

Diploma Programme Course Outline

Name of the DP subject	Biology (HL/SL)	
Level	<p style="text-align: center;">Higher <input type="checkbox"/> Standard <input type="checkbox"/></p> <p>SL and HL students are taught the core components in the same class</p>	
YEAR 1		
UNIT/TOPIC	TOPIC/CONCEPT	ASSESSMENT COMPONENTS
<p>1. Cell Biology</p> <p style="text-align: center;">(Core)</p>	<p>1.1 - Introduction to cells</p> <ul style="list-style-type: none"> ➤ Cell Theory ➤ Functions of life ➤ SA : Vol Ratio ➤ Magnification ➤ Emergent Properties ➤ Cell Differentiation ➤ Stem cells ➤ Stem Cell Therapy <p>1.2 Ultrastructure of cells</p> <ul style="list-style-type: none"> ➤ Prokaryotic cells ➤ Eukaryotic cells ➤ Electron Microscopy ➤ Cell micrographs ➤ Prokaryote structure ➤ Eukaryote Structure <p>1.3 Membrane structure</p> <ul style="list-style-type: none"> ➤ Phospholipid bilayer ➤ Membrane Proteins 	<p>External</p> <p>Paper 1 assessment Paper 2 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Internal assessment</p> <p>Formative</p> <p>Tests Quizzes Presentations Research Think Pair Square</p>

	<ul style="list-style-type: none"> ➤ Cholesterol ➤ Fluid-Mosaic Model ➤ Membrane model <p>1.4 Membrane transport</p> <ul style="list-style-type: none"> ➤ Types of transport ➤ Simple diffusion ➤ Osmosis ➤ Osmolarity ➤ Facilitated Diffusion ➤ Active Transport ➤ Vesicular Transport ➤ Bulk Transport <p>1.5 The origin of cells</p> <ul style="list-style-type: none"> ➤ Non-living Synthesis ➤ Biogenesis ➤ Endosymbiosis <p>1.6 Cell division</p> <ul style="list-style-type: none"> ➤ Cell cycle ➤ Interphase ➤ DNA supercoiling ➤ Mitosis ➤ Cytokinesis ➤ Mitotic index ➤ Cyclins ➤ Cancer development ➤ Smoking and Cancer 	<p>Paper 1 assessment Paper 2 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative Tests Quizzes Presentations Research Think Pair Square</p>
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<p>2. Molecular Biology</p> <p>(Core)</p>	<p>2.1 Molecules to metabolism</p> <ul style="list-style-type: none"> ➤ Molecular Biology ➤ Organic Compounds ➤ Organic Subunits ➤ Organic Polymers ➤ Falsifying Vitalism ➤ Metabolism ➤ Anabolism and Catabolism <p>2.2 Water</p> <ul style="list-style-type: none"> ➤ Water Structure ➤ Hydrogen Bonding ➤ Thermal Properties ➤ Cohesive and Adhesive Properties ➤ Solvent Properties <p>2.3 Carbohydrates and lipids</p> <ul style="list-style-type: none"> ➤ Sugar Subunits ➤ Sugar Polymers ➤ Types of Fatty Acids ➤ Triglycerides ➤ Lipid Health Risks ➤ Sugars versus Lipids ➤ Body Mass Index <p>2.4 Proteins</p>	<p>Paper 1 assessment Paper 2 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative Tests Quizzes Presentations Research Think Pair Square</p>
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	<ul style="list-style-type: none"> ➤ Amino Acids ➤ Peptide Bonds ➤ Protein Structure ➤ Denaturation ➤ Gene ⇒ Polypeptide ➤ Proteome ➤ Protein Functions <p>2.5 <u>Enzymes</u></p> <ul style="list-style-type: none"> ➤ Enzyme & Substrate ➤ Enzyme Catalysis ➤ Enzyme Specificity ➤ Enzyme Activity ➤ Enzyme Experiments ➤ Enzymes in Industry <p>2.6 Structure of DNA and RNA</p> <ul style="list-style-type: none"> ➤ Nucleotides ➤ DNA versus RNA ➤ DNA Structure ➤ Watson & Crick <p>2.7 DNA replication, transcription and translation</p> <ul style="list-style-type: none"> ➤ Semi-Conservative ➤ DNA Replication ➤ PCR ➤ Transcription ➤ Genetic Code 	<p>Paper 1 assessment Paper 2 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative Tests Quizzes Presentations Research Think Pair Square</p>
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	<ul style="list-style-type: none">➤ Translation➤ Universality➤ Sequence Decoding <p>2.8 Cell respiration</p> <ul style="list-style-type: none">➤ ATP Production➤ Anaerobic Respiration➤ Aerobic Respiration➤ Yeast Fermentation➤ Respirometry <p>2.9 <u>Photosynthesis</u></p> <ul style="list-style-type: none">➤ Photosynthesis➤ Light Spectrum➤ Light Spectrum➤ Chlorophyll➤ Action Spectrum➤ Photosynthetic Reactions➤ Chromatographs➤ Limiting Factors➤ Oxygenation of Earth	

UNIT	TOPIC/CONCEPT	ASSESSMENT COMPONENTS
7. Nucleic Acids (HL ONLY)	<p>7.1 DNA structure and replication)</p> <ul style="list-style-type: none"> ➤ Hershey and Chase ➤ Structure of DNA ➤ DNA Replication (HL) ➤ Okazaki Fragments ➤ DNA Sequencing ➤ Non-coding DNA ➤ Nucleosomes <p>7.2 Transcription and gene expression</p> <ul style="list-style-type: none"> ➤ Sections of a Gene ➤ Transcription (HL) ➤ Messenger RNA ➤ Gene Expression ➤ Epigenetics <p>7.3 Translation</p> <ul style="list-style-type: none"> ➤ Ribosomes and tRNA ➤ tRNA Activation ➤ Translation (HL) ➤ Polysomes ➤ Protein Destinations ➤ Protein Structure 	<p>Paper 1 assessment Paper 2 assessment</p> <p>Paper 3 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative Tests Quizzes Presentations Research Think Pair Square</p>

<p>8. Metabolism, Cell Respiration, and Photosynthesis</p> <p>(HL ONLY)</p>	<p>8.1 Metabolism</p> <ul style="list-style-type: none"> ➤ Metabolic Pathways ➤ Activation Energy ➤ Enzyme Inhibition ➤ Feedback Inhibition ➤ Enzyme Kinetics ➤ Rational Drug Design <p>8.2 Cell respiration</p> <ul style="list-style-type: none"> ➤ Energy Conversions ➤ Glycolysis ➤ Link Reaction ➤ Krebs Cycle ➤ Electron Transport Chain ➤ Aerobic Overview ➤ Mitochondria <p>8.4 Photosynthesis</p> <ul style="list-style-type: none"> ➤ Photosynthesis ➤ Light Dependent Reactions ➤ Photophosphorylation ➤ Light Independent Reactions ➤ Calvin Cycle ➤ Chloroplast 	<p>Paper 1 assessment Paper 2 assessment</p> <p>Paper 3 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative Tests Quizzes Presentations Research Think Pair Square</p>
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<p>3. Genetics</p> <p>(Core)</p>	<p>3.1 Genes</p> <ul style="list-style-type: none"> ➤ Meiotic Division ➤ Sister Chromatids ➤ Stages of Meiosis ➤ Crossing Over ➤ Random Assortment ➤ Sexual Life Cycle ➤ Genetic Variation ➤ Non-Disjunction ➤ Karyotyping <p>3.2 Chromosomes</p> <ul style="list-style-type: none"> ➤ Prokaryotic Genetics ➤ Eukaryote Genetics ➤ Identifying Genes ➤ Homologous Pairs ➤ Diploid versus Haploid ➤ Autosome versus Heterosome ➤ Karyograms ➤ Chromosome Size ➤ Chromosome Number ➤ Genome Size <p>3.3 Meiosis</p>	<p>Paper 1 assessment</p> <p>Paper 2 assessment</p> <p>Paper 3 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative</p> <p>Tests</p> <p>Quizzes</p> <p>Presentations</p> <p>Research</p> <p>Think Pair Square</p>
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- Meiotic Division
- Sister Chromatids
- Stages of Meiosis
- Crossing Over
- Random Assortment
- Sexual Life Cycle
- Genetic Variation
- Non-Disjunction
- Karyotyping

3.4 Inheritance

- Mendel's Laws
- Haploid Gametes
- Types of Zygosity
- Modes of Inheritance
- Punnett Grids
- Genetic Diseases
- Sex Linked Genes
- Gene Mutation Rates
- Pedigree Charts

3.5 Genetic modification and biotechnology

- PCR
- Gel Electrophoresis
- DNA Profiling
- Gene Transfer
- GMO Debate
- Clones

	<ul style="list-style-type: none"> ➤ Natural Cloning ➤ Artificial Cloning ➤ Stem Cuttings 	
4. Ecology (CORE)	<p>4.1 Species, communities and ecosystems</p> <ul style="list-style-type: none"> ➤ Species ➤ Ecology Terms ➤ Modes of Nutrition ➤ Autotrophs ➤ Heterotrophs ➤ Nutrient Cycling ➤ Mesocosms ➤ Chi Squared Test <p>4.2 Energy flow</p> <ul style="list-style-type: none"> ➤ Energy Source ➤ Energy Flow ➤ Energy Loss ➤ Energy Efficiency ➤ Pyramids of Energy ➤ Carbon cycling 	<p>Paper 1 assessment Paper 2 assessment</p> <p>Paper 3 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative Tests Quizzes Presentations Research Think Pair Square</p>

	<ul style="list-style-type: none"> ➤ Carbon Cycle ➤ Carbon Compounds ➤ Aquatic Conversions ➤ Methane ➤ Fossil Fuels ➤ Combustion ➤ Carbon Fluxes <p>4.3 Climate change</p> <ul style="list-style-type: none"> ➤ Greenhouse Gases ➤ Greenhouse Effect ➤ CO₂ Concentrations ➤ Climate Changes ➤ Ocean Acidification ➤ Greenhouse Debate 	
<p>5. Evolution and Biodiversity</p> <p>(Core)</p>	<p>5.1 Evidence for evolution</p> <ul style="list-style-type: none"> ➤ Evolution ➤ Fossil Record ➤ Selective Breeding ➤ Comparative Anatomy ➤ Speciation ➤ Evolution Example <p>5.2 Natural selection</p>	<p>Paper 1 assessment</p> <p>Paper 2 assessment</p> <p>Paper 3 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p>

	<ul style="list-style-type: none"> ➤ Natural Selection ➤ Variation ➤ Competition ➤ Adaptations ➤ Allele Frequency ➤ Adaptive Radiation ➤ Antibiotic Resistance <p>5.3 Classification of biodiversity</p> <ul style="list-style-type: none"> ➤ Binomial System ➤ Domains of Life ➤ Hierarchy of Taxa ➤ Classification ➤ Plant Phyla ➤ Animal Phyla ➤ Vertebrate Classes ➤ Dichotomous <p>5.4 Cladistics</p> <ul style="list-style-type: none"> ➤ Clades ➤ Cladograms ➤ Molecular Evidence ➤ Structural Evidence ➤ Clade Reclassification 	<p>Formative</p> <p>Tests</p> <p>Quizzes</p> <p>Presentations</p> <p>Research</p> <p>Think Pair Square</p> <p>IA</p>
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<p>6. Human Physiology</p> <p>(CORE)</p>	<p>6.1 Digestion and absorption</p> <ul style="list-style-type: none"> ➤ Digestive System ➤ Mechanical Digestion ➤ Chemical Digestion ➤ Chemical Digestion ➤ Small Intestine ➤ Absorption ➤ Starch Digestion ➤ Modelling Digestion <p>6.2 The blood system</p> <ul style="list-style-type: none"> ➤ Circulation ➤ Arteries ➤ Capillaries ➤ Veins ➤ Vessel Comparison ➤ Heart Structure ➤ Heart Beat ➤ Heart Rate ➤ Cardiac Cycle ➤ Heart Disease <p>6.3 Defense against infectious disease</p>	<p>Paper 1 assessment</p> <p>Paper 2 assessment</p> <p>Paper 3 assessment</p> <p>assessment objectives 1, 2 and 3.</p> <p>IA</p> <p>Formative</p> <p>Tests</p> <p>Quizzes</p> <p>Presentations</p> <p>Research</p> <p>Think Pair Square</p> <p>IA</p>
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- Surface Barriers
- Clotting
- Phagocytes
- Lymphocytes
- Antibiotics
- Penicillin
- HIV Infection

6.4 Gas exchange

- Ventilation
- Lung Structure
- Pneumocytes
- Mechanism of Breathing
- Respiratory Muscles
- Lung Disorders
- Spirometry

6.5 Neurons and synapses

- Neurons
- Resting Potential
- Action Potential
- Nerve Impulses
- Oscilloscope Traces
- Myelination
- Synaptic Transfer
- Neurotransmitters
- Graded Potentials

	<p>6.6 Hormones, homeostasis and reproduction</p> <ul style="list-style-type: none">➤ Insulin and Glucagon➤ Thyroxin➤ Leptin➤ Melatonin➤ Sexual Reproduction➤ Sex Development➤ Male Reproductive System➤ Female Reproductive System➤ Menstrual Cycle➤ In Vitro Fertilisation	

All Diploma Programme courses are designed as two-year learning experiences.