Marietta City Schools

2024–2025 District Unit Planner

IB Biology Y2 Unit 1: Responding to the Environment: Body Systems

Teacher(s)	IB Biology Y1 Logue PLC Logue/Trotter	**Subject group and course**	Group 4/IB Biology Y1 SL MHS Y2 SGO		
Course part and topic	Responding to the Environment: Body Systems **B3.1**.1-3.1.6, **B3.2**.1-3.2.6, **C2.2**.1-2.2.7, **C3.1**.1-3.1.16, **C3.2**.1-3.2.18**, D3.1**.1-3.1.7, **D3.3**.1-3.3.6 Review C1.1 and C1.2	**SL or HL/Year 1 or 2**	SL Y2	**Dates**	S1 7 weeks

Unit description and texts	**DP assessment(s) for unit**
Homeostasis is a dynamic equilibrium that is maintained in body tissues and organs. It is dynamic because it is constantly adjusting to the changes that the systems encounter. It is an equilibrium because body functions are kept within a normal range, with some fluctuations around a set point. The maintenance of homeostasis in the body typically occurs using feedback loops that control the body's internal conditions. Feedback loop is defined as a system used to control the level of a variable in which there is an identifiable receptor (sensor), control center (integrator or comparator), effectors, and methods of communication. Sickle Cell Theme throughout the course New IB Biology Guide First Assessment 2025	● Unit Formative and Summative assessment(s) ● Research Paper - How does sickle cell affect homeostasis? ● Homeostasis: Negative Feedback Pathways in the Human Body Activity **Applications of Skills:** ● **B3.1.6** Measurement of lung volumes ● **B3.2.2** Distinguish arteries and veins in micrographs ● **B3.2.4** Measurement of pulse rate - carotid or radial - by hand and digital ● **B3.2.6** Evaluate epidemiological data relating to the incidence ● of coronary heart disease. ● **C2.2.4** Variation in the speed of nerve impulses - +/- correlations and apply correlation coefficients and the coefficient of determination ● **C3.2.18** Evaluation of data related to the COVID-19 pandemic - calculate both percentage difference and percentage change **Review AOS from C1.1 and C1.2 via Flipped lessons and Virtual Simulations**

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Topic Abbreviations:
Themes: A = Unity & Diversity, B = Form & Function, C = Interaction & Interdependence, D = Continuity & Change
Level of Organization: 1 = Molecules, 2 = Cells, 3 = Organisms, 4 = Ecosystems

INQUIRY: Establishing the purpose of the unit

Statement of Inquiry:
The physiology of the Immune, endocrine, and nervous systems allow humans to maintain homeostasis in a changing environment. *Sickle Cell Theme

Phenomenon: 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.

Crosscutting Concepts
- Structure & Function
- Systems & System models
- Cause and Effect
- Stability and Change
- Patterns

CORE IDEAS
- Integration of Body Systems
- Levels of organization
- Responding to the Environment
- Hormones
- Feedback mechanisms
- Homeostasis
- Thermoregulation

SEP:
- Asking Questions and Defining Problems
- Constructing Explanations
- Analyze & Interpret Data

ACTION: teaching and learning through inquiry

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Content/skills/concepts—essential understandings **Themes: A = Unity & Diversity, B = Form & Function, C = Interaction & Interdependence, D = Continuity & Change** **Level of Organization: 1 = Molecules, 2 = Cells, 3 = Organisms, 4 = Ecosystems** **GQ - Guiding Questions** **NOS - Nature of Science** **AOS - Application of Skills** **LQ - Linking Question**	**Learning process** *Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.*
Students will know the following content/Students will grasp the following concepts: **B3.1 Gas Exchange (Form and Function: Organisms)** **GQ -** ● **How are multicellular organisms adapted to carry out gas exchange?** ● **What are the similarities and differences in gas exchange between a flowering plant and a mammal?** **Guidance:** **B3.1.1—Gas exchange as a vital function in all organisms** Students should appreciate that the challenges become greater as organisms increase in size because surface area-to-volume ratio decreases with increasing size, and the distance from the centre of an organism to its exterior increases. **B3.1.2—Properties of gas-exchange surfaces** Include permeability, thin tissue layer, moisture and large surface area. **B3.1.3—Maintenance of concentration gradients at exchange surfaces in animals** Include dense networks of blood vessels, continuous blood flow, and ventilation with air for lungs and with water for gills.	Learning experiences and strategies/planning for self-supporting learning: Lab Investigations/Activities Lecture Socratic Seminar Small Group/Pair Work PowerPoint Lecture Notes Individual Presentations Group Presentations Student Lecture/Leading the class Interdisciplinary Learning Details: Modeling, Think/Pair/Share, CER, Writing Prompts, Videos, etc. Accommodations: ● *SWD/504 – Accommodations Provided* ● *ELL – Reading & Vocabulary Support* ● *Intervention Support* ● *Extensions – Enrichment Tasks and Project* **Assessment Objectives:**

B3.1.4—Adaptations of mammalian lungs for gas exchange
Limit to the alveolar lungs of a mammal. Adaptations should include the presence of surfactant, a
branched network of bronchioles, extensive capillary beds and a high surface area.

B3.1.5—Ventilation of the lungs
Students should understand the role of the diaphragm, intercostal muscles, abdominal muscles and ribs.

B3.1.6—Measurement of lung volumes
Application of skills: Students should make measurements to determine tidal volume, vital capacity, and inspiratory and expiratory reserves.

LQ -
• How do multicellular organisms solve the problem of access to materials for all their cells?
• What is the relationship between gas exchange and metabolic processes in cells?

B3.2 Transport (Form and Function: Organisms)

GQ -
- **What adaptations facilitate transport of fluids in animals?**
- **What are the differences and similarities between transport in animals and plants? - Connection with U2**

Guidance:
B3.2.1—Adaptations of capillaries for exchange of materials between blood and the internal or external
environment
Adaptations should include a large surface area due to branching and narrow diameters, thin walls, and fenestrations in some capillaries where exchange needs to be particularly rapid.

B3.2.2—Structure of arteries and veins
Application of skills: Students should be able to distinguish arteries and veins in micrographs from the

The assessment objectives for biology reflect those parts of the aims that will be formally assessed either internally or externally. It is the intention of this course that students can fulfil the following assessment objectives.
1. Demonstrate knowledge of:
   A. terminology, facts, and concepts
   B. skills, techniques, and methodologies.
2. Understand and apply knowledge of:
   A. terminology and concepts
   B. skills, techniques, and methodologies.
3. Analyze, evaluate, and synthesize:
   A. experimental procedures
   B. primary and secondary data
   C. trends, patterns, and predictions.
4. Demonstrate the application of skills necessary to carry out insightful and ethical investigations

For C3.1, Integration of systems, these standards will be covered with each body system that it relates too. For example, C3.1.15, will be covered in the Gas Exchange unit and the Ventilation lesson.

structure of a vessel wall and its thickness relative to the diameter of the lumen. **B3.2.3—Adaptations of arteries for the transport of blood away from the heart** Students should understand how the layers of muscle and elastic tissue in the walls of arteries help them to withstand and maintain high blood pressures. **B3.2.4—Measurement of pulse rates** **Application of skills: Students should be able to determine heart rate by feeling the carotid or radial pulse with fingertips. Traditional methods could be compared with digital ones.** **B3.2.5—Adaptations of veins for the return of blood to the heart** Include valves to prevent backflow and the flexibility of the wall to allow it to be compressed by muscle action. **B3.2.6—Causes and consequences of occlusion of the coronary arteries** **Application of skills: Students should be able to evaluate epidemiological data relating to the incidence of coronary heart disease.** **NOS: Students should understand that correlation coefficients quantify correlations between variables** **and allow the strength of the relationship to be assessed. Low correlation coefficients or lack of any correlation could provide evidence against a hypothesis, but even strong correlations such as that between saturated fat intake and coronary heart disease do not prove a causal link.** **C2.2 Neural Signaling (Interactions & Interdependence: Cells)** **GQ -** • **How are electrical signals generated and moved within neurons?** • **How can neurons interact with other cells?** **Guidance:** **C2.2.1—Neurons as cells within the nervous system that carry electrical impulses** Students should understand that cytoplasm and a nucleus form the cell body of a neuron, with elongated nerve fibers of varying length projecting from it. An axon is a long single fiber.	

Dendrites are multiple shorter fibers. Electrical impulses are conducted along these fibers. **C2.2.2—Generation of the resting potential by pumping to establish and maintain concentration gradients of sodium and potassium ions** Students should understand how energy from ATP drives the pumping of sodium and potassium ions in opposite directions across the plasma membrane of neurons. They should understand the concept of amembrane polarization and a membrane potential and also reasons that the resting potential is negative. **C2.2.3—Nerve impulses as action potentials that are propagated along nerve fibers** Students should appreciate that a nerve impulse is electrical because it involves movement of positively charged ions. **C2.2.4—Variation in the speed of nerve impulses** Compare the speed of transmission in giant axons of squid and smaller non-myelinated nerve fibers. Also compare the speed in myelinated and non-myelinated fibers. **Application of skills: Students should be able to describe negative and positive correlations and apply correlation coefficients as a mathematical tool to determine the strength of these correlations. Students should also be able to apply the coefficient of determination (R^2) to evaluate the degree to which variation in the independent variable explains the variation in the dependent variable. For example, conduction speed of nerve impulses is negatively correlated with animal size, but positively correlated with axon diameter.** **C2.2.5—Synapses as junctions between neurons and between neurons and effector cells** Limit to chemical synapses, not electrical, and these can simply be referred to as synapses. Students should understand that a signal can only pass in one direction across a typical synapse. **C2.2.6—Release of neurotransmitters from a presynaptic membrane** Include uptake of calcium in response to depolarization of a presynaptic membrane and its action as a signaling chemical inside a neuron. **C2.2.7—Generation of an excitatory postsynaptic potential**	

Include diffusion of neurotransmitters across the synaptic cleft and binding to transmembrane receptors. Use acetylcholine as an example. Students should appreciate that this neurotransmitter exists in many types of synapse including neuromuscular junctions.

LQ -
• In what ways are biological systems regulated?
• How is the structure of specialized cells related to function?

C3.1 Integration of Body Systems (Interaction and Interdependence - Organisms)

GQ -
- **What are the roles of nerves and hormones in integration of body systems?**
- **What are the roles of feedback mechanisms in regulation of body systems?**

Guidance:
C3.1.1—System integration (Will cover within each associated system)
This is a necessary process in living systems. Coordination is needed for component parts of a system to collectively perform an overall function.

C3.1.2—Cells, tissues, organs and body systems as a hierarchy of subsystems that are integrated in a multicellular living organism
Students should appreciate that this integration is responsible for emergent properties. For example, a cheetah becomes an effective predator by integration of its body systems.

C3.1.3—Integration of organs in animal bodies by hormonal and nervous signaling and by transport of materials and energy
Distinguish between the roles of the nervous system and endocrine system in sending messages. Using examples, emphasize the role of the blood system in transporting materials between organs.

C3.1.4—The brain as a central information integration organ
Limit to the role of the brain in processing information combined from several inputs and in learning and memory. Students are not required to know details such as the role of slow-acting neurotransmitters.

C3.1.5—The spinal cord as an integrating center for unconscious processes Students should understand the difference between conscious and unconscious processes. **C3.1.6—Input to the spinal cord and cerebral hemispheres through sensory neurons** Students should understand that sensory neurons convey messages from receptor cells to the central nervous system. **C3.1.7—Output from the cerebral hemispheres to muscles through motor neurons** Students should understand that muscles are stimulated to contract. **C3.1.8—Nerves as bundles of nerve fibers of both sensory and motor neurons** Use a transverse section of a nerve to show the protective sheath, and myelinated and unmyelinated nerve fibers. **C3.1.9—Pain reflex arcs as an example of involuntary responses with skeletal muscle as the effector** Use the example of a reflex arc with a single interneuron in the grey matter of the spinal cord and a free sensory nerve ending in a sensory neuron as a pain receptor in the hand. **C3.1.10—Role of the cerebellum in coordinating skeletal muscle contraction and balance** Limit to a general understanding of the role of the cerebellum in the overall control of movements of the body. **C3.1.11—Modulation of sleep patterns by melatonin secretion as a part of circadian rhythms** Students should understand the diurnal pattern of melatonin secretion by the pineal gland and how it helps to establish a cycle of sleeping and waking. **C3.1.12—Epinephrine (adrenaline) secretion by the adrenal glands to prepare the body for vigorous activity** Consider the widespread effects of epinephrine in the body and how these effects facilitate intense muscle contraction. **C3.1.13—Control of the endocrine system by the hypothalamus and pituitary gland** Students should have a general understanding, but are not required to know differences	

between
mechanisms used in the anterior and posterior pituitary.

C3.1.14—Feedback control of heart rate following sensory input from baroreceptors and chemoreceptors
Include the location of baroreceptors and chemoreceptors.
Baroreceptors monitor blood pressure. Chemoreceptors monitor blood pH and concentrations of oxygen and carbon dioxide. Students should understand the role of the medulla in coordinating responses and sending nerve impulses to the heart to change the heart's stroke volume and heart rate.

C3.1.15—Feedback control of ventilation rate following sensory input from chemoreceptors (Gas Exchange)
Students should understand the causes of pH changes in the blood. These changes are monitored by chemoreceptors in the brainstem and lead to the control of ventilation rate using signals to the diaphragm and intercostal muscles.

C3.1.16—Control of peristalsis in the digestive system by the central nervous system and enteric nervous system
Limit to initiation of swallowing of food and egestion of feces being under voluntary control by the
central nervous system (CNS) but peristalsis between these points in the digestive system being under involuntary control by the enteric nervous system (ENS). The action of the ENS ensures passage of material through the gut is coordinated.

LQ -

- **What are examples of branching (dendritic) and net-like (reticulate) patterns of organization?**
- **What are the consequences of positive feedback in biological systems?**

C3.2 Defense against Disease (Interaction and Interdependence - Organisms)

GQ -

- **How do body systems recognize pathogens and fight infections?**
- **What factors influence the incidence of disease in populations?**

C3.2.1—Pathogens as the cause of infectious diseases
Students should understand that a broad range of disease-causing organisms can infect humans. A disease-causing organism is known as a pathogen, although typically the term is reserved for viruses, bacteria, fungi and protists. Archaea are not known to cause any diseases in humans.

NOS: Students should be aware that careful observation can lead to important progress. For example, careful observations during 19th-century epidemics of childbed fever (due to an infection after childbirth) in Vienna and cholera in London led to breakthroughs in the control of infectious disease.

C3.2.2—Skin and mucous membranes as a primary defense
The skin acts as both a physical and chemical barrier to pathogens. Students are not required to draw or label diagrams of skin.

C3.2.3—Sealing of cuts in skin by blood clotting
Include release of clotting factors from platelets and the subsequent cascade pathway that results in rapid conversion of fibrinogen to fibrin by thrombin and trapping of erythrocytes to form a clot. No further details are required.

C3.2.4—Differences between the innate immune system and the adaptive immune system
Include the idea that the innate system responds to broad categories of pathogen and does not change
during an organism's life whereas the adaptive system responds in a specific way to particular pathogens and builds up a memory of pathogens encountered, so the immune response becomes more effective. Students are not required to know any components of the innate immune system other than phagocytes.

C3.2.5—Infection control by phagocytes
Include amoeboid movement from blood to sites of infection, where phagocytes recognize pathogens, engulf them by endocytosis and digest them using enzymes from lysosomes.

C3.2.6—Lymphocytes as cells in the adaptive immune system that cooperate to produce antibodies

Students should understand that lymphocytes both circulate in the blood and are contained in lymph nodes. They should appreciate that an individual has a very large number of B-lymphocytes that each make a specific type of antibody. **C3.2.7—Antigens as recognition molecules that trigger antibody production** Students should appreciate that most antigens are glycoproteins or other proteins and that they are usually located on the outer surfaces of pathogens. Antigens on the surface of erythrocytes may stimulate antibody production if transfused into a person with a different blood group. **C3.2.8—Activation of B-lymphocytes by helper T-lymphocytes** Students should understand that there are antigen-specific B-cells and helper T-cells. B-cells produce antibodies and become memory cells only when they have been activated. Activation requires both direct interaction with the specific antigen and contact with a helper T-cell that has also become activated by the same type of antigen. **C3.2.9—Multiplication of activated B-lymphocytes to form clones of antibody-secreting plasma cells** There are relatively small numbers of B-cells that respond to a specific antigen. To produce sufficient quantities of antibody, activated B-cells first divide by mitosis to produce large numbers of plasma B-cells that are capable of producing the same type of antibody. **C3.2.10—Immunity as a consequence of retaining memory cells** Students should understand that immunity is the ability to eliminate an infectious disease from the body. It is due to the long-term survival of lymphocytes that are capable of making the specific antibodies needed to fight the infection. These are memory cells. **C3.2.11—Transmission of HIV in body fluids** Include examples of the mechanisms of HIV (human immunodeficiency virus) transmission. **C3.2.12—Infection of lymphocytes by HIV with AIDS as a consequence** Students should understand that only certain types of lymphocyte are infected and killed, but that a reduction in these lymphocytes limits the ability to produce antibodies and fight opportunistic infections. **C3.2.13—Antibiotics as chemicals that block processes occurring in bacteria but not in**	

eukaryotic cells Include reasons that antibiotics fail to control infection with viruses. **C3.2.14—Evolution of resistance to several antibiotics in strains of pathogenic bacteria** Students should understand that careful use of antibiotics is necessary to slow the emergence of multiresistant bacteria. **NOS: Students should recognize that the development of new techniques can lead to new avenues of research; for example, the recent technique of searching chemical libraries is yielding new antibiotics.** **C3.2.15—Zoonoses as infectious diseases that can transfer from other species to humans** Illustrate the prevalence of zoonoses as infectious diseases in humans and their varied modes of infection with several examples including tuberculosis, rabies and Japanese encephalitis. Include COVID-19 as an infectious disease that has recently transferred from another species, with profound consequences for humans. **C3.2.16—Vaccines and immunization** Students should understand that vaccines contain antigens, or nucleic acids (DNA or RNA) with sequences that code for antigens, and that they stimulate the development of immunity to a specific pathogen without causing the disease. **C3.2.17—Herd immunity and the prevention of epidemics** Students should understand how members of a population are interdependent in building herd immunity. If a sufficient percentage of a population is immune to a disease, transmission is greatly impeded. **NOS: Scientists publish their research so that other scientists can evaluate it. The media often report on the research while evaluation is still happening, and consumers need to be aware of this. Vaccines are tested rigorously and the risks of side effects are minimal but not nil. The distinction**	

between pragmatic truths and certainty is poorly understood. **C3.2.18—Evaluation of data related to the COVID-19 pandemic** **Application of skills: Students should have the opportunity to calculate both percentage difference and percentage change.** **LQ -** **• How do animals protect themselves from threats?** **• How can false-positive and false-negative results be avoided in diagnostic tests?** **D3.1 Reproduction (Continuity and Change - Organisms)** **GQ -** ● **How does asexual or sexual reproduction exemplify themes of change or continuity?** ● **What changes within organisms are required for reproduction?** **Guidance:** **D3.1.1—Differences between sexual and asexual reproduction** Include these relative advantages: asexual reproduction to produce genetically identical offspring by individuals that are adapted to an existing environment, sexual reproduction to produce offspring with new gene combinations and thus variation needed for adaptation to a changed environment. **D3.1.2—Role of meiosis and fusion of gametes in the sexual life cycle** Students should appreciate that meiosis breaks up parental combinations of alleles, and fusion of gametes produces new combinations. Fusion of gametes is also known as fertilization. **D3.1.3—Differences between male and female sexes in sexual reproduction** Include the prime difference that the male gamete travels to the female gamete, so it is smaller, with less food reserves than the egg. From this follow differences in the numbers of gametes and the reproductive strategies of males and females. **D3.1.4—Anatomy of the human male and female reproductive systems** Students should be able to draw diagrams of the male-typical and female-typical systems and annotate them with names of structures and functions. **D3.1.5—Changes during the ovarian and uterine cycles and their hormonal regulation**	

Include the roles of oestradiol, progesterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH) and both positive and negative feedback. The ovarian and uterine cycles together constitute the menstrual cycle. **D3.1.6—Fertilization in humans** Include the fusion of a sperm's cell membrane with an egg cell membrane, entry to the egg of the sperm nucleus but destruction of the tail and mitochondria. Also include dissolution of nuclear membranes of sperm and egg nuclei and participation of all the condensed chromosomes in a joint mitosis to produce two diploid nuclei. **D3.1.7—Use of hormones in in vitro fertilization (IVF) treatment** The normal secretion of hormones is suspended, and artificial doses of hormones induce superovulation. **LQ -** **How can interspecific relationships assist in the reproductive strategies of living organisms?** **What are the roles of barriers in living systems?** **D3.3 Homeostasis (Continuity and Change - Organisms)** **GQ -** ● **How are constant internal conditions maintained in humans?** ● **What are the benefits to organisms of maintaining constant internal conditions?** **Guidance:** **D3.3.1—Homeostasis as maintenance of the internal environment of an organism** Variables are kept within preset limits, despite fluctuations in external environment. Include body temperature, blood pH, blood glucose concentration and blood osmotic concentration as homeostatic variables in humans. **D3.3.2—Negative feedback loops in homeostasis** Students should understand the reason for use of negative rather than positive feedback control in	

homeostasis and that negative feedback returns homeostatic variables to the set point from values above and below the set point. **D3.3.3—Regulation of blood glucose as an example of the role of hormones in homeostasis** Include control of secretion of insulin and glucagon by pancreatic endocrine cells, transport in blood and the effects on target cells. **D3.3.4—Physiological changes that form the basis of type 1 and type 2 diabetes** Students should understand the physiological changes, together with risk factors and methods of prevention and treatment. **D3.3.5—Thermoregulation as an example of negative feedback control** Include the roles of peripheral thermoreceptors, the hypothalamus and pituitary gland, thyroxin and also examples of muscle and adipose tissue that act as effectors of temperature change. **D3.3.6—Thermoregulation mechanisms in humans** Students should appreciate that birds and mammals regulate their body temperature by physiological and behavioral means. Students are only required to understand the details of thermoregulation for humans. Include vasodilation, vasoconstriction, shivering, sweating, uncoupled respiration in brown adipose tissue and hair erection. **LQ -** ● **For what reasons do organisms need to distribute materials and energy?** ● **What biological systems are sensitive to temperature changes?**	
Students may be assessed daily with classwork, discussions, group work, and reflections using a variety of formats with a focus on the applications and skills provided in the syllabus. Applications and Skills will be assessed.	**Formative assessment:** Quiz/Test Lab Analysis/Report Project/Model CER/Reflection Essay/Writing Assignment

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Students will be assessed per subtopic and then at the end of the unit (Topic) to ensure understanding using IB exam style questions, modeling, reflection, lab reports, and writing prompts Students may be aware of many of the concepts within this unit, so building on prior knowledge using scaffolding techniques to aid students in a deeper understanding and extending learning to ensure that students can meet the goals set by the unit.	**Summative assessment:** Quiz/Test Lab Analysis/Report Lab Practical Project/Model CER/Reflection Essay/Writing Assignment Differentiation: Affirm Identity - build self-esteem Value Prior Knowledge Scaffold Learning Extend Learning Details: Many concepts may be familiar to the students and others will need more scaffolding and extension.

Approaches to learning (ATL)

Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see the guide.

Thinking - Asking questions and defining problems
Social Communication- Constructing Explanations
Self-management - Asking questions and defining problems
Research- Developing and using models

Language and learning	**TOK connections**	**CAS connections**
Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB's approach to language and learning, please see the guide.	*Check the boxes for any explicit TOK connections made during the unit*	*Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the "details" section explaining how students engaged in CAS for this unit.*

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Activating Background Knowledge Scaffolding for new learning Acquisition of new learning through practice Demonstrating proficiency Poikilotherms (animals that have a variable body temperature) are more effective producers of protein than homeotherms (animals that maintain a regulated body temperature) as they have a higher rate of conversion of food to biomass.	Personal and Shared Knowledge Ways of Knowing Areas of Knowledge The Knowledge Framework Details: The precautionary principle is meant to guide decision-making in conditions where a lack of certainty exists. Is certainty ever possible in the natural sciences?	Creativity Activity Service Details: Modeling and active participation in the learning process. Creating materials to aid their fellow classmates in understanding a particular concept through peer interaction and team/group activities.

International Mindedness/Aims:

International Mindedness: (Research/Reflections/Writing)
How does sickle cell affect homeostasis?
Global migration and the changing distribution of sickle hemoglobin

Aims: (Labs/Activities/Student Reflections/CER Activities)
The course enables students, through the overarching theme of the NOS, to:

1. **develop conceptual understanding that allows connections to be made between different areas of the subject, and to other DP sciences subjects**
2. **acquire and apply a body of knowledge, methods, tools, and techniques that characterize science**
3. **develop the ability to analyze, evaluate and synthesize scientific information and claims**
4. **develop the ability to approach unfamiliar situations with creativity and resilience**
5. **design and model solutions to local and global problems in a scientific context**
6. **develop an appreciation of the possibilities and limitations of science**
7. **develop technology skills in a scientific context**
8. **develop the ability to communicate and collaborate effectively**
9. **develop awareness of the ethical, environmental, economic, cultural, and social impact of science.**

Resources
• MCS Science Resources • Textbook Pearson Biology for the IB Diploma Standard and Higher Level • IB Biology Guide First Assessment 2025 • Van de Lagemaat, R. www.inthinking.net: Andorra la Vella, Andorra, 2019. • IB Biology Schoology Course • Discovery Education Biology and Chemistry Resources

Stage 3: Reflection—considering the planning, process and impact of the inquiry

What worked well *List the portions of the unit (content, assessment, planning) that were successful*	**What didn't work well** *List the portions of the unit (content, assessment, planning) that were not as successful as hoped*	**Notes/changes/suggestions:** *List any notes, suggestions, or considerations for the future teaching of this unit*