

CURRICULUM

GUIDE

Biology

Providence
Schools

QUARTER I

Content students have to learn

Processes students will learn and use

Unit 1.1 – Ecosystems (12 days)

- Understand the relationship between photosynthesis, cellular respiration, and the transfer of energy in an ecosystem.
- Understand how changes in an ecosystem can affect the amount of energy at each trophic level.
- Develop an understanding of the flow of matter and energy through trophic levels and between organisms.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.

Unit 1.2 – Evolution of Ecosystems (10 days)

- Determine that the locations of mountain ranges, recent earthquakes, and volcanic eruptions can be used to identify patterns in earth systems.
- Understand that natural events can lead to changes in an ecosystem.
- Identify a climax community and understand how an ecosystem maintains equilibrium.
- Examine environmental disruptions and relate them to primary and secondary succession.
- Illustrate the relationships between environmental disruptions and natural selection/evolution.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.
- » Evaluate models according to their adequacy in representing biological objects and events.

Unit 1.3 – Collecting Data from Ecosystems (10 days)

- Understand that valid and relevant evidence is needed to identify potential biases in media sources.
- Understand that logical arguments about environmental issues depend on the appropriate use and interpretation of scientific data.
- Recognize that human events and activities can affect the flow of energy or cycling of matter in an ecosystem.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.

Unit 1.4 – Humans and the Ecosystem (7 days)

- Understand that human demands on an ecosystem (ecological footprint) have an impact on all living organisms.
- Recognize that sustainability of organisms depends on the survival of diverse ecosystems.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.

QUARTER 2

Content students have to learn

Processes students will learn and use

Unit 2.1 – Specialized Structures in a Cell (12 days)

- Describe the structures and functions of cell organelles found in prokaryotic and eukaryotic cells.
- Investigate and identify cellular processes that maintain a stable condition (homeostasis).
- Understand how the structures of cellular organelles complement their functions.

- » Implement investigative procedures, including using a microscope and making wet-mount slides.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.

Unit 2.2 – Unicellular and Multicellular Specialization (9 days)

- Recognize that unicellular organisms have subcellular structures that perform functions that enable them to survive and reproduce.
- Understand that multicellular organisms have specialized cells that perform functions that enable them to survive and reproduce.
- Understand that unicellular organisms have subcellular structures that perform functions similar to the functions of specialized cells in multicellular organisms.
- Recognize the importance of specialization of cells to the survival of multicellular organisms.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.
- » Evaluate models according to their adequacy in representing biological objects and events.

Unit 2.3 – Cell Cycle (5 days)

- Describe the stages of mitosis and their relationship to the cell cycle.
- Understand the significance of mitosis to unicellular and multicellular organisms.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.

Unit 2.4 – Factors That Affect Homeostasis (10 days)

- Understand that the human body systems—nervous, immune, and endocrine—interact to maintain homeostasis.
- Understand that homeostasis in humans is affected by external and internal environmental changes.
- Recognize that feedback mechanisms work to maintain homeostasis in the human body.
- Recognize that a disruption of homeostasis in human body systems can be a cause of human disease.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.
- » Evaluate models according to their adequacy in representing biological objects and events.

QUARTER 3

Content students have to learn

Processes students will learn and use

Unit 3.1 – Classical Genetics (15 days)

- Understand the mechanisms that allow genetic information to be passed from parent to offspring.
- Make predictions using models about phenotypes and genotypes from genetic crosses.
- Understand and explain how meiosis can produce gametes that are genetically different from the parent cells.
- Describe the stages of meiosis.
- Understand the significance of meiosis in contributing to genetic variation of offspring.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.
- » Evaluate models according to their adequacy in representing biological objects and events.

Unit 3.2 – DNA Structure (10 days)

- Recognize components of DNA and understand how the information for specifying the traits of an organism is carried in the DNA.
- Use models of DNA to explain replication.
- Understand that DNA exists in two conditions (coiled to prevent damage to the DNA structure during mitosis and uncoiled so that replication or transcription can take place during interphase).

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Communicate valid conclusions supported by data.

Unit 3.3 – Protein Synthesis (10 days)

- Understand the processes (transcription and translation) that result in the production of proteins.
- Understand gene expression.
- Understand the connections between proteins and expressed traits.
- Understand that chromosomes are made up of genes.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.

Unit 3.4 – Mutations (7 days)

- Understand that a change in the genetic code (mutations) can have varying effects on an organism's phenotype.
- Recognize how some environmental factors cause changes in the DNA sequence.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Collect data and make measurements with precision.
- » Communicate valid conclusions supported by data.

Unit 3.5 – Genetic Engineering and Selective Breeding (10 days)

- Understand that DNA sequences of an organism can be changed through selective breeding or genetic engineering.
- Understand that selective breeding and genetic engineering can be beneficial or detrimental to the environment, personal health, and the economy.

- » Apply appropriate safety measures in the class and lab rooms as well as outdoors.
- » Communicate valid conclusions supported by data.
- » Evaluate models according to their adequacy in representing biological objects and events.

QUARTER 4

Content students have to learn

Processes students will learn and use

Unit 4.1 – Evolution: History and Evidence (11 days)

- Understand that the diversity of organisms on Earth is the result of natural selection and evolution.
- Recognize that the modern theory of evolution is based on the contributions of scientists who worked in various scientific disciplines.
- Recognize that data and technology have enhanced our understanding of plate tectonics, which provides further evidence of evolution.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom, laboratory, and outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.

Unit 4.2 – Evolution: Mechanisms (8 days)

- Understand that microevolution and macroevolution can account for speciation and extinction.
- Recognize that sudden or gradual changes in the environment affect the rate of the evolution of a species or population.
- Understand that a change in an environment will cause a range (advantage, disadvantage, or no impact) of adaptive pressures on an organism.

- » Plan and implement investigative procedures.
- » Apply appropriate safety measures in the classroom, laboratory, and outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.
- » Evaluate models according to their adequacy in representing biological objects and events.

Unit 4.3 – Evolution: Classification (11 days)

- Recognize that organisms can be organized into a hierarchy of groups and subgroups based on evolutionary relationships.
- Understand how to use taxonomic keys to analyze evolutionary relationships among organisms.
- Recognize the patterns found in molecular and fossil evidence used to explain natural selection and its evolutionary consequences.

- » Implement investigative procedures.
- » Apply appropriate safety measures in the classroom, laboratory, and outdoors.
- » Collect data and make measurements with precision.
- » Organize, analyze, evaluate, make inferences, and predict trends in data.
- » Communicate valid conclusions supported by data.
- » Evaluate models to determine if they are accurate in representing biological objects and events.

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