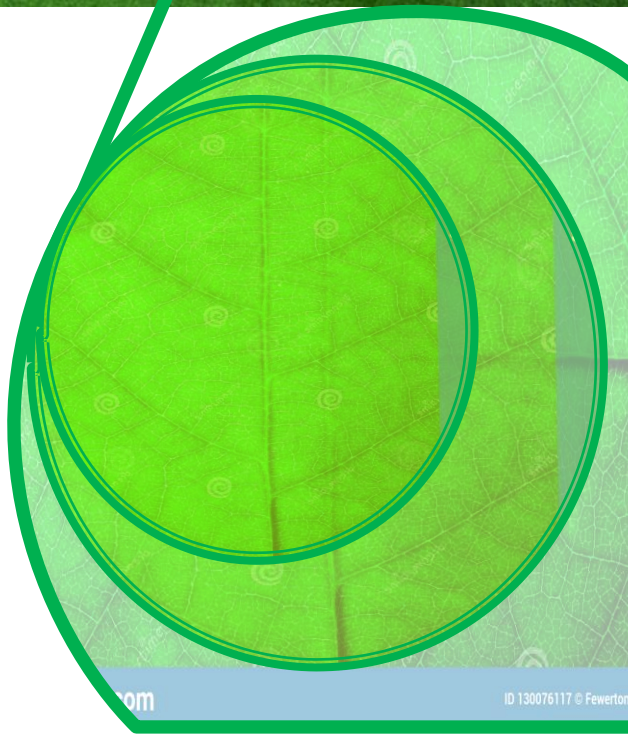
**Grade 10 CSEC Biology Syllabus Objectives**

Herbert Morrison Technical High School Science Department



# GRADE 10 BIOLOGY TOPICS WITH OBJECTIVES

## SECTION A - LIVING ORGANISMS IN THE ENVIRONMENT

| TOPICS | OBJECTIVES | CONTENT/EXPLANATORY NOTES |
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| **1. THE VARIETY OF LIVING ORGANISMS** | 1.1. group living organisms found in a named habitat based on observed similarities and differences; | |
| 2. **CLASSIFICATION OF LIVING THINGS** | 2.1. classify organisms into taxonomic groups based on physical similarities; | Simple classification of living organisms into the ***five kingdoms: Plantae, Animalia; Fungi (mushroom), Prokaryotae (Bacteria) and Proctotista (amoeba).***<br><br>***Further subdivision of the Animal Kingdom into Phyla, for example, Vertebrate which includes Classes (fish, reptiles, insects, birds mammals). These are further classified to the level of species.***<br><br>***Further subdivision of the Plant Kingdom into Phyla, for example, Flowering Plants which includes Monocotyledon and Dicotyledon*** |

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| **ECOLOGY AND THE IMPACT OF ABIOTIC FACTORS ON LIVING ORGANISMS** | **2.1** Carry out a simple ecological study using the most appropriate collecting and sampling methods; | **Use quadrats to investigate the distribution of species in a particular habitat;**<br><br>Use of pooters, bottles, jars, nets, sieves, quadrats, line and belt transects, mark, release and recapture methods to collect data on organisms from a named habitat. |
| | **2.2** Distinguish between the following pairs of terms:<br>(a) abiotic and biotic factors,<br>(b) niche and habitat, | Ecology – the study of living organisms in their environment. Ecosystem- a community of living organisms sharing an environment. Environment – the abiotic (non-living chemical and physical) and biotic (living) factors. Habitat - the place where a particular organism lives. Niche – the role of an organism in an ecosystem. |

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| | Students should be able to:<br>(c) population and community,<br>(d) species and population; | Species – a group of individuals of common ancestry that closely resemble each other and are normally capable of interbreeding to produce a fertile offspring.<br>Population – members of a particular species living in a particular habitat.<br>Community – all the populations of different species found living in a particular habitat. |
| | **2.3** discuss the impact of the abiotic factors (soil, water, climate) on living organisms; | Components of soil – air (O2) and, water-holding capacity, mineral nutrients, pH and salinity. |
| **FEEDING RELATIONSHIPS BETWEEN ORGANISMS** | 3.1 Identify the relative positions of producers and consumers in food chains; | Construct food chains and simple pyramids. |

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| | 3.2 Identify from each habitat, a food chain containing at least four organisms; | Terrestrial (arboreal and edaphic) and aquatic (marine and freshwater) habitats.<br><br>Construct food chains using organisms in each habitat. |
| | 3.3 identify from each habitat: herbivore, carnivore and omnivore; | |
| | 3.4 Identify from each habitat, predator/ prey relationships;<br>. | Terrestrial arboreal and edaphic) and aquatic (marine and fresh water) habitats.<br><br>Example of the application of predator relationship. **The use of 'Biological Controls'** |
| | 3.5 construct a food web to include different trophic levels; | Use of examples from the habitat(s) investigated. Students may be required to interpret a food web containing unfamiliar examples.<br><br>**Identify different trophic levels in food webs.** |

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| | 3.6 explain the role of decomposers; | Role of fungi and bacteria in converting complex compounds to simple substances. |
| | 3.7 assess the special relationships among organisms; | **Simple of symbiotic relationships: parasitism, commensalism, mutualism** - using local examples, such as lice and ticks on mammals, epiphytes on trees, nitrogen fixing bacteria in root nodules of legumes. |
| | 4.1 explain energy flow within a food chain or web; | Simple diagram of non-cyclic energy flow from the sun.<br><br>( Ecological Pyramids to include Pyramid of Number, Biomass, Energy must)<br><br>- Bioaccumulation |
| **THE CYCLING OF NUTRIENTS** | 5.1 explain, with examples, the impact of the continual re-use of materials in nature; | Note the role of decomposers in the **Carbon Cycle.** |
| **POPULATION GROWTH, NATURAL** | 5.2 discuss the importance of and | Consider biodegradable and non-biodegradable materials, |

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| **RESOURCES AND THEIR LIMITS** | difficulties encountered in recycling manufactured materials; | collection, transport and storage; note economic factors. Interpret data on waste management and pollution. |
| **THE EFFECT OF HUMAN ACTIVITY ON THE ENVIRONMENT** | 6.1 describe the impact of human activities on natural resources; | Human activities to include the production of Energy and the use and extraction of resources such as mineral, trees from the forest, organisms from the marine, environment as well as over population and over fishing. |
| | 6.2 explain the negative impact of human activity on the environment; | Consider pollution by agricultural practices such as use of chemical fertilizers; products of industrialization and improper garbage disposal. Impact on eco-tourism.<br><br>Loss of habitat, species; impact on human health.<br><br>Research projects. (For example, collect data on use of **agricultural chemicals and its impact on the environment**). |

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| | 6.3 Assess the implications of pollution of marine and wetland environments; | Refer specifically to impact on the health of ecosystems, aesthetic and economic benefits to small island states.<br><br>Research and interpret data on pollution of marine environments in the Caribbean, for example, **Coral reefs.** |
| | 6.4 Discuss current and future trends regarding climate change; | Refer to increase in greenhouse gases, rising global temperatures, rising sea levels and ocean acidification. |
| | 6.5 Suggest means by which the environment could be conserved and restored; | Consider effect of the change in practices; example use of natural materials in agriculture, conservation methods, education, monitoring strategies, organic agriculture. |
| | 7.1 Discuss the factors that affect the growth and survival of populations including human | Include competition for food and space; effects of disease, pests, invasive species, natural disasters. |

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| | populations. | |
| **CELLS** | 1.1 compare the structure of the generalised plant and animal cells, and selected microbes; | |
| | 1.2 distinguish between cell wall and cell membrane; mitochondrion and chloroplast; | Cell wall, cell membrane, nucleus, cytoplasm, vacuoles, mitochondrion, chloroplast. Microbes to include bacterium, Protista, for example, amoeba. Simple structure of a bacterium to include nucleoid, cell wall, capsule and flagellum. |
| | 1.3 relate the structure of organelles to their functions; | Simple treatment of chloroplast; mitochondrion; vacuole; nucleus. For example, nucleus: chromosomes carry genetic information in the form of DNA |

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| | 1.4 differentiate between plant and animal cells; | Reference to plant cells as characterised by the presence of a cell wall, large vacuoles and chloroplasts.<br><br>Relate structure of plant and animal cells to their function. |
| | 1.5 explain the importance of cell specialization in multicellular organisms; | Examples of specialized cells from both plants and animals.<br><br>Consideration that a number Of cells come together to form tissues and tissues (for example, epidermis, xylem, phloem) come together to form organs (leaf, stem) and organ come together to form systems (transpiration; translocation). |

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| | 1.6 explain the processes of diffusion and osmosis; | Importance of diffusion and osmosis in transporting substances in and out of cells and from one cell to another in all living organisms. Reference to the cell membrane as a differentially permeable membrane, contrast with cell wall which is freely permeable.<br>Carry out simple investigations to illustrate the movement of particles (molecules and ions).<br>Identify everyday instances of these processes occurring<br><br>**Key terms to note: Hypotonic solution, hypertonic solution and Isotonic solution.** |

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| **3. NUTRITION** | 1.7 discuss the importance of diffusion, osmosis and active transport in living systems. | Cite examples of each process occurring in living organisms.<br><br>For example, **diffusion** across membrane of Amoeba, gas exchange across respiratory surfaces, absorption in small intestine, **active uptake** of mineral ions by plant roots |
| | 2.1 distinguish among heterotrophic, autotrophic and saprophytic nutrition; | Simple inorganic substances used by plants compared to complex organic substances consumed by animals and fungi.<br><br>Identify sources of food for a named organism for each type of nutrition. |
| | 2.2 describe the process of photosynthesis in green plants; | Simple treatment involving an equation to summarize the process;<br>- the evolution of oxygen as a result of the splitting of water by light energy;<br>- the subsequent |

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| | | reduction of carbon dioxide to a carbohydrate;<br>- the chloroplast as the site of the reaction;<br>- role of chlorophyll;<br>- the fate of products (metabolised to provide energy or stored).<br><br>Test for evolution of oxygen using water plant.<br><br>Carry out controlled experiments to demonstrate that light and chlorophyll are necessary for photosynthesis;<br>Tests for end products, starch or reducing sugar. |

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| | 2.3 relate the structure of the leaf of a flowering plant to its function in photosynthesis; | The external features and the internal structure of a dicotyledonous leaf as seen in cross section under the light microscope. Emphasize adaptations for photosynthesis (stomata; intercellular spaces; chloroplasts in palisade layer close to epidermis). |
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| | 2.4 explain how environmental factors affect the rate of photosynthesis; | Explanations and investigations should include<br>to include<br>temperature,<br>water and CO2. |

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| | 2.5 discuss the importance of minerals in plant nutrition using nitrogen and magnesium as examples; | Emphasis on the importance of nitrogen in the formation of proteins and magnesium in the formation of chlorophyll. |
| | 2.6 perform tests to distinguish among food substances; | Starch, protein, lipids, reducing and non-reducing sugars; chemical and physical properties (solubility) of carbohydrates, proteins, lipids; hydrolysis and condensation (dehydration synthesis). |
| | 2.7 relate the structures of the human alimentary canal to their functions; | Simple diagrams of the alimentary canal and internal structure of a tooth required.<br>Mastication and the role of teeth in the mechanical breakdown of food to be included. |
| | 2.8 explain the role and importance of enzymes; | Inclusion of **catalysis.**<br><br>**Properties** of enzymes, **role** of digestive enzymes in the mouth, stomach and pancreatic enzymes in the |

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| | | small intestine. |
| | 2.9 investigate the effect of temperature and pH on the activity of the enzymes catalase or amylase; | Candidates may be asked to deduce from tables and graphs the effects of temperature and pH on enzyme activity. |
| | 2.10 describe what happens to the products of digestion after their absorption; | Simple diagram of villi and role in absorption of products of digestion. Transport to the liver and assimilation to be included, that is, how products are used and what happens to excess. |
| | 2.11 discuss the importance of a balanced diet in human. | Components of a balanced diet **(including vitamins and minerals and their roles).** The results of their **deficiency or surplus (malnutrition).** The effects of age, sex and occupation on dietary needs. Vegetarianism Dietary recommendations for treating and preventing named deficiency and physiological diseases – diabetes and hypertension. |

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| **3. RESPIRATION** | 3.1 describe the process of aerobic respiration; | Involvement of enzymes in releasing energy as **ATP.** Distinguish between respiration and breathing.<br><br>Simple treatment. A **chemical and word equation to show the starting materials and final products of aerobic respiration is required.** |
| | 3.2 distinguish between aerobic and anaerobic respiration; | Include the production of lactic acid in muscle, alcohol and carbon dioxide in plants, production of bio-gas from organic matter. |
| | 3.3 describe the mechanism of breathing in humans and gaseous exchange in flowering plants; | **Simple diagrams to show the relationship between the trachea, the bronchi, alveoli and lungs and the diaphragm and ribcage required.** The necessity for a continuous supply of oxygen and the removal of waste products to be included. |

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| | 3.4 identify characteristics common to gaseous exchange surfaces; | Emphasis on mechanisms for increasing surface area in humans, fish and plants. |
| | 3.5 discuss the effects of smoking. | For example, nicotine addiction, damage to the lining of the lungs, cancercausing effects and reduction in the oxygen carrying capacity of the blood. Marijuana addiction, acute chest illness, obstruction of airways (no further details required). |
| **4. TRANSPORT**<br><br>**TRANSPORT IN ANINMALS** | 4.1 explain the need for transport systems in multi-cellular organisms; | The limitations of simple diffusion. Comparison with single celled organism such as the amoeba. The relationship between surface area and volume. |
| | 4.2 identify the materials which need to be transported in animals and plants; | Oxygen, carbon dioxide, hormones, mineral nutrients, glucose and amino acids. |
| | 4.3 describe *the structure and function of* the circulatory system in humans; | Structure and function of the heart. Names of blood vessels supplying lungs, kidney, liver, brain, intestine |

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| | | only.<br><br>Draw diagrams to show differences in the structures of arteries, veins and capillaries. |
| | 4.4 relate the structure of the components of blood to their function; | Diagrams of red and white blood cells required. |
| | 4.5 describe the role of blood in defending the body against disease; | Include the ***clotting mechanism; the role of phagocytes and natural immunity.*** |
| | 4.6 explain how the principles of immunisation are used in the control of communicable diseases; | **Key terms**<br>Antigen/antibody, variation, natural selection . |