idea of humans exploiting plants as a source of food can be re-looked from a plant's perspective: Does the cultivation of food plants; genetic modifications of plant genome (e.g. Bt toxin plants), plant based economy (agricultural, horticultural exports), heroin and neuro-active plant derivatives suggest that plants are exploiting humans by meeting human's need for food, pleasure, money?</p>

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Term 2 Week 5 - Week 7	18 Sexual Reproduction in man	<ul style="list-style-type: none"> • Describe the growth of the pollen tube and its entry into the ovule followed by fertilisation (production of endosperm and details of development are not required) • Identify on diagrams of the male reproduction system and give the functions of : testes, scrotum, sperm ducts, prostate gland, urethra & penis • Identify on diagrams of the female reproduction system and give the functions of : ovaries, oviducts, uterus, cervix and vagina • Compare male and female gametes in terms of size, number and mobility • Describe the menstrual cycle with reference to the alternation of menstruation and ovulation, the natural variation in its length, and the fertile and infertile phase of the cycle with reference to the effects of progesterone and estrogen only. • Describe fertilization and early development of the zygote simply in terms of the formation of a ball of cells which becomes implanted in the wall of the uterus. • State the functions of the amniotic sac and the amniotic fluid • Describe the function of the placenta and umbilical cord in relation to exchange of dissolved nutrients, gases and excretory products. (structural details are not required) <p>Discuss the spread of human immunodeficiency virus (HIV) and methods by which it may be controlled</p>	<p>Theory</p> <p>Assignment :</p> <p>Worksheet W17 – Reproduction in Man</p> <p>Q 1 - 4 Pg 334, TB.</p> <p>TOK: Discuss the potential risks inherent in IVF protocols as well as the societal and cultural implications of offspring gender selection services provided by some fertility clinics in Thailand</p> <p>TOK: Discuss Singapore’s population circa 1970, when the government encouraged women, especially lowly educated women to undergo tubal ligation.</p>

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Term 2 Week 8 – Week 10	<p>19 Inheritance Chromosomes and genes</p> <p>Essential ideas: Every living organism inherits a blueprint for life from its parents.</p> <p>The inheritance of genes follows patterns</p>	<ul style="list-style-type: none"> • define a gene as a unit of inheritance and distinguish clearly between the terms gene and allele • explain the terms dominant, recessive, codominant, homozygous, heterozygous, phenotype and genotype • state that genes are carried on chromosomes • predict the results of simple crosses with expected ratios of 3:1 and 1:1, using the terms homozygous, heterozygous, F1 generation, F2 generation • explain why observed ratios often differ from expected ratios, especially when there are small numbers of progeny • use genetic diagrams to solve problems involving monohybrid inheritance (Genetic diagrams involving autosomal linkage or epistasis are not required) 	<p>Theory</p> <p>Level 1 W19</p> <p>Q 2 - 5 Pg 377, TB.</p> <p>Practical</p> <p>Level 1</p> <p>Inheritance of seed colours in corn cobs.</p>

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Term 3 Week 1 – Week 2	19 Inheritance Chromosomes and genes	<ul style="list-style-type: none"> • explain codominance & multiple alleles by reference to the inheritance of the ABO blood group phenotypes (A, B, AB, O, gene alleles IA, IB and IO) • describe the determination of sex in Man (XX and XY chromosomes) • describe mutation as a change in the structure of a gene (sickle cell anaemia) or in the chromosome number (Down’s syndrome) 	<p>Theory</p> <p>Level 1 Q 1 & 2 Pg 293, TB.</p> <p>Level 1 W16 Biology Matters Workbook Section A: Q1 – 8 Section B: Q1, 2 & 4 Section C: Q1, 2</p> <p>TOK: Is there any basis for Mr Lee Kuan Yew’s view that graduate parents will conceive intellectually better endowed offspring? (Eugenics) Conversely, do convicted murders produce homicidal offspring? (Nature Vs Nurture debate)</p> <p>IP: Interdisciplinary Science Project launch. Project to be submitted for term 3 assessment.</p>

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Term 3 Week 3	19 Variation	<ul style="list-style-type: none"> • describe mutation as a change in the structure of a gene (sickle cell anaemia) or in the chromosome number (Down's syndrome) • name radiation and chemicals as factors which may increase the rate of mutation. • describe the difference between continuous and discontinuous variation and give examples of each • state that competition leads to differential survival of , and reproduction by those organisms best fitted to the environment • give examples of environmental factors that act as forces of natural selection • assess the importance of natural selection as a possible mechanism for evolution • give examples of artificial selection in the production of economically important plants and animals 	<p>Theory</p> <p>Q 2 - 5 Pg 377, TB.</p> <p>Level 1 W16 Biology Matters Workbook Section A: Q9 – 12 Section C: Q3</p>

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Term 3 Week 4 – Week 6	<p>20 Molecular Genetics</p> <p>Essential idea: Genetic information in DNA can be accurately copied and can be translated to make the proteins needed by the cell.</p>	<ul style="list-style-type: none"> • outline the relationship between DNA, genes & chromosomes • state the structure of DNA in terms of the bases, sugar and phosphate groups found in each of their nucleotides • state the rule of complementary base pairing • state that DNA is used to carry the genetic code, which is used to synthesise specific polypeptides • state that each gene is a sequence of nucleotides, as part of a DNA molecule • explain that genes may be transferred between cells (reference should be made to transfer between organisms of the same or different species) • briefly explain how a gene that controls the production of human insulin can be inserted into bacterial DNA to produce human insulin in medical biotechnology • IP: outline the process of large-scale production of insulin using fermenters • discuss the social & ethical implications of genetic engineering, with reference to a named example 	<p>Theory</p> <p>Level 1 Q 1 & 2 Pg 388, TB.</p> <p>Q 1 - 5 Pg 399 TB</p> <p>Level 1 W16 Biology Matters Workbook Section A: Q13, 14 Section B: Q3 Section B: Q4</p>

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Term 3 Week 7 – Week 8	<p>21 Energy flow</p> <p>Food chains and food webs</p> <p>Carbon cycle</p> <p>Essential idea: Ecosystems require a continuous supply of energy to fuel life processes and to replace energy lost as heat</p>	<ul style="list-style-type: none"> ▪ Briefly describe the non-cyclical nature of energy flow ▪ Explain the terms producers, consumers, & trophic level in the context of food chains & food webs ▪ Explain how energy losses occur along food chains, & discuss the efficiency of energy transfer between trophic levels ▪ Describe how carbon is cycled within an ecosystem 	<p>Level 1 W17 Biology Matters Workbook</p>
Term 3 Week 9 – Week 10	<p>22 Effects of Man on the Ecosystem</p> <p>Essential idea: The continued survival of living organisms including humans depends on sustainable communities.</p>	<ul style="list-style-type: none"> • Explain and evaluate the effects of carbon foot print and carbon sink • Evaluate the effects of water pollution by sewage and by inorganic waste; pollution due to insecticides including bioaccumulation up food chains and impact on top carnivores • outline the roles of microbes in sewage disposal as an example of environmental biotechnology • discuss reasons for conservation of species with reference to the maintenance of biodiversity, management of fisheries & management of timber production 	<p>Theory</p> <p>Level 1 Q 1 - 9 Pg 442, TB.</p> <p>Level 1 W17 Biology Matters Workbook</p>

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Term 4 Week 1 – Week 3	Revision for End of Year Examination	End of Year Examination Topics: <ul style="list-style-type: none"> ▪ Cells ▪ Movement of Substances ▪ Nutrients ▪ Enzymes ▪ Nutrition in Humans ▪ Nutrition in Plants ▪ Transport in Humans ▪ Transport in Plants ▪ Respiration ▪ Excretion ▪ Homeostasis ▪ Nervous System ▪ Human Eye ▪ Hormones ▪ Cell Division ▪ Reproduction in Plants ▪ Reproduction in Humans ▪ Heredity ▪ Molecular Genetics ▪ Ecology ▪ Our Impact on the Ecosystem 	Practice on Past Year SJI End of Year Examination Papers 2015 to 2018 End of Year Examination