

THS Curriculum Biology

Course: Biology I, Biology CP

Grade: 9

Unit Name: The Science of Biology

Essential Questions:

- How do organisms react to a change in the environment?
- How does science help us answer questions about the world around us?
- What does it mean to question?
- What is scientific inquiry?
- Why do scientists conduct investigations?

Suggested Time Frame: 3.5 Weeks

High School Content Expectations

B1.1A Generate new questions that can be investigated in the laboratory or field.

B1.1B Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions.

B1.1C Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).

B1.1D Identify patterns in data and relate them to theoretical models.

B1.1E Describe a reason for a given conclusion using evidence from an investigation.

B1.1f Predict what would happen if the variables, methods, or timing of an investigation were changed.

B1.1g Use empirical evidence to explain and critique the reasoning used to draw a scientific conclusion or explanation.

B1.1h Design and conduct a systematic scientific investigation that tests a hypothesis. Draw conclusions from data presented in charts or tables.

B1.1i Distinguish between scientific explanations that are regarded as current scientific consensus and the emerging questions that active researchers investigate.

B1.2A Critique whether or not specific questions can be answered through scientific investigations.

B1.2B Identify and critique arguments about personal or societal issues based on scientific evidence.

B1.2C Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.

B1.2D Evaluate scientific explanations in a peer review process or discussion format.

B1.2E Evaluate the future career and occupational prospects of science fields.

B1.2f Critique solutions to problems, given criteria and scientific constraints.

B1.2g Identify scientific tradeoffs in design decisions and choose among alternative solutions.

B1.2h Describe the distinctions between scientific theories, laws, hypotheses, and observations.

B1.2i Explain the progression of ideas and explanations that leads to science theories that are part of the current scientific consensus or core knowledge.

B1.2j Apply science principles or scientific data to anticipate effects of technological design decisions.
B1.2k Analyze how science and society interact from a historical, political, economic, or social perspective.

Materials Used:

- Prentice Hall Biology Textbook
- PowerPoint or Smartboard Notes for Chapter 1 Sections 1-4
- Laboratory Activities: Data Interpretation & Observation Activity, Importance of Writing Clear Instructions: Clay Lab, Surface Tension Lab, Bubble Gum Lab, Microscope Lab, and Soybean Experiment.

Major Themes/Concepts:

- What is science?
- How scientists work.
- Characteristics of life.
- Tools and procedures involved in science.

Assessments:

- Section Quizzes (1-4), laboratory assignments, and chapter 1 pre and posttests.

THS Curriculum Biology

Course: Biology I, Biology CP

Grade: 9

Unit Name: The Chemistry of Life

Essential Questions:

- How does the structure of each complex organic molecule serve its function?
- How is food use in organisms related to food storage?
- What are organic molecules and why are they important to life?
- What is the chemical nature of living organisms?
- Where is the energy in biological organic macromolecules?

Suggested Time Frame: 4 Weeks

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.

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

Materials Used:

- Prentice Hall Biology Textbook
- PowerPoint or Smartboard Notes for Chapter 2 Sections 1-4
- Laboratory Activities: Atomic Structure Activity, Food Label Activity, pH (Cabbage Lab), and Enzyme Lab

Major Themes/Concepts:

- The nature of matter.
- Properties of water.
- Carbon Compounds.
- Chemical reactions and enzymes.

Assessments:

- Section Quizzes (1-4), laboratory assignments, and chapter 2 pre and posttests.

THS Curriculum Biology

Course: Biology I, Biology CP

Grade: 9

Unit Name: Cell Structure and Function

Essential Questions:

- What are the differences between prokaryotic and eukaryotic cells and how do these differences relate to an organism's complexity?
- What are the organelles associated with eukaryotic and prokaryotic cells?
- How does cell structure serve its function?
- How do materials move in and out of cells?

Suggested Time Frame: 3.5 weeks

High School Content Expectations

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

L2.p1A Distinguish between living and nonliving systems.

L2.p1B Explain the importance of both water and the element carbon to cells.

L2.p1C Describe growth and development in terms of increase in cell number, cell size, and/or cell products.

L2.p1D Explain how the systems in a multicellular organism work together to support the organism.

L2.p1E Compare and contrast how different organisms accomplish similar functions (e.g., obtain oxygen for respiration, and excrete waste).

L2.p2A Describe how organisms sustain life by obtaining, transporting, transforming, releasing, and eliminating matter and energy.

L2.p2B Describe the effect of limiting food to developing cells.

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.

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

B2.5g Compare and contrast plant and animal cells.

B2.5h Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport).

B2.5i Relate cell parts/organelles to their function.

Materials Used:

- Prentice Hall Biology Textbook
- PowerPoint or Smartboard Notes for Chapter 7 Sections 1-4
- Laboratory Activities: Characteristics of Prokaryotic and Eukaryotic Cells, Animal and Plant Cell Lab, Osmosis/Diffusion, Cells Alive Interactive Lesson, and Cell Growth

Major Themes/Concepts:

- Life is cellular
- Eukaryotic cell structure
- Cell Boundaries
- The diversity of cellular life

Assessments:

- Section Quizzes (1-4), laboratory assignments, and chapter 7 pre and posttests.

THS Curriculum Biology

Course: Biology I, Biology CP

Grade: 9

Unit Name: Photosynthesis & Cellular Respiration

Essential Questions:

- How are photosynthesis and cellular respiration related?
- How does ATP provide energy for cells?
- What are the differences and similarities between aerobic and anaerobic respiration?

Suggested Time Frame: 2 weeks

High School Content Expectations

B1.1 Scientific Inquiry

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 Scientific Reflection and Social Implications

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.

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

L2.p3B Explain the origins of plant mass.

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

L2.p3D Explain how the roots of specific plants grow.

L2.p4A Classify different organisms based on how they obtain energy for growth and development.

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

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.

B2.4e Explain how cellular respiration is important for the production of ATP (build on aerobic vs. anaerobic).

B2.4f Recognize and describe that both living and nonliving things are composed of compounds, which are themselves made up of elements joined by energy-containing bonds, such as those in ATP.

B2.4g Explain that some structures in the modern

B2.5C Describe how energy is transferred and transformed from the Sun to energy-rich molecules during photosynthesis.

THS Curriculum Biology

Course: Biology I, Biology CP

Grade: 9

Unit Name: Cell Cycle and Mitosis

Essential Questions:

- What happens to cells as a given organism grows?
- Why is it necessary for cells to become specialized?

Suggested Time Frame: 2 weeks

High School Content Expectations

L2.p1D Explain how the systems in a multicellular organism work together to support the organism.

L2.p1E Compare and contrast how different organisms accomplish similar functions.

B2.1C Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/or cell products

B2.1d Describe how, through cell division, cells can become specialized for specific function.

Materials Used:

- Prentice Hall Biology Textbook
- PowerPoint or Smartboard Notes for Chapter 10
- Laboratory Activities: Limits to Cell Growth, Mitosis, Cell Cycle

Major Themes/Concepts:

- Cell Growth
- Cell Division
- Regulating the Cell Cycle

Assessments:

- Pretest for chapter 10
- Lab quizzes over three labs
- Practical quiz over mitosis
- Cell regulators quiz
- Posttest for chapter 10.