# MCS IB Biology Year 2 Subject Group Overview

**Themes:** A = Unity & Diversity, B = Form & Function, C = Interaction & Interdependence, D = Continuity & Change

**Level of Organization:** 1 = Molecules, 2 = Cells, 3 = Organism, 4 = Ecosystems

| Unit Name | Internal Assessments (IA) (Ongoing through March) | Unit 1 Responding to the Environment: Body Systems | Unit 2 Responding to the Environment: Plant Systems | Unit 3 Biodiversity & Environment | Unit 4 Ecosystems: Interactions & Interdependence | Unit 5 Ecosystems: Human Impacts | Exams/ Review |
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| **Time** | Ongoing August Through March 2025 | S1: 9 weeks | S1: 6 weeks | S1: 5 weeks | S2: 6 weeks | S2: 4 weeks | 6 Weeks May 2025 Exam |
| **Topics** Theme = Letter Level of Organization = # | All Topics Student Choice | **B3.1**.1-3.1.6, **B3.2**.1-3.2.6, **B3.3**.1-3.3.10 **C2.2**.1-2.2.7, **C2.3** **C3.1**.1-3.1.16, **C3.2**.1-3.2.18, **D3.1**.1-3.1.7, **D3.3**.1-3.3.6<br><br>Review C1.1 & C1.2 | **B3.1**.7-3.1.10, **B3.2**.7-B3.2.10, **D2.3**.1-2.3.6, **D3.1**.8-3.1.12<br><br>Review C1.2 & C1.3 | **A4.1**.1 - 4.1.7, **D4.1**.1-4.1.8, **D4.1**.9- **D4.1**.15 **A3.1**.1-3.1.11, **A3.2**.1-3.2.9 **A4.2**.1-A4.2.8<br><br>Review D1.1, D1.2, D1.3, D2.2 | **B4.1**.1-4.1.8, **B4.2**.1-4.2.13, **C4.1**.1-4.1.18, **C4.2**.1-4.2.22 | **D4.2**.1-4.2.11, **D4.3**.1-4.3.8 | All Topics |
| **Content-Specific** | **Scientific investigation** 20% of the final IB score in the class. 10 hours minimum Required Student work is internally assessed by the teacher and externally moderated by the IB.<br><br>**Internal Assessment Components** Research Design 6 Marks | **Statement of Inquiry:** The physiology of the Immune, endocrine, muscular, skeletal and nervous systems allow humans to maintain homeostasis in a changing environment. *Sickle Cell Theme<br><br>**Phenomenon:** | **Statement of Inquiry:** The structure of plant systems allows plants to respond to their environment in order to maintain homeostasis in a changing environment.<br><br>**Phenomenon:** The therapeutic potential of extracts from the leaves and seeds of *Cajanus cajan* (pigeon pea), | **Statement of Inquiry:** Changing environments cause selective pressures on organisms resulting in the diversity of life on earth.<br><br>**Phenomenon:** In some parts of the world, the infectious parasitic disease malaria and the genetic disease sickle cell anemia | **Statement of Inquiry:** In recent years, the underlying biochemical unity of all plants, animals and microbes has become increasingly apparent.<br><br>**Phenomenon:** Plasmodium falciparum is a protozoan parasite that has adapted to live and reproduce | **Statement of Inquiry:** Humans modify the environment which can cause benefits to some populations while harming others.<br><br>**Phenomenon:** Humans spray insecticides and modify the environment to decrease the population of | Review all Topics. |

Published: 8,2025 Resources, materials, assessments not linked to SGO or unit planner will be reviewed at the local school level.

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| | Data Analysis<br>*Statistics<br>6 Marks<br>Conclusion<br>6 Marks<br>Evaluation<br>6 Marks | The correction of anemia in Sickle Cell Disease requires careful balancing of the detrimental effects of anemia with the potential risks associated with increased blood viscosity.<br><br>**Crosscutting Concepts:**<br>Structure & Function<br>Systems & System models<br>Cause and Effect<br>Stability and Change<br>Patterns | leaves of *Zanthoxylum zanthoxyloides* (artar root) and leaves of *Carica papaya* (papaya) by extracting molecules in the structures and applying them to blood samples from Sickle Cell Disease patients is under investigation.<br><br>**Crosscutting Concepts:**<br>Structure & Function<br>Systems & System models<br>Cause and Effect<br>Interactions & Equilibrium<br>Stability & Change | are intimately connected.<br><br>**Crosscutting Concepts:**<br>Systems & System models<br>Patterns<br>Cause and Effect | in mosquitoes and humans.<br><br>**Crosscutting Concepts:**<br>Energy and Matter: Flows, Cycles, and Conservation<br>Stability and Change of Systems<br>Patterns<br>Scale, Proportion, and Quantity | mosquitoes carrying malaria.<br><br>**Crosscutting Concepts:**<br>Stability and Change of Systems<br>Cause and Effect<br>Patterns<br><br>**Core Ideas:**<br>Stability of Ecosystems<br>Deforestation<br>Keystone Species<br>Human Impact: Pollution and Climate Change<br>Sustainability of Resource Harvesting<br>Eutrophication<br>Biomagnification<br>Succession (HL Only) | |

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| | **Crosscutting Concepts:** ALL<br><br>**SEP:** ALL<br><br>**Core Ideas:**<br>Can come from any topic in the course that interests the students, and a scientific investigation can be conducted | **Core Ideas:**<br>Integration of Body Systems<br>Muscle and Motility<br>Levels of organization<br>Responding to the Environment<br>Hormones<br>Feedback mechanisms<br>Homeostasis<br>Thermoregulation<br><br>**SEP**<br>● Asking Questions and Defining Problems<br>● Constructing Explanations<br>● Analyze & Interpret Data | **Core Ideas:**<br>Gas Exchange<br>Transport<br>Neural Signaling<br>Defense against Disease<br>Reproduction/Germination<br>Homeostasis<br><br>**SEP:**<br>● Analyze & Interpret Data<br>● Developing and Using Models<br>● Planning and Carrying out Investigations<br>● Use Mathematics and Computational Thinking | **Core Ideas:**<br>Evolution and Speciation<br>Natural Selection<br>Diversity of Organisms<br>Classification and Cladistics<br>Conservation of Biodiversity<br>Extinction<br><br>**SEP:**<br>● Developing and Using Models<br>● Obtaining, Evaluating, and Communicating information<br>● Analyzing and Interpreting Data | **Core Ideas:**<br>Adaptation to the Environment<br>Ecological Niches<br>Populations and Communities<br>Transfers of Energy and Matter<br><br>**SEP:**<br>● Developing and Using Models<br>● Obtaining, Evaluating, and Communicating information<br>● Analyzing and Interpreting Data<br>● Planning and Carrying out Investigations | **SEP:**<br>● Use Mathematics and Computational Thinking<br>● Obtaining, Evaluating, and Communicating information<br>● Analyzing and Interpreting Data | |
| **Assessments/ Major Projects**<br><br>Unit Formative and Summative assessment(s) | | Research Paper - How does sickle cell affect homeostasis?<br><br>Homeostasis: Negative Feedback Pathways in the Human Body Activity<br><br>**Applications of Skills:**<br>**B3.1.6** Measurement of lung volumes | **Applications of Skills:**<br>**B3.1.10** Use micrographs or perform leaf casts to determine stomatal density.<br>**B3.2.9** Distribution of tissues in a transverse section of the stem of a dicotyledonous plant from micrographs<br>**B3.2.10** Distribution of tissues in a transverse section of | **Applications of Skills:**<br>**D4.1.8** Modelling of sexual and natural selection based on experimental control of selection pressures -Interpret data from John Endler's experiments with guppies.<br>**A3.1.7** Karyotyping and karyograms -classify chromosomes by | **Applications of Skills:**<br>**B4.1.4** Use transect data to correlate the distribution of plant or animal species with an abiotic variable from a natural or semi-natural habitat.<br>**B4.2.8** Students should examine models or digital collections of skulls to infer diet from the anatomical features. Examples may include | **Applications of Skills:**<br>**D4.2.3** Deforestation of Amazon rainforest as an example of a possible tipping point in ecosystem stability - Calculate % change from original area of the forest | IB Biology Exam in May<br><br>Final Internal Assessment complete |

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| | | **B3.2.2** Distinguish arteries and veins in micrographs<br>**B3.2.4** Measurement of pulse rate - carotid or radial - by hand and digital<br>**B3.2.6** Evaluate epidemiological data relating to the incidence of coronary heart disease.<br>**B3.3.7** Compare the range of motion of a joint; measure joint angles using computer analysis or a goniometer<br>**C2.2.4** Variation in the speed of nerve impulses - +/- correlations and apply correlation coefficients and the coefficient of determination<br>**C3.2.18** Evaluation of data related to the COVID-19 pandemic - calculate both percentage difference and percentage change | the root of a dicotyledonous plant from micrographs<br>**D2.3.4** Measure changes in tissue length and mass, and analyze data to deduce isotonic solute concentration -use standard deviation and standard error to help in the analysis of data.<br><br>Review Measure the rate of cellular respiration – what affects cellular respiration rate? (C1.2)<br><br>Thin layer or paper Chromatography- pigmentation of spinach leaves – calculate Rf values – identify pigments by color and value (C1.3)<br><br>Determine the rate of photosynthesis from data for oxygen production and carbon dioxide consumption for varying wavelengths – plot data to make an action spectrum (C1.3)<br><br>Rates of Photosynthesis Lab – limiting factors (C1.3) | banding patterns, length and centromere position-evaluate the evidence for the hypothesis that chromosome 2 in humans arose from the fusion of chromosomes 12 and 13 with a shared primate ancestor<br>**A3.1.10** Extract information about genome size for different taxonomic groups from a database to compare genome size to organism complexity | *Homo sapiens* (humans), *Homo floresiensis* and *Paranthropus robustus*<br>**C4.1.3** Random quadrat sampling to estimate population size for sessile organisms (plants and animals) - number counts suitable - standard deviation of the mean<br>**C4.1.4** Capture–mark–release –recapture and the Lincoln index to estimate population size for motile organisms<br>**C4.1.7** Population Growth Curves - test the growth of a population against the model of exponential growth using a graph with a logarithmic scale for size of population on the vertical axis and a non-logarithmic scale for time on the horizontal axis<br>**C4.1.8** Modelling of the sigmoid population growth curve-collect data regarding population growth. Yeast and duckweed are recommended but other organisms that proliferate under experimental | | |

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| | | | | | conditions could be used<br>**C4.1.15** Use of the chi-squared test for association between (presence/absence) two species- several sampling sites, exploring the differences or similarities in distribution (interspecific competition)<br>**C4.2.11** Construction of energy pyramids<br>-use research data from specific ecosystems to represent energy transfer and energy losses between trophic levels in food chains | | |

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| **Level Specific Differentiation ALL UNITS** | Marietta City Schools teachers provide specific differentiation of learning experiences for all students. Details for differentiation for learning experiences are included on the district unit planners. |
| **Resources** | MCS Science Resources<br>● Textbook Pearson Biology for the IB Diploma Standard and Higher Level<br>● IB Biology Guide First Assessment 2025<br>● Van de Lagemaat, R. www.inthinking.net: Andorra la Vella, Andorra, 2019.<br>● IB Biology Schoology Course<br>● Discovery Education Biology and Chemistry Resources |