Phoenixville Area School District Understanding by Design (UbD) Science Unit Plan

Grade Level &/or HS Subject: BIOLOGY **Unit Name: ORGANISM STRUCTURE & ORGANIZATION**

Stage 1 Desired Results

Overarching NGSS & PA Standards:

HS-LS1-2

HS-LS1-3

HS-LS1-6

Which branch(es) of science apply:

BIOLOGY

Transfer

Students will be able to independently use their learning to…

- Develop and/or use models
- Plan and/or carry out investigations
- Analyze and interpret data using computational thinking
- Construct explanations and design solutions

Meaning-Making

Students will understand that…

- there is a hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- feedback mechanisms maintain homeostasis.
- carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

ESSENTIAL QUESTIONS

Students will keep considering...

- How do structures of organisms enable life's functions?
- How do organisms detect, process, and use information about the environment?
- How do organisms obtain and use the matter and energy they need to live and grow?

Knowledge and Skills Acquisition

UNDERSTANDINGS

Students will know…

- Systems of specialized cells within organisms help them perform the essential functions of life.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells

Students will be skilled at…

- Developing and using a model based on evidence to illustrate the relationships between systems or between components of a system
- Planning and conducting an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed

	• As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. • Relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).* • How carbon is uniquely suited to form biological macromolecules.* • The structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.* • the characteristics of life shared by all prokaryotic and eukaryotic organisms.* • cellular structures and their functions in prokaryotic and eukaryotic cells.* • the unique properties of water and how these properties support life on Earth* • how organisms maintain homeostasis* • how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.* • the mechanisms that transport materials across the plasma membrane* • how endoplasmic reticulum, Golgi apparatus, and other membrane-bound cellular organelles facilitate transport of materials within cells.* KEY VOCABULARY Dehydration Synthesis, Homeostasis, Hydrolysis, Monomer, Multicellular, Negative Feedback, Cell, Tissue, Organ, Organ System, Polymer, Positive Feedback, Plasma Membrane, Passive Transport, Active Transport, Diffusion, Facilitated Diffusion, Osmosis, Endocytosis, Exocytosis, Transport Vesicle, ER, Golgi Apparatus	to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly • Constructing and revising an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Stage 2 – Evidence		
Evaluative Criteria	***Assessment Evidence***	
What criteria will be used in each assessment to evaluate attainment of the desired results?	PERFORMANCE TASK(S): • Organism Homeostasis Inquiry Lab (explain organization of systems interacting to maintain homeostasis using exercise lab) • Molecule Modeling Lab(s)/Jigsaw Activity	Differentiation Considerations: • Grouping of students
What criteria will be used in each assessment to evaluate attainment of the desired results?	OTHER EVIDENCE: • Quizzes and Unit Exams • Choice of the following labs: o Microscope Lab/Practicum o Properties of Water Inquiry Lab o Buffer Lab o Identifying Nutrients Inquiry Lab o Cell Types Inquiry Lab o Cell Membrane Modeling Lab o Osmosis Lab (Gummy Bear or Dialysis, etc)	Differentiation Considerations: • Grouping of students • Split Screen Activities • Scaffolding of Information