International Baccalaureate
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MARIETTA CITY SCHOOLS

Marietta City Schools

2025–2026 District Unit 6 Planner

Grade & Course: 10th Grade Biology	**Topic:** Cells: Structure and Function of Living Systems	**Duration:** 4 weeks
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Georgia Standards of Excellence:

SB1. Obtain, evaluate, and communicate information to analyze the nature of the relationships between structures and functions in living cells.

a. Construct an explanation of how cell structures and organelles (including nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, Golgi, endoplasmic reticulum, vacuoles, ribosomes, and mitochondria) interact as a system to maintain homeostasis.

c. Construct arguments supported by evidence to relate the structure of macromolecules (carbohydrates, proteins, lipids, and nucleic acids) to their interactions in carrying out cellular processes. (*Clarification statement:* The function of proteins as enzymes is limited to a conceptual understanding.)

d. Plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis.

SB4. Obtain, evaluate and communicate information to illustrate the organization of interacting systems within single-celled and multi-celled organisms.

a. Construct an argument supported by scientific information to explain patterns in structures and functions amongst clades of organisms, including the origin of eukaryotes by endosymbiosis.

c. Construct an argument supported by empirical evidence to compare and contrast the characteristics of viruses and organisms.

Narrative / Background Information

Prior student knowledge includes the foundational life science standards mastered in kindergarten, fifth grade, and seventh grade science.

7th Grade Foundational GSE:

S7L1. Obtain, evaluate, and communicate information to investigate the diversity of living organisms and how they can be compared scientifically.

a. Develop and defend a model that categorizes organisms based on common characteristics.

S7L2. Obtain, evaluate, and communicate information to describe how cell structures, cells, tissues, organs, and organ systems interact to maintain the basic needs of organisms.

a. Develop a model and construct an explanation of how cell structures (specifically the nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, and mitochondria) contribute to the function of the cell as a system in obtaining nutrients in order to grow, reproduce, make needed materials, and process waste. (Clarification statement: The intent is for students to demonstrate how the component structures of the cell interact and work together to allow the cell as a whole to carry out various processes. Additional structures, beyond those listed, will be addressed in high school Biology.)

5th Grade Foundational GSE:

S5L3. Obtain, evaluate, and communicate information to compare and contrast the parts of plant and animal cells.

a. Gather evidence by utilizing technology tools to support a claim that plants and animals are comprised of cells too small to be seen without magnification.

b. Develop a model to identify and label parts of a plant cell (membrane, wall, cytoplasm, nucleus, chloroplasts) and of an animal cell (membrane, cytoplasm, and nucleus).

c. Construct an explanation that differentiates between the structure of plant and animal cells.

Kindergarten Foundational GSE:

SKL1. Obtain, evaluate, and communicate information about how organisms (alive and not alive) and non-living objects are grouped.

a. Construct an explanation based on observations to recognize the differences between organisms and nonliving objects.
b. Develop a model to represent how a set of organisms and nonliving objects are sorted into groups based on their attributes.

Year-Long Anchoring Phenomena: (LEARNING PROCESS)
Sickle cell is a heritable genetic mutation that evolved in response to interactions in ecosystems.

Unit Phenomena (LEARNING PROCESS)
Homeostatic adaptations of salt water fish.

MYP Inquiry Statement:
Identity is determined by the **relationship** between different levels of cellular organization in your body which, although differing in complexity, share **patterns** and **functions** with all life on Earth.

MYP Global Context:
Identities and Relationships

Approaches to Learning Skills:
Thinking Skills
Social Skills
Communication Skills
Self-Management Skills

Science & Engineering Practices
Constructing explanations
Engaging in argument from evidence
Planning and carrying out investigations

Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)
- CHONPS
- Organic and Inorganic
- Structure & function of carbohydrates, lipids, proteins, and nucleic acids
- Cell Organelles function in maintaining homeostasis
- Endosymbiosis
- Passive & Active Transport

Crosscutting Concepts: (KNOWLEDGE & SKILLS)
- Structure & Function
- System & System Models
- Stability & Change

MYP Key and Related Concepts:
- Relationships
- Patterns
- Function

GADOE Achievement Level Descriptors for Biology

Disciplinary Core Content: cell structure and function
Focus Science & Engineering Practices: developing and using models; constructing explanations
Focus Crosscutting Concepts: structure and function

SB1a: Construct an explanation of how cell **structures** and organelles (including nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, Golgi, endoplasmic reticulum, vacuoles, ribosomes, and mitochondria) interact as a system to maintain homeostasis.
SB1c: Construct arguments supported by evidence to relate the **structure** of macromolecules (carbohydrates, proteins, lipids, and nucleic acids) to their interactions in carrying out cellular processes. (Clarification statement: The function of proteins as enzymes is limited to a conceptual understanding.)
SB1d: Plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis.

The beginning learner can…	The developing learner can…	The proficient learner can…	The distinguished learner can…
• identify the structures and functions of cell parts; • relate the structure of macromolecules to their interactions in carrying out	• explain that cell structures and organelles interact as a system to maintain homeostasis; • select arguments that are	• construct an explanation of how cell structures and organelles (i.e., nucleus, cytoplasm, cell membrane, cell wall, chloroplasts,	• refine explanations of how cell structures and organelles interact as a system to maintain homeostasis;

cellular processes; • recognize that cellular transport is involved in maintaining homeostasis	supported by evidence to relate the structure of macromolecules to their interactions in carrying out cellular processes; • identify investigations used to determine the role of cellular transport in maintaining homeostasis	lysosome, Golgi, endoplasmic reticulum, vacuoles, ribosomes, mitochondria) interact as a system to maintain homeostasis; • construct arguments supported by evidence to relate the structure of macromolecules (carbohydrates, proteins, lipids, and nucleic acids) to their interactions in carrying out cellular processes; • plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis	• refine arguments supported by evidence to relate the structure of macromolecules to their interactions in carrying out cellular processes; • refine investigations to determine the role of cellular transport in maintaining homeostasis

Student Friendly Learning Targets

1. I can state the eight characteristics of living things.
2. I can classify an object as living or non-living based on known characteristics of living things.
3. I can construct an argument supported by evidence to support the claim that viruses are lifelike but nonliving.
4. I can differentiate between a monomer and polymer.
5. I can explain that carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur are important elements found in all living things.
6. I can define the term organic and give examples and non examples.
7. I can use terms such as macromolecule, carbon-based molecule, organic molecule, and organic polymer when explaining the structure and function of carbohydrates, proteins, lipids, and nucleic acids.
8. I can explain why carbon is considered the building block of life.
9. I can differentiate between a monomer and a polymer.
10. I can list the four groups of macromolecules: carbohydrates, proteins, lipids, and nucleic acids.
11. I can state the monomer for carbohydrates, proteins, and nucleic acids.
12. I can give common biological examples of carbohydrates, proteins, lipids, and nucleic acids.
13. I can describe the major function(s) of the four groups of macromolecules.
14. I can give common examples of the role of the four groups of macromolecules in cellular processes.
15. I can relate the structure of a macromolecule(monomer/polymer) to its function in cellular processes.
16. I can construct an argument supported by evidence to support the claim that the structure of a macromolecule influences its function in cellular processes.
17. I can refine an argument supported by evidence to support the claim that the structure of a macromolecule influences its function in cellular processes.
18. I can explain the role of enzymes as biological catalysts.
19. I can explain how enzymes act as biological catalysts by lowering activation energy for chemical reactions.
20. I can describe external factors that influence how biological molecules function in living systems (i.e., temperature, pH, salinity).
21. I can differentiate between prokaryotic cellular structure and eukaryotic cellular structure.
22. I can differentiate between plant and animal cells.
23. I can identify the structure and function of cellular parts.
24. I can define and give examples of cellular homeostasis.
25. I can explain that cell structures and organelles interact as a system to maintain homeostasis.
26. I can construct an explanation of how cell structures and organelles (i.e., nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, Golgi, endoplasmic reticulum, vacuoles, ribosomes, mitochondria) interact as a system to maintain homeostasis.

27. I can refine arguments supported by evidence to relate the structure of macromolecules to their interactions in carrying out cellular processes.
28. I can explain the role of phospholipids, carbohydrates, proteins, and cholesterol in the proper function of cell membranes.
29. I can describe the fluid mosaic model of the cell membrane.
30. I can explain why the cell membrane is selectively permeable, and which molecules are easily diffused through the cell membrane.
31. I can identify the parts of a solution (solute and solvent).
32. I can differentiate between a hypertonic, hypotonic, and isotonic environment.
33. I can describe the importance of concentration gradients to a cell's ability to maintain homeostasis.
34. I can differentiate between passive and active transport, and give biological examples of each.
35. I can differentiate between diffusion, osmosis, and facilitated diffusion, and give biological examples of each.
36. I can predict the response of both plant and animal cells to solutions of different tonicity.
37. I can appropriately apply terms such as lysis, turgid, flaccid, and plasmolyzed to demonstrate my understanding of how different cells respond to solutions of different tonicity.
38. I can describe factors that affect the rate of diffusion across a cell membrane, and how each factor affects the rate of diffusion (temperature, surface area, concentration gradient, size of particles, diffusion medium).
39. I can differentiate between protein pumps, endocytosis, and exocytosis, and give biological examples of each.
40. I can identify investigations used to determine the role of cellular transport in maintaining homeostasis
41. I can plan and carry out investigations to determine the role of cellular transport (e.g., active, passive, and osmosis) in maintaining homeostasis.
42. I can refine investigations to determine the role of cellular transport in maintaining homeostasis.

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students should have a basic understanding of the differences between prokaryotic and eukaryotic cells, as well as the basic functions of the organelles. Students should understand the general idea of homeostasis and the processes that occur at cellular level to transport across the cell membrane.

Possible Misconceptions:
Organelles do not affect the larger organisms' function.
One organelle is more critical than other organelles.
Mitochondria are the "powerhouse" of the cell. A model must be a 3-D representation. Homeostasis means equilibrium- not necessarily that the environment (of the cell) is stable→ not everything in terms of solutes should be equal inside and outside the cell.
The structure of various macromolecules does not impact the function within the cell or organism.
The different macromolecules are not involved in the cell maintaining homeostasis.
All things move through the cell membrane in the same way.
The environment does not affect how things move into or out of a cell.

Key Vocabulary: (KNOWLEDGE & SKILLS)

Students should master the following vocabulary as they build a core understanding within the context of the disciplinary core ideas. Note that terms with a ~~strikethrough~~ will be explored with other topics in the course.

- Active Transport
- ADP
- Amino Acid
- Animal Cell
- ATP
- Bacteria
- ~~Binary Fission~~
- ~~Calvin Cycle~~
- Carbohydrate
- Catalyst
- Cell Cycle
- Cell Membrane
- Cell Wall
- ~~Centrioles~~
- ~~Centromere~~
- Chloroplast
- Chlorophyll
- ~~Chromosomes~~
- Concentration Gradient
- Cytoplasm
- ~~Daughter Cells~~
- Denature
- Diffusion
- DNA
- ~~Electron Transport Chain~~
- Energy
- Enzyme
- Endocytosis
- Endoplasmic Reticulum
- Eukaryote
- Exocytosis
- Facilitated Diffusion
- Fatty Acids
- ~~Gamete~~
- ~~Genes~~
- ~~Genetic Continuity~~
- Glycerol
- ~~Glycolysis~~
- Golgi Apparatus
- Homeostasis
- ~~Homologous Chromosomes~~
- Hydrophobic
- Hypertonic
- Hypotonic
- Isotonic
- ~~Krebs Cycle~~
- ~~Light Reactions~~
- Lipid
- Lysosome
- Macromolecule
- Matter
- ~~Meiosis~~
- Mitochondria
- ~~Mitosis~~
- Monosaccharide
- Monomer
- Nuclei
- Nucleus
- Nucleic Acids
- Nucleotides
- Organic Molecule
- Osmosis
- ~~Parent cell~~
- pH
- Phospholipid
- Phospholipid Bilayer
- Plant cell
- Polymer
- Polysaccharide
- Prokaryote
- Protein
- Protein Pumps
- Ribosomes
- ~~RNA~~
- ~~Sister Chromatids~~
- Solute
- Solution
- Solvent
- ~~Spindle Fibers~~
- Stimuli
- Substrate
- Transport Proteins
- Vacuole
- Vesicle

Inquiry Questions:

Factual

What are the characteristics of living things?
What are cells and how are they structured?
What roles do cells carry out?
What are the major organelles in a cell?
What are the functions of each of the organelles?
What are the structural differences between prokaryotic and eukaryotic cells?
What are the 4 major classes of macromolecules, their monomers, and their functions?

Conceptual

What determines whether something is alive or not?
Are viruses alive?
How does cell structure relate to function?
How do cell structures interact to maintain the homeostasis of the cell?
How do the structures of the 4 macromolecules relate to their function in cellular processes?
How do active and passive transport help cells maintain homeostasis?

Debatable Question

Would you recommend consumption of advertised athletic drinks such as Gatorade and PowerAid to help support homeostasis in cells?
Are humans a special form of life?

MYP Objectives	Summative Assessment	
Sciences **Design**	Assessment Tasks: Common Formative Assessments: SB1a and SB1c MYP Assessment: SB1d Common Summative Assessment	Relationship between summative assessment task(s) and statement of inquiry: The CFAs help to monitor and determine student progress as we move through the unit. This data informs the teacher of which students to accelerate, and which to remediate prior to the unit summative. The summative assessments serve to test students' mastery of the learning targets at the proficient and distinguished level of the Achievement Level Descriptors for Biology

Unit Objectives:

- Living things have characteristics that distinguish them from nonliving things: made up of cells; reproduce, based on universal genetic code, obtain and use materials and energy, respond to the environment, maintain homeostasis, evolve
- Cells are made of four major macromolecules–proteins, lipids, nucleic acids and carbohydrates.
- Cells are the building blocks of living things, and carbon is the building block of cells.
- Cells can be classified into two broad categories–prokaryotic and eukaryotic.
- Eukaryotic cells can be further divided into groups based on the presence or absence of certain structures.
- Cells have parts with specific functions: the nucleus, DNA,cytoplasm,cell membrane, and cell wall.
- Microscopes are tools that allow the observation and study of very small objects such as cells.
- Cells are very small so that materials such as nutrients and wastes can be exchanged efficiently between the inside and outside of the cell.
- Cells exchange materials with their environment to maintain homeostasis via various types of passive and active transport.
- Models help us understand complex biological structures such as the cell.
- Enzymes help to facilitate cellular processes in living things.

Learning Activities and Experiences	Obtain:	Evaluate:	Communicate:
Weeks 1: **Topic 1: Macromolecule Structure & Function** • Characteristics of Life • CHONPS • Carbs • Lipids • Proteins & Enzymes • Nucleic Acids	Common Openers & Closers for Unit 6: Structure & Function of Living Systems Biochemistry PPT (Honors) Biochemistry Student Notes (Honors) Biochemistry Interactive Notes	Mystery Organism Performance Task: *Students will use various resources to create a claim in response to whether a mystery item is living or nonliving based on the characteristics of living things.* Macromolecules Quick Comparison Chart The Last Supper: Identifying Macromolecules Activity Using Models to Predict Enzyme Effectiveness Task	Enzyme Catalysis Inquiry Investigation Catalase Inquiry Lab

		Solving the Mystery of the Messed Up Jello Activity Toothpick-ase Enzyme Simulation Detergent Enzyme Lab	
Weeks 2 & 3: **Topic 2: Cell Organelles Structure & Function** • prokaryotic versus eukaryotic cells • plant versus animal cells • how the structure of organelles supports cellular function • cell membrane structure and function • Endosymbiotic theory	Cell Structure, Function & Transport PPT (Honors) Cell Organelle Structure & Function Interactive Notes	Cell Theory Article - Annotating & Summarizing Strategies Microscopy and a Comparison of Cells Lab Cell Organelle Structure/Function Card Sort Cutouts Defective Organelle Case Study Little Girl Lost Case Study Cell Membrane Drawing Activity Malfunctioning Organelles Research Presentation Cell Structure & Function Debate Endosymbiotic Theory	Common Formative Assessment
Weeks 3 & 4: **Topic 3: Cellular Transport** • homeostasis • types of cellular environments • types of passive transport • types of active transport	Cell Structure, Function & Transport PPT (Honors) Cell Transport Interactive Notes	Cell Transport Practice Problems Virtual Diffusion Lab: Dialysis Bag Activity Transport Proteins on Strike Case Study Modeling Cell Transport Lab Cell Transport Lab Potato Osmosis Lab	MYP - Unit 6

		Cell Homeostasis Virtual Lab Investigating SA to V Ratio in Cells	
Week 4.5: **Assess & Remediate** - Common Summative Assessment & Unit Remediation			Common Summative Assessment Remediation & Enrichment
Resources (hyperlink to model lessons and/or resources): Discovery Education Science Techbook Schoology Pages			