THS Curriculum Biology II

Course: Biology II

Grades: 10, 11, 12

Unit Name: It's All About Carbon

Essential Questions:

- Why is carbon the building block of so many molecules that life depends on?
- How is carbon recycled through both biotic and abiotic factors in an ecosystem? How are you involved in this process?
- How is the increase in carbon dioxide in the atmosphere affecting the Earth?
- What it the relationship between photosynthesis and cellular respiration?
- What are the 4 macromolecules and why are they important to living things?

Suggested Time Frame: 6 Weeks

High School Content Expectations:

B1.1 and B1.2 Scientific Inquiry and Scientific Reflection and Social Implications

L2.p3A Explain the significance of carbon in organic molecules.

L2.p3C Predict what would happen to plants growing in low carbon dioxide atmospheres.

L2.p4B Explain how an organism obtains energy from the food it consumes.

L2.p5A Recognize the six most common elements in organic molecules (C, H, N, O, P, S).

L2.p5B Identify the most common complex molecules that make up living organisms.

B2.1A Explain how cells transform energy (ultimately obtained from the sun) from one form to another through the processes of photosynthesis and respiration. Identify the reactants and products in the general reaction of photosynthesis.

B2.1B Compare and contrast the transformation of matter and energy during photosynthesis and respiration.

B2.2A Explain how carbon can join to other carbon atoms in chains and rings to form large and complex molecules.

B2.2B Recognize the six most common elements in organic molecules (C, H, N, O, P, S).

B2.2C Describe the composition of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids)

B2.2D Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.

B2.2E Describe how dehydration and hydrolysis relate to organic molecules.

B2.2f Explain the role of enzymes and other proteins in biochemical functions (e.g., the protein hemoglobin carries oxygen in some organisms, digestive enzymes, and hormones).

B2.3A Describe how cells function in a narrow range of physical conditions, such as temperature and pH (acidity), to perform life functions.

B2.5A Recognize and explain that macromolecules such as lipids contain high energy bonds.

B2.5e Explain the interrelated nature of photosynthesis and cellular respiration in terms of ATP synthesis and degradation.

B2.5f Relate plant structures and functions to the process of photosynthesis and respiration.

L3.p3B Distinguish between the living (biotic) and nonliving (abiotic) components of an ecosystem.
L3.p3C Explain how biotic and abiotic factors cycle in an ecosystem (water, carbon, oxygen, and nitrogen).

B3.1A Describe how organisms acquire energy directly or indirectly from sunlight.

B3.1B Illustrate and describe the energy conversions that occur during photosynthesis and respiration.

B3.1C Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.
B3.1D Explain how living organisms gain and use mass through the processes of photosynthesis and respiration.
B3.1e Write the chemical equation for photosynthesis and cellular respiration and explain in words what they mean.
B3.1f Summarize the process of photosynthesis.
B3.4c Examine the negative impact of human activities.
B3.4d Describe the greenhouse effect and list possible causes.
B3.4e List the possible causes and consequences of global warming.

Materials Used:

- Biology Textbook
- NPR Videos, Global Warming Sampler Project, and Notes: Carbon Cycle, How is Carbon Recycled Between Plants and Animals, Let's Talk About Carbs, The Other Macromolecules,
- Laboratory Activities: Photosynthesis and Cellular Respiration Project, Light/Photosynthesis, Bromothymol Blue/Elodea, Exercise and CO_2 Quick Lab, Yeast Production, Calorimetry, and The Nature of Enzymes.

Major Themes/Concepts:

- **Carbon Cycle,**
- **Photosynthesis and Cellular Respiration**
- **Macromolecules (Carbohydrates, proteins, lipids, and nucleic acids)**
- **Global Warming**

Assessments:

- Quizzes: Photosynthesis/Cellular Respiration, Carbohydrates, The Other Macromolecules, Enzymes, laboratory activities, projects and pre and posttests.

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Course: Biology II

Grades: 10, 11, 12

Unit Name: Biochemistry

Essential Questions:

- **What is the difference between organic and inorganic compounds?**
- **Why is carbon the central component of organic compounds?**
- **What elements are responsible for a significant portion of living organisms?**
- **What is the difference between products and reactants in a chemical reaction?**
- **How are atoms and molecules related?**
- **What are the components of an atom?**

Suggested Time Frame: 1 Week

High School Content Expectations

L2.p1B Explain the importance of both water and the element carbon to cells.
L2.p5B Identify the most common complex molecules that make up living organisms.
L2.p5C Predict what would happen if essential elements were withheld from developing cells.
B2.2A Explain how carbon can join to other carbon atoms in chains and rings to form large and complex molecules.
B2.2B Recognize the six most common elements in organic molecules (C, H, N, O, P, S).
B2.2C Describe the composition of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).
B2.2D Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.
B2.2E Describe how dehydration and hydrolysis relate to organic molecules.
B2.2f Explain the role of enzymes and other proteins in biochemical functions (e.g., the protein hemoglobin carries oxygen in some organisms, digestive enzymes, and hormones)
B2.3A Describe how cells function in a narrow range of physical conditions, such as temperature and pH (acidity), to perform life functions.
B2.3B Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.
B2.3C Explain how stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents.

Materials Used:

- Biology Textbook
- Chemical Bases of Life Notes
- Activities: Acid/Base Project

Major Themes/Concepts:

- Atoms and Molecules
- Chemical Reactions
- Electron Bonding
- Water
- Acids and Bases

Assessments:

- Acid/Base Project and pre and posttests.

THS Curriculum Biology II

Course: Biology II

Grades: 10, 11, 12

Unit Name: The Organization of Life

Essential Questions:

- What is biology and how can it be applied to life and society?
- What are the characteristics of life?
- How do metabolism and homeostasis relate to life processes?
- What is the importance of information transfer to living systems?
- What is the hierarchy of biological organization?
- Why is the theory of evolution a unifying principal in biology?
- Why is the theory of natural selection a logical explanation for evolution?
- Why is it important to design and tests experiments/hypothesis?

Suggested Time Frame: 2 Weeks

High School Content Expectations

B1.1 Science is a way of understanding nature. Scientific research may begin by generating new scientific questions that can be answered through replicable scientific investigations that are logically developed and conducted systematically. Scientific conclusions and explanations result from careful analysis of empirical evidence and the use of logical reasoning. Some questions in science are addressed through indirect rather than direct observation, evaluating the consistency of new evidence with results predicted by models of natural processes. Results from investigations are communicated in reports that are scrutinized through a peer review process.

B1.2 The integrity of the scientific process depends on scientists and citizens understanding and respecting the "nature of science." Openness to new ideas, skepticism, and honesty are attributes required for good scientific practice. Scientists must use logical reasoning during investigation design, analysis, conclusion, and communication. Science can produce critical insights on societal problems from a personal and local scale to a global scale. Science both aids in the development of technology and provides tools for assessing the costs, risks, and benefits of technological systems. Scientific conclusions and arguments play a role in personal choice and public policy decisions. New technology and scientific discoveries have had a major influence in shaping human history. Science and technology continue to offer diverse and significant career opportunities.

B2.3The internal environment of living things must remain relatively constant. Many systems work together to maintain stability. Stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents.

B2.3x The internal environment of living things must remain relatively constant. Many systems work together to maintain homeostasis. When homeostasis is lost, death occurs.

L3.p1 Organisms of one species form a population. Populations of different organisms interact and form communities. Living communities and the nonliving factors that interact with them form ecosystems.

L3.p2 Two types of organisms may interact with one another in several ways; they may be in a producer/consumer, predator/prey, or parasite/host relationship. Or one organism may scavenge or decompose another. Relationships may be competitive or mutually beneficial. Some species have become so adapted to each other that neither could survive without the other.

L3.p3 The number of organisms and populations an ecosystem can support depends on the biotic resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.

L3.p4 All organisms cause changes in their environments. Some of these changes are detrimental, whereas others are beneficial.

B3.2 The chemical elements that make up the molecules of living things pass through food webs and are combined and recombined in different ways. At each link in an ecosystem, some energy is stored in newly made structures, but much is dissipated into the environment as heat. Continual input of energy from sunlight keeps the process going.

B3.5 Populations of living things increase and decrease in size as they interact with other populations and with the environment. The rate of change is dependent upon relative birth and death rates.

B3.5x The shape of population growth curves vary with the type of organism and environmental conditions, such as availability of nutrients and space. As the population increases and resources become more scarce, the population usually stabilizes at the carrying capacity of that environment.

B5.1 The theory of evolution provides a scientific explanation for the history of life on Earth as depicted in the fossil record and in the similarities evident within the diversity of existing organisms.

B5.3 Evolution is the consequence of natural selection, the interactions of (1) the potential for a population to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection from environmental pressure of those organisms better able to survive and leave offspring.

Materials Used:

- Biology Textbook
- PowerPoint or Smartboard Notes: Biology the Science of Life
- Laboratory Activities: Scientific Method Activity and Measuring Lung Capacity Lab

Major Themes/Concepts:

- Scientific Method
- Life Essentials
- Defining Life
- Biological Organization
- Taxonomy
- Domains and Kingdoms
- Evolution/Natural Selection
- Input of Energy

Assessments:

- Quizzes, laboratory assignments, and pre and posttests.

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Suggested Time Frame: 6 Weeks

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B2.5f Relate plant structures and functions to the process of photosynthesis and respiration.

THS Curriculum Biology II

Course: Biology II

Grades: 10, 11, 12

Unit Name: Disease

Essential Questions:

- What is a virus and why is it considered non-living?
- What are the reproductive cycles of viruses?
- What are transformation, conjugation, and transduction in terms of bacterial reproduction?
- How has bacteria /viruses changed in terms of natural selection and evolution?
- What is etiology?

Suggested Time Frame: 6 Weeks

High School Content Expectations

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B5.3 Evolution is the consequence of natural selection, the interactions of (1) the potential for a population to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection from environmental pressure of those organisms better able to survive and leave offspring.

B2.4g Explain that some structures in the modern eukaryotic cell developed from early prokaryotes, such as mitochondria, and in plants, chloroplasts.

B2.4h Describe the structures of viruses and bacteria.

B2.4i Recognize that while viruses lack cellular structure, they have genetic material to invade cells.

L3.p2 Describe common relationships between organisms and provide examples.

B3.r5g Diagram and describe the stages of the life cycle for a human disease-causing organism.

B4.2B Recognize that every species has its own characteristic DNA sequence.

B4.2g Describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology.

Materials Used:

- Biology Textbook
- PowerPoint or Smartboard Notes: Bacteria Lecture and Virus Lecture
- Laboratory Activities: Bacterial Shapes, Antibiotic Resistance, Antibacterial Resistance, and Hand washing Labs

Major Themes/Concepts:

- Causes of disease: bacteria and viruses
- Bacteria characteristics (reproduction, sizes, shapes, gram +/-)
- Bacterial reproduction
- Koch's Postulates
- History of viruses/ H1N1
- Virus characteristics (reproduction, size, shape)
- Viral reproduction

Assessments:

- Quizzes, laboratory assignments, and pre and posttests, and historical pandemic project.