PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Concepts of Biology

Curriculum writing committee:

Danielle Giordano

Grade Level: 10

Date of Board Approval: 2023

Marking Period Course Weighting: Biology

Major Assessments	**45%**
Skills Application	**30%**
Skills Practice	**20%**
Participation	**5%**
Total	**100%**

Curriculum Map

Overview:

All biology courses at Delaware Valley High School aim to provide an overview of the essential topics in biology that include, but are not limited to, basic biological principles; biochemistry; cellular structure and function, including homeostasis and transport; bioenergetics, including photosynthesis and cellular respiration; cell growth and reproduction; DNA and Mendelian genetics; evolutionary principles; classification and taxonomy of living things; and ecological organization and interactions.

All units presented in the courses are interconnected through significant themes in biology and aim to stress the importance of the study of life, the continuity of life, and the diversity of life. Students will learn the ways in which living organisms are influenced by their environment and the role that biology plays in their everyday lives – including relevant, present-day scientific issues that occur in society.

Although the content of the courses will be consistent at all levels, the manner in which it is administered will be determined based on the needs and capabilities of the students. Each teacher will choose the most appropriate teaching methodologies to accommodate the nature of the students enrolled in the course. Students with diverse learning styles may have opportunities to use a variety of learning techniques to attain mastery of the skills and concepts necessary for success. These approaches could include direct instruction, digital manipulatives and simulations, laboratory activities and/or demonstrations, hands-on creative projects, interaction with various texts and media, collaboration with peers, guided inquiry, and written assignments. All biology courses are part of the planned science curricula at Delaware Valley High School.

Time/Credit for the Course: One full year, meeting daily for ~46 minutes/ 1 credit

Goals:

1. **Marking Period One: Over a 45-day period of time, students will aim to understand:**

   UNIT 0: Nature of Science and Basic Biological Principles
   - Review of Scientific Methodology and Experimentation
   - Characteristics of Living Things – unity of life
   - Classification of Living Things -kingdoms of life
   - Organization of life – Atom Molecule Organelle Cell Tissue Organ Organ System

   UNIT 1: Biochemistry
   - Basic atomic structure, molecules and chemical bonds, properties of water, carbon compounds (carbohydrates, lipids, proteins, nucleic acids)

   UNIT 2: DNA Structure, Function, and Replication
   - Expand on DNA as an essential life molecule - identify its structure, role in the cell, and mechanism for replication (revisit significance of enzymes learned in Unit 1)

2. **Marking Period Two: Over a 45-day period of time, students will aim to understand:**

   UNIT 3: Cellular Biology and Mechanisms of Cell Transport for Homeostasis
   - The Discovery of the Cell and Cell Theory – all living things are made of cells; cells are the basic units of structure/function; all cells come from pre-existing cells
   - Microscopy Skills
   - Structure and Function of Prokaryotic and Eukaryotic Cells
   - Cell Structures and their functions
   - Cell Transport and Regulation of materials into and out of the cell – Active and Passive Transport

   UNIT 4: Bioenergetics - Photosynthesis and Cellular Respiration
   - Chemical Reactions and Energy Transformations involved in Photosynthesis and Cell Respiration
   - ATP as cellular energy

3. **Marking Period Three: Over a 45-day period of time, students will aim to understand:**

   UNIT 5: Cell Reproduction (Mitosis), Production of Sex Cells (Meiosis)
   - Sexual vs. Asexual Reproduction
   - Cell Cycle, Cell Division, and Mitosis
   - Control of the cell cycle and cancer
   - Production of Sex Cells, Meiosis, chromosome analysis, and karyotyping

   UNIT 6: DNA's role in Protein Synthesis

- DNA's role in storing information for trait expression and protein synthesis
- Mechanisms of DNA Transcription and Translation

UNIT 7: Genetics and Biotechnology

- Genetics Terminology
- Mendelian genetics, Inheritance Patterns, Probability, exceptions to Mendel's Laws
- Genetics of Blood Typing and Pedigree Analysis
- Genetic Engineering

4. Marking Period Four: Over a 45-day period of time, students will aim to understand:

UNIT 8: Evolutionary Principles

- Genetic influence in evolutionary principles
- Evolution's Significance in Biology
- Evidence of Evolution – fossil, anatomical features, molecular similarities, embryology
- Charles Darwin's contribution and Natural Selection
- Adaptations
- Biodiversity

UNIT 9: Ecology

- Ecological organization
- Relationships in nature
- Population dynamics

UNIT 10: Diversity of Life, Laboratory Exploration, and Science Skill Enrichment

- Enhance student understanding of the Animal, Plant, Protist, Fungal Kingdoms
- Partake in various laboratory activities including dissections, owl pellet lab, microscope use, working with dichotomous keys, etc.

Big Ideas:

Big Idea #1: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Big Idea #2: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Big Idea #3: Heredity refers to specific mechanisms by which characteristics or traits are passed from one generation to the next via genes, and explains why offspring resemble, but are not identical to, their parents.

Big Idea #4: Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

Textbook and Supplementary Resources

Name of Textbook: *Inspire Biology*

Textbook ISBN#: 978-0-07-688434-6

Textbook Publisher & Year of Publication: McGraw-Hill Education, 2020

Supplemental Resources: *Inspire Biology* website & online resources

Curriculum Plan

UNIT 0: Nature of Science and Basic Biological Principles
Time: Approximately 10 days

Standards (by number): PA Keystone Biology Academic Standards
3.1.B.A1 , 3.1.B.A5, 3.1.B.A6, 3.1.B.A9, 3.1.B.C2, 4.1.3.A, 4.1.4.A

2025 Standards:
3.1.9-12.B Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
3.1.9-12.C Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Anchors:
BIO.A.1.1 Explain the characteristics common to all organisms.
BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.

Eligible Content:
BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells. BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms. BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.

Objectives: (Students will be able to)

1. Identify major themes in biology by describing the characteristics of living things and relating them to real-life examples (DOK 1)
2. State the goals of science and recall the steps of the scientific method (DOK 1)
3. Conduct and/or analyze one or more scientific investigations (DOK 2 and DOK 4)
4. Explain what a scientific theory is (DOK 3)
5. Identify patterns in the sequential organization of living things by recognizing examples in nature. (Atom →Molecule→Organelle→Cell→Tissue→Organ→Organ System) (DOK 2)
6. Cite evidence of how structure relates to function (pertaining to molecules, cells, organs, etc.) (DOK 3)
7. Describe the goals of binomial nomenclature and systematics (DOK 1)
8. Name the six kingdoms of life as they are currently identified and explain what the tree of life represents (DOK 1)
9. Develop a logical argument that all organisms share common characteristics (DOK 3)

Core Activities and Corresponding Instructional Methods:

1. Identify major themes in biology by describing the characteristics of living things and relating them to real-life examples.
    a. Read from Module 1 in the Inspire Biology textbook, Lesson 1, pages 4 - 10, to explore the field of biology and identify eight unifying characteristics of living things and to understand big ideas in biology.
    b. Students should identify examples of each of the characteristics in nature.
2. State the goals of science and identify examples of observation, inference, hypothesis, principle, fact, scientific theory and scientific law.
    a. Read from Module 1 in the Inspire Biology textbook, Lesson 2, pages 11 - 16, which defines the nature of science, science methodology, careers in science, and factors that affect science and society. Expand on the reading by discussing the article on page 17 - "A Shot in the Arm."
    b. Identify and define key vocabulary words pertaining to this content by way of a word sort, "click-n-drag," matching activity, or the like.
3. Conduct and/or analyze one or more scientific investigations.
    a. Complete a read-aloud, demonstration, or view a video that features a historical example of a scientific experiment (example: Redi's Investigation of Spontaneous Generation).
    b. Complete a discussion, and/or assessment pertaining to the experiments in order to recall the steps of the scientific method. In doing so, students will gain a deeper understanding of what science is and how certain scientific investigations have helped pave the way for current thinking in science.
    c. Have students practice identifying the controlled, independent and dependent variables of the experiments - set up a controlled experiment if applicable.
    d. Students compare the historical examples to modern day scientific issues and practice creating hypothesizing solutions to everyday problems, with the understanding that each hypothesis should be able to be tested.
4. Identify the organization of living things and cite evidence of how structure relates to function.
    a. Have students use real-world visual manipulatives to sort the organizational levels in the proper sequential order (Atom→Molecule→Organelle→Cell→Tissue→Organ→Organ System).
    b. Provide students with random objects and have them provide an explanation for how the object's structure relates to its function - use the same activity for biological examples such as organs in the human body, a tree's tall branches reaching for sunlight, etc.
5. Describe the present day mechanisms for classifying organisms using binomial nomenclature and be able to distinguish between the six kingdoms of life.
    a. Read from Module 16 in the *Inspire Biology* textbook, pages 424 - 445 to understand the history of taxonomy, the goals of binomial nomenclature first presented by Carolus Linnaeus, the modern classification system, domains and kingdoms of life, and the tree of life.

b. Utilize examples and graphic organizers to review taxonomic levels.
c. Practice using a dichotomous key to practice identifying objects using a systematic process.
d. Review characteristics utilized by taxonomists to classify species, including genetic code, physical features and behaviors, reproductive strategies, and habitats.
e. Research an organism to identify unique adaptations and related species based on classification criteria.

Assessments:

Diagnostic:

Teacher questioning and observation
Teacher-prepared questionnaire of prior knowledge
Vocabulary manipulatives
Warm-up activities

Formative:

Teacher questioning and observation
Group activities
Independent worksheets
Vocabulary/visual manipulatives
Interactive digital manipulatives
Laboratory Exercises
Graphic Organizers
Activities and Review Games - ex. *Quizizz or Kahoot*
Google Slides “Click-n-Drags” (when applicable)

Summative:

Scientific Methodology Assessment (Multiple Choice/Free Response Questions)
Characteristics of Life and Taxonomy Assessment (Multiple Choice/Free Response Questions)

UNIT 1: Biochemistry
Time: Approximately 25 days

Standards (by number): PA Keystone Biology Academic Standards
3.1.B.A2, 3.1.B.A5, 3.1.B.A7, 3.1.B.A8, 3.1.C.A2, 3.1.C.A7, 3.2.C.A2, 4.2.5.C

2025 Standards:
3.1.9-12.F Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Anchors:
BIO.A.2.1 Describe how the unique properties of water support life on Earth.
BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.
BIO.A.1.1 Explain the characteristics common to all organisms.
BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.

Eligible Content:

BIOA.2.1 Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).
BIO.A.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules.
BIO.A.2.2.2 Describe how biological macromolecules form from monomers.
BIO.A.2.2.3 Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.

Objectives: (Students will be able to)

1. Identify and distinguish between the three subatomic particles found in atoms (DOK 1, 2)
2. Describe the two main types of chemical bonds (DOK 2)
3. Identify the parts of a chemical reaction, including reactants, products, appropriate symbols such as a “plus” sign and an “arrow” and the use of coefficients in front of chemical formulas (DOK 1)
4. Identify patterns about the unique properties of water (DOK 2)
5. Differentiate between solutions and suspensions (DOK 3)
6. Compare acidic solutions and basic solutions (DOK 3)
7. Relate the properties of carbon to its significance in many different structural and functional characteristics of living things (DOK 2)
8. Differentiate between the structures and functions of each of the four groups of macromolecules (DOK 3)
9. Apply concepts learned when studying proteins to the understanding of metabolic functions (enzymes) (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Identify and distinguish between the three subatomic particles found in atoms.
    a. Read from Module 6 in the *Inspire Biology* textbook, Lesson 1, pages 127 - 132, which discusses atomic structure, elements, the periodic table, isotopes, and compounds.
    b. Complete a read-aloud, discussion, watch a video, and/or create a model to display understanding of atomic structure.
    c. Ask students to practice drawing electron configurations of common elements found in living organisms.
    d. Practice counting the number of atoms in a chemical formula and the role that subscripts play in the appearance of the chemical formula.
3. Describe the two main types of chemical bonds.
    a. Read from Module 6 in the *Inspire Biology* textbook, Lesson 1, pages 133 - 136, to identify the characteristics of chemical bonds, including covalent and ionic bonds.
    b. Complete a read-aloud, discussion, watch a video, act out, and/or create a model to display understanding of chemical bonding.
4. Identify the parts of a chemical reaction, including reactants, products, appropriate symbols such as a “plus” sign and an “arrow” and the use of coefficients in front of chemical formulas
    a. Read from Module 6 in the *Inspire Biology* textbook, Lesson 2, pages 137 - 140, to understand the parts of chemical reactions.
    b. Practice identifying parts of chemical reactions using common examples in biology.
    c. Demonstrate balancing equations and the importance of the number of atoms being consistent on both sides of the equation.
5. Identify patterns about the unique properties of water including its polar composition, Van der Waals forces, hydrogen bonding, cohesion, adhesion, capillary action, high specific heat, and states of matter.
    a. Read from Module 6 in the *Inspire Biology* textbook, Lesson 3, pages 144 - 147, to understand the properties of water.
    b. Practice drawing water molecules to exhibit its polar nature.
    c. Use water molecule models to demonstrate hydrogen bonding (can also be performed by having students “act out” water molecules) for the 3 states of matter.
    d. Identify the meaning of and examples of cohesion, adhesion, capillary action.
6. Differentiate between solutions and suspensions and compare acidic solutions and basic solutions.
    a. Read from Module 6 in the *Inspire Biology* textbook, Lesson 3, pages 148 - 150, to understand mixtures with water, solutions, suspensions, solutes, solvents, acids, and bases.
    b. Watch a video, perform a teacher demonstration or have students complete a lab activity that exhibits different examples of solutions, suspensions, and testing for acids and bases using litmus paper or other indicators.
    c. Relate acidic and basic solutions to examples of homeostasis.

7. Relate the properties of carbon to its significance in many different structural and functional characteristics of living things, particularly the four groups of macromolecules - carbohydrates, lipids, proteins, and nucleic acids.

a. Read from Module 6 in the *Inspire Biology* textbook, Lesson 4, pages 151 - 157, to define organic chemistry, understand how carbon's structure has titled it to be the "backbone of life" and the basis for biological molecules, and distinguishing between the 5 classes of macromolecules.
b. Have students practice drawing the carbon atom to understand how its valence electrons allow for versatility in creating life molecules.
c. Have students create or fill in a graphic organizer or reference cards that distinguish the structural and functional features that exist between and among carbohydrates, lipids, proteins, and nucleic acids.
d. Have students create visible/tangible displays of macromolecules to reinforce the relationship between monomer and polymer.
e. Have students perform a lab activity to identify macromolecules in an unknown substance using chemical properties (Murder/Stomach Contents Investigation Lab).
f. Explore the role of proteins as enzymes by performing a lab activity or watching a video.
g. Provide real-life examples of macromolecules such as in nutrition, everyday human body functions/composition, relevance in nature (ex. Oil harvested from whales; Chronic Waste Disease in ungulates) - refer to page 158 "Balancing your Plate" in textbook.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

Inorganic Chemistry Assessment (Consists of both Multiple Choice and Free Response Questions)
Properties of Water Assessment (Consists of both Multiple Choice and Free Response Questions)
Organic Chemistry Common Assessment (Consists of both Multiple Choice and Free Response Questions)

Unit 2: DNA Structure & Replication
Time Range in Days: Approximately 10 days

Standards (by number): PA Keystone Biology Academic Standards
3.1.B.A5, 3.1.B.B1, 3.1.B.B3, 3.1.B.B5, 3.1.B.C2, 3.1.C.B3, 3.1.C.C2

2025 Standards:
3.1.9-12.A Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
3.1.9-12.P Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
3.1.9-12.Q Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
3.1.9-12.R Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Anchors:
BIO.A.1.1 Explain the characteristics common to all organisms.
BIO.B.1.2 Explain how genetic information is inherited.

Eligible Content:
BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.
BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.
BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
BIO.B.2.2.2 Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.
BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame-shift).

Objectives: (Students will be able to)
1. Identify the role of DNA in heredity (DOK 1)
2. Recall that nucleotides are the molecular subunits of DNA discussed in Unit 1 (DOK 1)
3. Label a nucleotide monomer of a nucleic acid (DOK 1)
4. Illustrate the double helix structure of DNA (DOK 1)
5. Summarize the events in DNA replication, including the enzymatic activity (DOK 2)
6. Identify DNA replication as a repeating pattern that occurs in an organism's lifetime (DOK 2)
7. Compare and contrast the structure of DNA to that of RNA (DOK 2)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Identify the role of DNA in heredity and be able to recall and illustrate the structure of the nucleotide as the subunit/monomer that gives rise to the DNA double helix.
    a. Read from Module 11 in the *Inspire Biology* textbook, Lesson 1, pages 288 - 291, to learn about the historical events that lead to the discovery of DNA as the genetic material in cells.
    b. Read from Module 11 in the *Inspire Biology* textbook, Lesson 1, pages 291 - 295, to review the structure of the DNA double helix, and the scientific collaboration that led to its discovery.
    c. Present vocabulary and concepts in a way that students can use as a study tool and mastery of the main ideas and terminology.
    d. Have students watch a guided video featuring DNA structure and function such as PBS NOVA's "DNA: The Secret of Life."
    e. Have students perform a DNA extraction from a chosen source such as their cheek cells, strawberries, bananas, spinach, etc.
    f. Have the students create, draw, or color a model of the DNA double helix.
3. Summarize the events in DNA replication, including the enzymatic activity and identify DNA replication as a repeating pattern that occurs in an organism's lifetime.
    a. Read from Module 11 in the *Inspire Biology* textbook, Lesson 2, pages 296 - 298, to understand the process of DNA replication, including its necessity for cell division, the role that enzymes play in the process.
    b. Watch an animation featuring DNA replication.
    c. Use a simulation, hands-on manipulative, or cut-n-paste type of activity to allow students to practice base-pairing for DNA replication.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities/scenarios
Quizzes/graded assignments

Summative:

DNA Structure and Function Assessment

UNIT 3: Cellular Biology and Mechanisms of Cell Transport for Homeostasis
Time Range in Days: Approximately 35 days

Standards (by number): PA Keystone Biology Academic Standards
3.1.B.A9, 3.1.B.B6., 3.1.B.C4., 4.1.10.F., 4.2.10.D., 4.4.10.E., 3.1.10.A2, 3.1.10.A5, 3.1.10.A6., 3.1B.A1., 3.1.B.A5

2025 Standards:
3.1.6-8.A Conduct an investigation to provide evidence that living things are made of cells, either one cell or many different numbers and types of cells.
3.1.6-8.B Develop and use a model to describe the function of a cell as a whole and the ways that parts of cells contribute to the function.
3.1.6-8.C Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells

Anchors:
BIO.A.1.1 Explain the characteristics common to all organisms.
BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.
BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.
BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.

Eligible Content:
BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.
BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.
BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).
BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.
BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).
BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.
BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).

Objectives: (Students will be able to):
1. State the three parts of the cell theory (All living things are made of cells; cells are the basic structure and function of living things; all cells come from pre-existing cells) and be able to apply each part to an example in nature (DOK 1, 4)
2. List and arrange the cellular organization of living things (cells→tissues→organs→organ systems→organism) (DOK 1)

3. Make connections of diversity and specialization of cells to real-life examples (DOK 4)
4. Differentiate between the variety of cells that exist in the 3 domains of life (DOK 3)
5. Compare and contrast prokaryotic and eukaryotic cells (DOK 2)
6. List organelles found in eukaryotic cells (DOK 1)
7. Classify structural features of eukaryotic cell organelle and relate the structural features with the organelle's function (DOK 2)
8. Compare and contrast plant and animal cell organelle (DOK 2)
9. Identify structure and function of components in the cell membrane (DOK 1)
10. Distinguish between Active and Passive Transport (DOK 2)
11. Apply knowledge of concentration gradients in order to explain the mechanisms by which materials move across the cell membrane (DOK 4)
12. Recall the energy requirements that apply to different types of cell transport (DOK 1)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Define Scientific Theory and review the three parts of the Cell Theory.
    a. Read from Module 7 in the *Inspire Biology* textbook, Lesson 1, pages 162-163, which discusses the discovery of the cell and the Cell Theory.
    b. Hold a class discussion about the value of a scientific theory and how the Cell Theory is applied in biological study.
3. Review the three Domains of Life and compare Prokaryotic and Eukaryotic Cells.
    a. Read from Module 7 in the *Inspire Biology* textbook, Lesson 1, pages 167-168, to identify the characteristics of prokaryotic and eukaryotic cells and review the kingdoms included in each domain.
    b. Create a Venn Diagram, graphic organizer, or other visual to compare and contrast Prokaryotic and Eukaryotic cells. This could become a classroom visual that can be added to throughout the year with additional learned details to distinguish these two major cell types.
    c. Identify types of bacteria that share both positive and negative relationships with other organisms.
4. Utilize Compound Light Microscopes to visualize cells.
    a. Perform a lab to learn the features and functions of a light microscope and how to use appropriately.
    b. View prepared slides and create wet-mount slides of cells from onion skin.
5. Review the structure and function of organelles in a eukaryotic cell.
    a. Read from Module 7 the *Inspire Biology* textbook, Lesson 4, pages 181-193, to identify the structure and function of eukaryotic cells.
    b. Apply knowledge of these organelles in the form of an analogy to a city or school.
    c. Create a cut-n-paste style model of a eukaryotic cell.
    d. Perform research on a specific eukaryotic cell type and write a report or create a descriptive model to share with class.
    e. Distinguish between the organelles in a plant and animal cell by analyzing images of each type. Compare these eukaryotic images to images of prokaryotic cells.

f. Read an article on the Endosymbiotic Theory to create evolutionary connections to cell organelle structure.

6. Investigate the structures and functions of the components of the Cell Membrane.
    a. Read from Module 7 in the *Inspire Biology* textbook, Lesson 2, pages 169-172, to identify the characteristics of the components of the cell membrane.
    b. Draw or color in a picture that identifies components of the cell membrane.
    C. Identify key vocabulary words associated with cell transport such as cell membrane. and the molecules that compose it, active transport, passive transport, Adenosine Triphosphate, Concentration gradient, semi (selectively) permeable, etc.
7. Review types of cell transport as either passive or active and the manner in which materials are moving based on a concentration gradient.
    a. Read from Module 7 in the *Inspire Biology* textbook, Lesson 3, pages 173-180, to compare and contrast Active and Passive Transport.
    b. Perform diffusion and osmosis labs to demonstrate and measure cellular transport with eggs, dialysis tubing, or plastic bags.
    c. View real-life examples of osmoregulation by viewing a story of a woman who drank too much water and died; and another woman who drank too much soy sauce.
    d. Analyze images to distinguish major features of transport.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments
Diffusion/Osmosis Lab

Summative:

Cell Analogy Project or Cell Type Research Project
Common Assessment Cell Structure and Function (Consists of both Multiple Choice and Free Response Questions)
Common Assessment Cell Transport and Homeostasis

UNIT 4: Energy Transformations and Bioenergetics -- Photosynthesis and Cellular Respiration
Time Range in Days: Approximately 10 days

Standards (by number): PA Keystone Biology Academic Standards
3.1.B.A.7, 3.1.C.A2, 3.1.C.A2, 3.3.10A, 3.1.C.A1, 3.3.10B, 3.4.10A, 3.1.B.A2, 3.1.B.A2, 3.1.B.A5, 3.1.B.A7, 4.1.10.C

2025 Standards:
3.1.9-12.G Matter and Energy in Organisms and Ecosystems Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
3.1.9-12.E Matter and Energy in Organisms and Ecosystems Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy
3.1.9-12.J Matter and Energy in Organisms and Ecosystems Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions

Anchors:
BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).
BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.
BIO.A.3.1 Identify and describe the cell structures involved in processing energy.
BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.

Eligible Content:
BIO.A.2.3.1 Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.
BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.
BIO.A.3.1.1 Describe the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations.
BIO.A.3.2.1 Compare the basic transformation of energy during photosynthesis and cellular respiration.
BIO.A.3.2.2 Describe the role of ATP in biochemical reactions.

Objectives: (Students will be able to)

1. Identify the structure of ATP and explain its role in cellular work. (DOK2)
2. Identify the “big picture” energy transformations that occur in both photosynthesis and cellular respiration (DOK 1)
3. Recognize that both photosynthesis and cellular respiration are series of chemical reactions that take place inside organelles of cells and are affected by enzyme activity (DOK 1)
4. Recognize that light and pigments are necessary components of photosynthesis (DOK 1)
5. Write the chemical equation for photosynthesis, including reactants and products (DOK 1)
6. Identify and be able to draw the general structure of a chloroplast (DOK 1)
7. Compare the different factors that affect the rate at which photosynthesis (DOK 3)
8. Identify patterns by which organisms obtain energy needed for life processes (DOK 2)

9. Label a cross-section of a leaf and be able to distinguish which tissues are involved in photosynthesis (DOK 1, 2)
10. Write the chemical equation for cellular respiration, including reactants and products (DOK 1)
11. Identify and be able to draw the general structure of a mitochondrion (DOK 1)
12. Compare and contrast aerobic and anaerobic respiration (DOK 2)
13. Describe different types of anaerobic respiration (alcohol fermentation and lactic acid fermentation) (DOK 1)
14. Analyze the net production of ATP that is generated by both anaerobic and aerobic respiration (DOK 4)
15. Assess the relationship that exists in ecosystems between the processes of photosynthesis and cellular respiration (DOK 3)
16. Identify which types of cells undergo photosynthesis and cell respiration (DOK 1)
17. Apply prior understanding of autotrophs and heterotrophs to the processes of photosynthesis and cell respiration (DOK 4)
18. Explain the effect of enzymes in speeding up chemical reactions and lowering activation energy to catalyze reactions. (DOK2)
19. Connect prior knowledge of enzymatic reactions and how they affect chemical reactions (DOK 4)
20. Apply concepts learned when studying biochemistry to the transformations that occur between molecules in photosynthesis and cellular respiration (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Identify the "big picture" energy transformations that occur in both photosynthesis and cellular respiration and recognize that both processes are a series of chemical reactions that take place inside organelles of cells and are affected by enzyme activity.
    a. Read from Module 8 in the *Inspire Biology* textbook, Lesson 1, pages 198-201, to review the laws and label ATP structure.
    b. Use a graphic organizer or visual to highlight the energy transformations that occur in ecosystems.
    c. Identify types of energy - solar, chemical (glucose), and chemical (ATP) and the ways in which those forms are utilized by organisms.
3. Recognize that light and pigments are necessary components of photosynthesis, be able to identify the reactants and products of photosynthesis and where the process occurs in plants, as well as the factors that affect the rate of photosynthesis.
    a. Read sections from Module 8 in the *Inspire Biology* textbook, Lesson 2, pages 202 - 204 to learn about the overall reactions of photosynthesis.
    b. Use a graphic organizer to allow students to better understand the overall process of photosynthesis—particularly the components that are needed for the reaction to work and the major products that result at the end of the process.
    c. Show a video or animation of photosynthesis or have students sketch the reactions.

d. Use a word sort, “click-n-drag” or other manipulative that consists of chemical formulas and symbols that challenges students to correctly arrange the reactants and products for the photosynthesis chemical equation.

4. Identify the reactants and products of aerobic cellular respiration and where the process occurs in eukaryotic cells; compare and contrast aerobic and anaerobic respiration.
    a. Read sections from Module 8 in the *Inspire Biology* textbook, Lesson 3, pages 209 - 212 to learn about the overall reactions of aerobic cellular respiration.
    b. Use a graphic organizer to allow students to better understand the overall process of aerobic cellular respiration—particularly the components that are needed for the reaction to work and the major products that result at the end of the process.
    c. Show a video or animation of aerobic cellular respiration or have students sketch the reactions.
    d. Use a word sort, “click-n-drag” or other manipulative that consists of chemical formulas and symbols that challenges students to correctly arrange the reactants and products for the aerobic cellular respiration chemical equation.
    e. Read sections from Module 8 in the *Inspire Biology* textbook, Lesson 3, pages 213 - 214 to learn about anaerobic respiration.
    f. Read about situations in which fermentation occurs in nature - (i.e., animals eating fermented berries or autobrewery syndrome).
5. Create connections between physiological processes such as heart rate and breathing rate and energy demand and oxygen availability during Cellular Respiration and fermentation.
    a. Watch David Blaine’s “How I Held my Breath for 17 Minutes” to discuss the effects of Oxygen on energy availability and ways in which the body responds during a hypoxic situation.

Unit 5: Cell Division: Mitosis and Meiosis
Time Range in Days: Approximately 18 days

Standards: PA Keystone Biology Assessment Anchors and Enhanced Standards
3.1.B.A4, 3.1.B.A5, 3.1.B.B1, 3.1.B.B2, 3.1.B.B3, 3.1.B.B5, 3.1.B.C2, 3.1.C.C2

2025 Standards:
3.1.6-8.N Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
3.1.9-12.D Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
3.1.9-12.P Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
3.1.9-12.Q Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Anchors:
BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis
BIO.B.1.2 Explain how genetic information is inherited.

Eligible Content:
BIO.B.1.1.1 Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis.
BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions.
BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information.
BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.

Objectives: (Students will be able to)
1. Recognize that cell size is limited because of growth, DNA overload, and surface to volume ratio (DOK 1)
2. Identify different forms of DNA and how it should appear at different stages of the cell cycle (molecular, chromatin, chromosome) (DOK 1)
3. Explain the role of DNA and chromosomes in cell division (DOK 1)
4. Summarize the stages of the cell cycle (DOK 2)
5. Recognize that DNA must be copied before cell division can occur (DOK 1)
6. Recall what happens during the four phases of mitosis (DOK 1)
7. Describe the process of cytokinesis (DOK 1)
8. Distinguish between cytokinesis in animal cells and in plant cells (DOK 2)
9. Cite evidence of how the cell cycle is regulated (DOK 1)
10. Distinguish between cancer cells and healthy cells (DOK 2)
11. Relate the onset of cancer to the control of the cell cycle (DOK 2)
12. Differentiate between diploid and haploid cells (DOK 3)

13. Differentiate between asexual and sexual reproduction (DOK 3)
14. Compare and contrast a somatic cell and a gamete (DOK 2)
15. Summarize the events of meiosis (DOK 2)
16. Compare and contrast meiosis and mitosis (DOK 3)
17. Apply an understanding of cells to the processes of mitosis and meiosis (DOK 4)
18. Explain what a karyotype is and why it is used (DOK 1)
19. Create and analyze a karyotype in order to recognize chromosomal defects that may occur during meiosis as a result of nondisjunction(DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Recognize that cell size is limited because of growth, DNA overload, and surface to volume ratio and recall that cells must divide in order to maintain their size.
    a. Read from Module 9 in the *Inspire Biology* textbook, Lesson 1, pages 220 - 221, which discusses limitations to cell size.
    b. Have students brainstorm analogies to better understand surface to volume ratio (in relation to exchange of materials/communication) and DNA overload.
3. Identify different forms of DNA and how it should appear at different stages of the cell cycle (molecular, chromatin, chromosome) and explain the role of DNA and chromosomes in cell division.
    a. Read from Module 9 in the *Inspire Biology* textbook, Lesson 1, pages 222, to understand the different forms of DNA - Chromatin vs. Chromosome.
    b. Have students brainstorm analogies for chromatin vs. chromosomes (ex. Spaghetti vs. lasagna strands).
4. Summarize the stages of the cell cycle, including mitotic division and cytokinesis (and the differences between animal and plant cells), and recognize that DNA must be copied before cell division can occur.
    a. Read from Module 9 in the *Inspire Biology* textbook, Lesson 1, pages 223 - 227, to learn about the stages of the cell cycle, including the 3 important events that occur in Interphase - growth, DNA synthesis, and preparation for division.
    b. Have students draw, sort, or use an interactive simulation to understand the events that take place in mitosis and cytokinesis.
    c. Watch educational videos or animations that highlight the events that occur in the cell cycle - interphase, mitosis, and cytokinesis.
    d. For enrichment, have students create a model for mitosis (ex. sugar cookie lab).
5. Cite evidence of how the cell cycle is regulated and in doing so, distinguish between cancer cells and healthy cells, and understand how cancer is related to the control of the cell cycle.
    a. Read from Module 9 in the *Inspire Biology* textbook, Lesson 1, pages 228 - 230, to learn about cell cycle regulation, apoptosis, and patterns in abnormal cell cycle regulation that leads to cancer.
    b. Read a related article about the types, causes, and treatments of cancer.
    c. Complete the Nobel Prize Cell Cycle Control game to review the three checkpoints in the cell cycle.

5. Recall the differences between asexual and sexual reproduction as a lead into a discussion of the events that occur in meiosis and the production of gametes (sex cells). Distinguish between diploid body cells and haploid gametes and identify similarities and differences between the processes of mitosis and meiosis.

a. Read from Module 9 in the *Inspire Biology* textbook, Lesson 2, pages 231 -238 , to learn about meiosis, chromosomes, mitosis vs. meiosis, and sexual vs. axesual reproduction.
b. Have students draw, sort, or use an interactive simulation to understand the events that take place in meiosis.
c. Watch educational videos or animations that highlight the events that occur in meiosis.
d. Complete a graphic organizer such as a Venn diagram that compares and contrasts mitosis and meiosis.

6. Explain what a karyotype is and why it is used and practice creating and/or analyzing a karyotype in order to recognize chromosomal defects that may occur during meiosis as a result of nondisjunction.

a. Read from Module 9 in the *Inspire Biology* textbook, Lesson 2, pages 239 -241, to learn about karyotyping and nondisjunction, autosomes vs. sex chromosomes and examples of genetic conditions that result from chromosomal abnormalities.
b. Have students practice creating a karyotype by either cutting out a picture of chromosomes and rearranging them, use a preset template, or complete the activity using a computerized simulation.
c. For enrichment, complete a genetic disorder project that distinguishes between those that are the result of DNA mutations versus those that are the result of chromosomal abnormalities.

7. For further discussion, read/analyze the Module Wrap-up on Page 247 titled, “Why do some cells look so different from each other?”

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

Chromosome Visuals Lab for the processes of Mitosis and Meiosis
Cell Cycle and Mitosis Common Assessment (Multiple Choice/Free Response Questions)
Meiosis and Karyotyping Common Assessment (Multiple Choice/Free Response Questions)

Unit 6: DNA Transcription and Translation for Protein Synthesis
Time Range in Days: Approximately 7 days

Standards (by number): PA Keystone Biology Academic Standards
3.1.B.A5, 3.1.B.B1, 3.1.B.B3, 3.1.B.B5, 3.1.B.C2, 3.1.C.B3, 3.1.C.C2

2025 Standards:
3.1.9-12.A Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
3.1.9-12.P Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
3.1.9-12.Q Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
3.1.9-12.R Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Anchors:
BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).
BIO.B.2.3 Explain how genetic information is expressed.

Eligible Content:
BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.
BIO.B.2.2.1 Describe how the processes of transcription and translation are similar in all organisms
BIO.B.2.2.2 Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins.
BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame-shift).

Objectives: (Students will be able to)
1. Recall the double helix structure of DNA (DOK 1)
2. Review the events in DNA replication, including the enzymatic activity (DOK 2)
3. Compare and contrast the structure of DNA to that of RNA (DOK 2)
4. List the 3 types of RNA (DOK 1)
5. Explain why DNA must make mRNA in order to successfully produce proteins (DOK 1)
6. Summarize the process of transcription, including the enzymatic activity (DOK 2)
7. Recall that amino acids are the subunits of proteins (DOK 1)
8. Make connections to show how mRNA codons, that were transcribed from a DNA blueprint, are then translated into a code of amino acids (DOK 4)
9. Summarize the process of protein synthesis (translation), including the role of DNA, mRNA, tRNA, and rRNA (DOK 2)

10. Recognize that mutations may occur during DNA replication and protein synthesis and may or may not have observable effects (DOK 2)
11. Differentiate between types of genetic mutations (DOK 3)
12. Create an analogy for the process of protein synthesis (DOK 4)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Compare and contrast the structure of DNA to that of RNA, list the 3 types of RNA, and understand the necessity of MRNA for the successful production of proteins.
    a. Read from Module 11 in the *Inspire Biology* textbook, Lesson 3, pages 299 - 301, to understand the process of DNA transcription and translation, including the role of the three types of mRNA and enzymes in the production of proteins.
    b. Create an analogy for the students about the roles of DNA, mRNA, rRNA, tRNA and the production of proteins (DNA = Captain of ship; mRNA = first mate; rRNA = the ship deck; tRNA = the crew members doing the heavy lifting) or have the students create their own analogy for protein synthesis.
3. Recall that amino acids are the subunits of proteins and describe the manner in which mRNA codons are translated into a code of amino acids; summarize the processes of DNA translation and its role in Protein Synthesis.
    a. Read from Module 11 in the *Inspire Biology* textbook, Lesson 3, pages 301 - 305, to learn about mRNA codons, translation, and the way in which genes code for proteins.
    b. Use a classroom model, video, or manipulative to allow students to visualize/demonstrate protein synthesis.
4. Recognize that mutations may occur during DNA replication and protein synthesis; Differentiate between types of genetic mutations.
    a. Read from Module 11 in the *Inspire Biology* textbook, Lesson 4, pages 306 - 314 to learn about gene regulations and mutations.
    b. Have students practice scenarios in which mutations can occur and discuss the differences in outcomes for mutations occurring during DNA replication prior to mitosis and those that occur prior to meiosis.
    c. Refer to the chart on page 311 to identify types of mutations and examples of associated diseases.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities/scenarios

Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

DNA, RNA, Transcription, Translation & Protein Synthesis Assessment

Unit 7: Genetic Inheritance
Time Range in Days: Approximately 20 days

Standards: PA Keystone Biology Assessment Anchors and Enhanced Standards
3.1.B.B1, 3.1.B.B2, 3.1.B.B3, 3.1.B.B5, 3.1.C.B3, 3.1.C.C2

2025 Standards:
3.1.6-8.M Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
3.1.9-12.P Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
3.1.9-12.Q Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Anchors:
BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.
BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics.

Eligible Content:
BIO.B.2.1.1 Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, codominance, incomplete dominance, sex-linked, polygenic, and multiple alleles).
BIO.B.2.1.2 Describe processes that can alter composition or number of chromosomes (i.e., crossing-over, nondisjunction, duplication, translocation, deletion, insertion, and inversion).
BIO.B.2.4.1 Explain how genetic engineering has impacted the fields of medicine, forensics, and agriculture (e.g., selective breeding, gene splicing, cloning, genetically modified organisms, gene therapy).

Objectives:

1. Apply concepts from DNA studies to the understanding of heredity (DOK 4)
2. Describe geneticist Gregor Mendel's studies and conclusions about inheritance how Mendel's principles apply to all organisms (DOK 1)
3. Recall what happens during segregation in meiosis and the principle of independent assortment, genetic recombination, and gene linkage as they apply to chromosome distribution in sex cells (DOK 1)
4. Display how geneticists use the principles of probability to predict genetic crosses by setting up and analyzing Punnett Squares (DOK 2, 4)
5. Predict the multiplicative effects of inheritance of multiple different traits at the same time (dihybrid inheritance patterns.) (DOK 3)
6. Identify examples of applied genetics such as selective breeding, hybridization, inbreeding, and test crosses (DOK 1)
7. Recognize patterns of inheritance of human traits by analyzing pedigree charts (DOK 4)

8. Cite evidence for the causes of genetic disorders—distinguish between small changes in DNA; errors occurring in meiosis; and chromosomal abnormalities (DOK 2, 3)
9. Explain the differences between Mendelian (complete dominance) and non-Mendelian (codominance, incomplete dominance, sex-linked traits) and predict offspring genotypes and phenotypes based on parent genotype (DOK 4)
10. Define codominance and apply the ABO blood typing system as a model of codominance (DOK 1, 4)
11. Show the cause and effect relationship between gene expression and the environment (DOK 2)
12. Identify examples of biotechnology and genetic engineering (DOK 1)
13. Evaluate the effect of new biotechnologies in society (DOK4)
14. Apply ethical reasoning to new biotechnologies for appropriate uses (DOK4)
15. Connect examples of biotechnology, genetic engineering, gene splicing to the students' understanding of the principles of DNA and how it can be applied to techniques for gene therapy and genetically modified organisms (DOK 4)

Core Activities and Corresponding Instructional Methods: (The teacher is recommended to):

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Apply concepts from previous lessons on DNA and meiosis to the understanding of heredity as explained through Grengor Mendel's genetic studies.
    a. Read from Module 10 in the *Inspire Biology* textbook, Lesson 1, pages 252 - 254, to learn about knowledge of essential vocabulary terms including genetics, allele, dominant, recessive, homozygous, heterozygous, phenotype, and genotype.
    b. Ask students to reinforce the vocabulary in a way that will lead to mastery.
3. Recall what happens during segregation in meiosis and the principle of independent assortment, genetic recombination, and gene linkage as they apply to chromosome distribution in sex cells.
    a. Read from Module 10 in the *Inspire Biology* textbook, Lesson 1, pages 255 - 256, to understand Mendel's laws of segregation and independent assortment.
    b. Read from Module 10 in the *Inspire Biology* textbook, Lesson 2, pages 260 - 262, to understand genetic recombination and gene linkage.
4. Display how geneticists use the principles of probability to predict genetic crosses by setting up and analyzing Punnett Squares.
    a. Read from Module 10 in the *Inspire Biology* textbook, Lesson 1, pages 257 - 259, to learn about Punnett Squares, monohybrid and dihybrid crosses and the probability of genes being passed from one generation to the next through fertilization. Mendel's laws of segregation and independent assortment.
    b. Have students practice numerous examples of interpreting genotypes and phenotypes of organisms, setting up, and solving Punnett squares to be able to find the probability of traits being passed from one generation to the next.
5. Identify examples of applied genetics such as selective breeding, hybridization, inbreeding, and test crosses.

a. Read from Module 10 in the *Inspire Biology* textbook, Lesson 3, pages 263 - 265, to identify ways in which breeding patterns can impact the inheritance patterns of certain populations of species.
b. Have the students watch the *National Geographic* documentary "Science of Dogs" (or something comparable) to witness a well-known, relatable example of selective breeding.

6. Recognize patterns of inheritance of human traits by analyzing pedigree charts, identifying gene expression as influenced by environmental factors, and citing evidence for the causes of genetic disorders—distinguish between small changes in DNA; errors occurring in meiosis; and chromosomal abnormalities.
    a. Read from Module 10 in the *Inspire Biology* textbook, Lesson 4, pages 266 - 272, to understand how pedigree analysis can be used to predict or analyze inheritance patterns of traits among families.
    b. Have students identify types of genetic disorders that can be inherited through specific genes vs. those that are caused by DNA mutations, or chromosomal abnormalities.
    c. Read from Module 10 in the *Inspire Biology* textbook, Lesson 5, pages 279 - 282, which features inheritance patterns such as sex-linked traits, polygenic traits, and environmental influences on gene expression.
7. Compare Mendelian (complete dominance) and non-Mendelian genetics (codominance, incomplete dominance, sex-linked traits) and predict offspring genotypes and phenotypes based on parent genotype --while doing so, apply the ABO blood typing system as a model of codominance.
    a. Read from Module 10 in the *Inspire Biology* textbook, Lesson 5, pages 273 - 276, which features incomplete dominance, codominance, and multiple alleles.
    b. Have students read or watch a video about the ABO blood typing system and how it applies to multiple alleles and codominance. Use a graphic organizer to highlight the way in which the ABO alleles are expressed.
    c. Ask students to solve Punnett Squares using the proper ABO blood typing alleles.
    d. For enrichment, perform a demonstration of or have students complete the blood simulation lab to demonstrate the ABO blood typing system and the inability to mix different types of blood together.
    e. Play the Nobel Prize Blood Typing game to identify blood types and determine safe transfusions.
8. Connect examples of biotechnology, genetic engineering, gene splicing to the students' understanding of the principles of DNA and how it can be applied to techniques for gene therapy and genetically modified organisms, while identifying examples of and applying ethical reasoning to such new biotechnologies for appropriate uses.
    a. Have students read scientific articles or watch credible videos that highlight advancements in biotechnology - allow for a discussion of the pros and cons of the procedures, such as genetically modified organisms.
    b. Read "A Question of Ethics" on page 315 in *Inspire Biology*, which references the story of Henrietta Lacks and her HeLa cells.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

Genetic Disorder Research Assignment
Genetics Common Assessment (Consists of both Multiple Choice and Free Response Questions)

Unit 8: Evolution and Natural Selection
Time Range in Days: Approximately 15 days

Standards: PA Keystone Biology Assessment Anchors and Enhanced Standards
3.1.B.A9, 3.1.B.B3, 3.1.B.C1, 3.1.B.C3, 3.3.10.C, 3.3.10.D, 4.7.10.C, 4.8.10.A, 4.8.10.C, 4.8.10.D

2025 Standards:
3.1.6-8.O Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
3.1.6-8.P Apply scientific ideas to construct an explanation for anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
3.1.6-8.Q Analyze displays of pictorial data to compare patterns of similarities in anatomical structures across multiple species to identify relationships not evident in the fully formed anatomy.
3.1.6-8.R Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
3.1.6-8.S Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
3.1.9-12.R Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
3.1.9-12.S Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
3.1.9-12.T Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
3.1.9-12.U Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
3.1.9-12.W Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
3.1.9-12.X Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Anchors:
BIO.B.3.1 Explain the mechanisms of evolution.
BIO.B.3.2 Analyze the sources of evidence for biological evolution.
BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.

Eligible Content:

BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population.
BIO.B.3.1.2 Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration).
BIO.B.3.1.3 Explain how genetic mutations may result in genotypic and phenotypic variations within a population.
BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code).
BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.

Objectives:

1. Define evolution (DOK 1)
2. Summarize Charles Darwin's journey on the HMS Beagle (DOK 2)
3. Explain Darwin's theory of natural selection and how it has affected changes in populations over time, or how it may affect future changes in populations (DOK 3)
4. Identify the patterns of biodiversity that were observed by Darwin (DOK 2)
5. Distinguish between the conclusions drawn by James Hutton and Charles Lyell about the Earth's history (DOK 2)
6. Compare Jean-Baptiste Lamarck's hypothesis of evolution with that of Darwin's (DOK 2)
7. Report on Thomas Malthus' view of human population growth (DOK 1)
8. Differentiate between the research of Hutton, Lyell, Lamarck, Malthus, and Wallace and cite evidence of how it influenced Darwin's research (DOK 3)
9. Explain the role of inherited variation in artificial selection (DOK 1)
10. Identify the conditions under which natural selection occurs (DOK 1)
11. Cite evidence of adaptations in nature (DOK 3)
12. Define fitness in the context of success of passing on one's DNA (DOK 1)
13. Explain the principle of common descent (DOK 2)
14. Compare how geologic distribution of species relates to their evolutionary history (DOK 2)
15. Explain how fossils and the fossil record provide evidence of the descent of modern species from ancient ancestors (DOK 1)
16. Draw conclusions of what homologous structures, analogous structures, vestigial structures, and embryology suggest about the process of evolutionary change (DOK 3)
17. Apply the idea that DNA is molecular evidence that can be used to trace the process of evolution (DOK 4)
18. Describe how genetics plays a role in evolutionary change (DOK 1)
19. Make connections about mutations and genetic variation in a population (DOK 4)
20. Identify ways in which genetic recombination in sexual reproduction plays a role in evolution (DOK 1)
21. Describe genetic drift (DOK 1)
22. Describe genetic equilibrium and state what types of factors may affect it (DOK 1)
23. Identify the types of isolation that can lead to the formation of new species (DOK 1)
24. Summarize the processes that influenced survival or extinction of a species (DOK 2)
25. Identify some of the hypotheses about early Earth and the origin of life (DOK 1)
26. Explain the endosymbiotic theory for the evolution of eukaryotes from prokaryotes (DOK 1)

27. Explain how a species is defined using Ernst Mayr's Biological Species Concept and what the barriers are to interspecies reproduction. (DOK2)
28. Create and read cladograms/phylogenetic trees based on shared derived characteristics (DOK4)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Review the definitions and misconceptions of a Scientific Law and Scientific Theory.
    a. Connect definitions to the Law of Evolution: that populations change over time, and the Theory of Evolution: the evidence to explain that and how species change over time.
    b. Read from Module 1 in the *Inspire Biology* textbook, Lesson 2, pages 11-14, to learn about the characteristics of scientific inquiry.
3. Learn about how Darwin and Wallace used evidence from their naturalist voyages, and information regarding geology and population growth to develop their Theory of Natural Selection. Review the evidences for Evolution with real examples.
    a. Read from Module 14 in the *Inspire Biology* textbook, Lesson 1, pages 368-373, to learn about Darwin' Theory of Natural Selection.
    b. Watch HHMI Biointeractive "Making of a Theory."
    c. Play the Peppered Moth interactive to visualize how natural adaptations, such as camouflage can change the allele frequency of a population.
    d. Watch selected portions of "Your Inner Fish/Reptile/Monkey" to see examples of evolutionary evidences in the human body.
    e. Watch National Geographic's "The Science of Dogs" to observe mechanisms of artificial selection.
    f. Demonstrate how BLAST can be used to analyze DNA and protein sequences for species similarity.
4. Define evolution as a change in allele frequency in a population.
    a. Read from Module 14 in the *Inspire Biology* textbook, Lesson 3, pages 381-384, to learn about Hardy Weinberg, selection and speciation.
    b.
    c. Watch TED-Ed "The Five Fingers of Evolution" to see how small populations (genetic drift), sexual selection, mutations, natural selection and gene flow contribute to population evolution.
5. Create and interpret Phylogenetic Trees to depict common ancestry of species
    a. Read from Module 16 in the *Inspire Biology* textbook, Lesson 2, pages 436-439, to learn about phylogenetic organization
    b. Play the NOVA Evolution Lab

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

Evolution Common Assessment (Consists of both Multiple Choice and Free Response Questions)

Unit 9: Ecology
Time Range in Days: Approximately 15 days

Standards: PA Keystone Biology Assessment Anchors and Enhanced Standards
3.1.B.A2, 3.1.B.A4, 3.1.B.A5, 3.1.B.A7, 3.1.B.A8, 3.2.B.B.6, 3.2.C.A1, 4.1.5.C, 4.1.10.1, 4.1.10.B, 4.1.10.C, 4.1.10 E, 4.1.12.A, 4.1.12.C, 4.2.10.A, 4.2.10.B, 4.2.10.C,4.1.12.A, 4.2.12.B, 4.3.10B, 4.3.12.A, 4.5.10B, 4.5.12.B

2025 Standards:
3.1.6-8.I Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
3.1.6-8.J Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
3.1.6-8.K Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
3.1.6-8.L Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
3.1.6-8.U Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
3.1.9-12.H Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
3.1.9-12.I Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
3.1.9-12.K Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
3.1.9-12.L Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
3.1.9-12.M Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
3.1.9-12.N Can design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
3.1.9-12.V Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Anchors:
BIO.B.4.1 Describe ecological levels of organization in the biosphere.
BIO.B.4.2 Describe interactions and relationships in an ecosystem.

Eligible Content:
BIO.B.4.1.1 Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere).
BIO.B.4.1.2 Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems.
BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).

BIO.B.4.2.2 Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis).
BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle).
BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species, pollution, fires).
BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction.

Objectives:

1. Define ecology and describe the methods used to study ecology (DOK 2)
2. Explain how biotic and abiotic factors influence an ecosystem (DOK 3)
3. Distinguish between the ecological levels of organization of living things (species→ population→community→ecosystem→biome→biosphere) (DOK 2)
4. Define a niche (DOK 1)
5. Describe the role competition plays in shaping communities (DOK2)
6. Describe the role predation and herbivory play in shaping communities (DOK2)
7. Identify the three types of symbiotic relationships in nature (DOK1)
8. Define primary producers/autotrophs (DOK 1)
9. Predict how the loss of primary producers will affect the ecosystem (DOK 2)
10. Define consumers/heterotrophs (primary, secondary, tertiary) and identify patterns in which they obtain energy and nutrients (DOK 1 and DOK 2)
11. Trace the flow of energy through living systems by using food chains, food webs, and energy pyramids (DOK 2)
12. Identify cycles as patterns in nature and differentiate between the water cycle, carbon cycle, nitrogen cycle, and phosphorus cycle (DOK 2 and DOK 3)
13. Compare types of succession such as those that occur after a natural disturbance and those that occur after a human caused disturbance (DOK3)
14. Describe how ecosystems recover from a disturbance (DOK2)
15. Describe and compare the characteristics of the major biomes in the biosphere (DOK3)
16. List the characteristics used to describe a population (DOK1)
17. Identify factors that affect population growth (DOK2)
18. Describe exponential growth (DOK1)
19. Describe logistic growth (DOK1)
20. Analyze data to determine the type of population growth (DOK4)
21. Identify factors that determine carrying capacity (DOK1)
22. Identify the limiting factors that depend on population density (DOK1)
23. Identify the limiting factors that do not depend on population density (DOK1)
24. Discuss the trend of human population growth (DOK2)
25. Describe human activities that can affect the biosphere (DOK2)
26. Describe the relationship between resource use and sustainable development (DOK2)
27. Define biodiversity and explain its value and factors affecting it (DOK2)
28. Gain exposure to the concept of ecological footprint (DOK1)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Define ecology and identify biotic and abiotic factors that exist in the biosphere, including limiting factors that restrict numbers, reproduction, and distribution of organisms in ecosystems.
    a. Read from Module 2 in the *Inspire Biology* textbook, Lesson 1, pages 24 - 29, to define ecology, the biosphere, biotic and abiotic factors, and limiting factors.
    b. Use photographs of ecosystems to identify biotic and abiotic factors.
    c. Create a list of limiting factors for a given population in a specific ecosystem.
3. Describe the levels of ecological study.
    a. Read from Module 2 in the *Inspire Biology* textbook, Lesson 1, pages 30 - 31, to review ecological organization.
    b. Assign a National Park to each student and have the student identify the levels of organization for the organisms and factors in the park.
4. Identify community interactions by defining niche, competition, predation, herbivory and symbiosis.
    a. Read from Module 2 in the *Inspire Biology* textbook, Lesson 1, pages 32 - 34, to learn about factors and relationships that shape communities and the patterns that exist in nature.
    b. Assign a National Park to each student and have the student identify examples of such community interactions that exist within the park.
5. Define primary producers (autotrophs) and consumers (heterotrophs) and the role that each type of organisms plays in an ecosystem, including the patterns that they exhibit to obtain energy and nutrients.
    a. Read from Module 2 in the *Inspire Biology* textbook, Lesson 2, pages 35 - 37, to review types of organisms as defined by the way in which they obtain their energy and the models that are used to display flow of energy in an ecosystem including food chains, food webs, and energy pyramids.
    b. Assign a National Park to each student and have the student identify examples of producers, consumers (primary, secondary, and tertiary) as they would be displayed within a food web and also an energy pyramid for the park.
    c. If time permits, dissect owl pellets for evidence of meal choice and sources of energy (if not, complete in unit 10).
6. Identify cycles as patterns in nature and differentiate between the water cycle, carbon cycle, nitrogen cycle, and phosphorus cycle.
    a. Read from Module 2 in the *Inspire Biology* textbook, Lesson 3, pages 39 - 44, to define biogeochemical cycles and the manner in which nutrients cycle through an ecosystem.
    b. Use a graphic to emphasize that energy exhibits a one-way pathway in ecosystems, while nutrients can be recycled.
    c. Show a clip from the *Lion King* titled “Mufasa’s morning lesson with Simba,” in which the King describes the way in which animals’ bodies decompose into the soil and nutrients are recycled.

    d. Review the importance of biomolecules such as carbohydrates, lipids, proteins, and nucleic acids, the elements that are necessary for their composition, and the sources for those elements in nature.
7. Compare types of succession such as those that occur after a natural disturbance and those that occur after a human caused disturbance and describe the ways in which ecosystems recover from such disturbances.
    a. Read from Module 3 in the *Inspire Biology* textbook, Lesson 1, pages 50 - 53, to learn about primary and secondary succession.
    b. Watch a video pertaining to the Mount Saint Helen volcano that erupted in the 1980s and the way in which the ecosystem recovered years thereafter.
8. Describe and compare the characteristics of the major biomes throughout the biosphere.
    a. Read from Module 3 in the *Inspire Biology* textbook, Lessons 2 and 3, pages 54 - 70, to learn about the major characteristics of biomes.
    b. Research the major climate, defining features, threats, plants and animals of a biome.
9. Study population growth curves and demography.
    a. Read from Module 4 in the *Inspire Biology* textbook, Lesson 1 and 2, pages 77 - 93 to learn about population growth curves, limiting factors, and demography.
    b. Assign a National Park to each student and have the student identify examples of population changes within the park.
    c. For enrichment, use https://www.footprintcalculator.org/home/en to calculate a student's ecological footprint and predict impacts of global resource usage.
10. Review current threats to biodiversity.
    a. Read from Module 5 in the *Inspire Biology* textbook, Lessons 1-3, pages 98 - 113, to learn about biodiversity, threats and actions for remediation.
    b. Assign a National Park to each student and have the student analyze the biodiversity within the park and whether the park is considered to be ecologically healthy in comparison to others.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

National Park Research Project
Owl Pellet Lab
Ecology Common Assessment (Consists of both Multiple Choice and Free Response

Questions)

Unit 10: Diversity of Life, Laboratory Exploration, and Science Skill Enrichment
Time Range in Days: Approximately 15 days

Standards: PA Keystone Biology Assessment Anchors and Enhanced Standards
4.7.10.C, 3.3.10.D

2025 Standards:
3.1.6-8.C Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells
3.1.6-8.D Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.
3.1.6-8.H Gather and synthesize information about how sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
3.1.9-12.B Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
3.1.9-12.C Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Anchors:
BIO.A.1.1 Explain the characteristics common to all organisms.
BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.
BIO.B.3.2 Analyze the sources of evidence for biological evolution.
BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.

Eligible Content:
BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.
BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).
BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.
BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).

Objectives:
1. Identify and evaluate some of the hypotheses about early Earth and the origin of life (DOK 1, 4)
2. Name the six kingdoms of life as they are currently identified (DOK 1)
3. Explain what the tree of life represents (DOK 1)
4. Review characteristics of bacteria and viruses from Cellular Biology Unit (DOK 1)
5. Summarize some major characteristics of protists (DOK 2)
6. Summarize some major characteristics of fungi (DOK 2)

7. Summarize some major characteristics of plants (DOK 2)
8. Summarize some major characteristics of animals (DOK 2)
9. Students will compare and contrast the animal phyla (DOK 2)
10. Students will learn about the animal organ systems and their major features and structures (DOK 2)
11. Students may dissect an earthworm, flower, and frog to learn about anatomical features and physiological function (DOK4)

Core Activities and Corresponding Instructional Methods:

1. Students may investigate major themes of the unit that correspond to lessons and activities to *Encounter the Phenomenon,* complete *BioLab Activities,* review *Vocabulary terms*, and the *Go Further Data Analysis Lab* as provided in the Inspire textbook series.
2. Read from Modules 16-20 in the *Inspire Biology* textbook, to review major features of all kingdoms of life
3. Read from Modules 22-27 in the *Inspire Biology* textbook, to review major features animal anatomy and physiology
4. Compare and contrast different eukaryotic phyla.
    a. Create Venn Diagrams and charts with descriptions and example species
    b. Use dissections of choice such as the flower, the earthworm, the starfish, and the frog dissection to allow students the opportunity to investigate characteristics of organisms in various animal phyla.

Assessments:

Diagnostic:

Teacher prepared diagnostic test
Teacher questioning and observation

Formative:

Teacher observations, questioning techniques
Define Vocabulary words for this unit
Group activities
Homework – example problems from the textbook and workbook for each section
Quizzes/graded assignments

Summative:

Earthworm, Flower, and Frog Dissections