Pearson

Honors Biology

Semester A Summary:

Honors Biology A is designed to give the student a strong basis for understanding the world. The course consists of a varied curriculum that provides the student the opportunity to explore, compare, research, reflect, and make real-world connections. The curriculum, which meets Next Generation Science Standards (NGSS), engages students in problem-solving and scientific investigation and provides opportunities for both hands-on exploration and virtual simulation. During this course, the student will study the science of life. The student will explore the idea that living things are extremely diverse in form, yet are unified by certain core characteristics that they all share. In learning about these core characteristics, the student will be able to critically evaluate data and information related to biological problems, connect many ideas to the student's own life, and see the world in a new way. Throughout the course, the student will engage in activities to encourage critical thinking, including using multiple examples to generate broader generalizations, exploring an increased complexity of conceptual relationships, and studying content appropriate for college preparation studies.

Semester A Outline

1. **Course Overview**
    1. Biology Course Overview
2. **Biochemistry**
    1. Biochemistry Unit Introduction
    2. The Building Blocks of Life
        - In this section, you will explain the relationship between atoms in sugar molecules formed in or ingested by an organism and atoms found in large carbon-based molecules.
    3. What All Biomolecules Have in Common
        - In this section, you will use evidence to explain that sugar molecules are composed of carbon, oxygen, and hydrogen atoms, and that amino acids and other complex carbon-based molecules are composed largely of carbon, oxygen, and hydrogen atoms.
        - In this section, you will describe macromolecules and the role they play in maintaining life processes.
    4. The Essential Sugar Molecule
        - In this section, you will explain that larger carbon-based molecules and amino acids can be a result of chemical reactions between sugar molecules and other atoms.
    5. You Are What You Eat
        - In this section, you will use evidence to explain that all organisms take in matter and rearrange the atoms in chemical reactions.
    6. Chemical Reactions
        - In this section, you will use evidence to explain that chemical reactions can create products that are more complex than the reactants, and that chemical

reactions involve changes in the energies of the molecules included in the reaction.

7. Matter Conservations Matters
    - In this section, you will explain how atoms from sugar molecules combine with other elements to form large carbon-based molecules while conserving matter.
8. Respiration Overview
    - In this section, you will use evidence to explain that cellular respiration involves chemical reactions between sugar molecules and other molecules in which energy is released that can be used to drive other chemical reactions.
9. Reliable Sources
    - In this section, you will use a variety of valid and reliable sources as the evidence to explain how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids or other large carbon-based molecules.
10. Biochemistry Apply
    - In this section, you will explain how each organism of a food chain receives the food matter it needs to create the biomolecules for food and growth
11. Biochemistry Review and Reflect
12. Biochemistry Unit Test

3. **Cells and Body Systems**
    1. Cells and Body Systems Unit Intro
    2. What Goes In Must Come Out
        - In this section, you will model how cell membranes help to regulate the transport of materials into and out of the cell.
        - In this section, you will describe how the cell theory is supported by evidence.
        - In this section, you will explain how the structure and function of the cell membrane support cell transport.
    3. Structures of the Cell
        - In this section, you will model how different cell structures work together in order to create proteins. You will also show how proteins are modified, packaged, and transported to different parts of the cell.
    4. Cell Structures
        - In this section, you will describe the various types of organelles found in cells and compare the cell structures found in different organisms.
    5. Parts of a Multicellular Organism
        - In this section, you will make a model that shows the parts of human body systems and how they function.
    6. Modeling Body Systems
        - In this section, you will explore how different body systems work together to help an organism survive and describe ways that different systems affect each other.
    7. Interactions Between Systems
        - In this section, you will use a model to show how different body systems interact.
    8. Models Versus Actual Body Systems
        - In this section, you will compare models of body systems with actual body systems and describe how they differ.
    9. Cells and Body Systems Apply
    10. Cells and Body Systems Review
    11. Cells and Body Systems Unit Test

4. **Homeostasis Portfolio**
    1. Homeostasis Portfolio 1
        - In this portfolio activity, you will plan and conduct an investigation that provides evidence of a feedback mechanism that maintains homeostasis.
        - In this section, you will identify an area of research that shows how feedback mechanisms help an organism maintain homeostasis.
        - In this section, you will plan an investigation and identify evidence that will show how feedback mechanisms help an organism maintain homeostasis.
    2. Homeostasis Portfolio 2
        - In this section, you will describe the data that will be collected during your investigation of homeostasis. You will also explain why the data you will collect is relevant.
        - In this section, you will carry out an investigation that shows how feedback mechanisms help organisms maintain homeostasis.
    3. Homeostasis Portfolio 3
        - In this section, you will review your investigation and evaluate the quality of the data you collected.
5. **Cell Work**
    1. Cell Work Unit Introduction
    2. Photosynthesis
        - In this section, you will model how photosynthesis transforms light into stored chemical energy by converting carbon dioxide and water into sugars and oxygen.
    3. Photosynthesis: Energy Conversion
        - In this section, you will model photosynthesis as a process that stores energy equal to the difference between the energies of the chemical bonds of the inputs and outputs of the process.
        - In this section, you will model how photosynthesis transforms light into stored chemical energy by converting carbon dioxide and water into sugars and oxygen.
    4. Photosynthesis Portfolio 1
        - In this portfolio activity, you will think about how to design, conduct, and evaluate an investigation to gather evidence that photosynthesis converts light energy to stored chemical energy by showing how leaves take in carbon dioxide and release oxygen at a measurable rate.
        - In this section, you will describe carbon dioxide absorption and oxygen release in photosynthesis.
        - In this section, you will develop an investigation that would give evidence of the absorption of carbon dioxide and release of oxygen in photosynthesis.
    5. Photosynthesis Portfolio 2
        - In this section, you will describe the connection between data collected and the phenomenon of carbon dioxide absorption and oxygen release in photosynthesis.
        - In this section, you will complete an investigation of the absorption of carbon dioxide and release of oxygen in photosynthesis.
    6. Photosynthesis Portfolio 3
        - In this section, you will assess the accuracy and precision of data collected in an investigation.
    7. Cellular Respiration and Matter
        - In this section, you will model the parts of cellular respiration.
    8. Making and Breaking Bonds for Energy
        - In this section, you will model the breaking and forming of chemical bonds in

cellular respiration.

9. Cellular Respiration
    - In this section, you will model the release of energy in cellular respiration.
10. Energy and Matter Conservation
    - In this section, you will model the flow of matter and energy in the chemical reactions of oxygen and food molecules.
11. Heat and Cellular Respiration
    - In this section, you will model the transfer of energy from food and oxygen to the cell to sustain life processes, including the maintenance of body temperature.
12. Cell Work Apply
13. Cell Work Review
14. Cell Work Unit Test

6. **DNA**
    1. DNA Unit Introduction
    2. Genes, Chromosomes, and DNA
        - In this section, you will describe the structure and function of DNA, explain the relationships between DNA and the genes that are made of DNA, and determine the structure of the proteins that carry out the functions of life and the chromosomes that package the genes into cells.
        - In this section, you will explore how what we know about the molecular structure of DNA has changed throughout history.
    3. How Cells Make Proteins
        - In this section, you will use reasoning to connect evidence that shows the relationship between the structures and functions of DNA and proteins. You will also sequence the steps in the formation of proteins within cells.
    4. Gene Expression
        - In this section, you will use models of DNA to form questions and provide answers that show the cause and effect relationship between DNA, proteins, and traits.
    5. Gene Expression and Gene Regulation
        - In this section, you will use models of DNA to form questions and provide answers that show how gene function is controlled by the cell.
    6. Genetic Factors in Inheritance
        - In this section, you will use scientific information to show that traits are often the result of genetic factors that interact with each other and that are affected by environmental factors.
    7. Genetically Modified Organisms
        - In this section, you will explore and communicate information about the use of biotechnology in forensics, medicine, and agriculture.
    8. Genetically Modified Organisms Discussion
    9. What is a Virus
        - In this section, you will compare and contrast viruses and living things, using evidence.
        - In this section, you will describe the different ways viruses reproduce.
        - In this section, you will describe how viruses cause disease.
        - In this section, you will learn how viruses depend on their hosts to replicate, which requires energy gained from the hosts.
    10. What is a Bacterium?
        - In this section, you will compare the structures and functions of bacteria.
        - In this section, you will compare the modes of reproduction for bacteria.
        - In this section, you will explain the roles bacteria and viruses have on other

organisms and the environment.
    - In this section, you will explain how the germ theory of infectious disease is supported by evidence.
11. DNA Apply
12. DNA Review and Reflect
13. DNA Unit Test

7. **Mitosis**
    1. Mitosis Unit Introduction
    2. Complex Organisms
        - In this section, you will model how cells of complex organisms duplicate and become more specialized through the processes of mitosis and differentiation.
    3. Inputs and Outputs of Mitosis
        - In this section, you will use a model to describe how the processes of mitosis and cellular differentiation result in a complex organism.
    4. Mitosis in Complex Organisms
        - In this section, you will model how complex organisms use mitosis for the growth, replacement, and repair of cells. You will also describe how differentiation produces specialized cells that each have different functions within organisms.
    5. Mitosis and Genetic Information
        - In this section, you will use a model to show how eukaryotes use mitosis to grow new cells that contain identical genetic information.
    6. Gene Expression
        - In this section, you will use a model to show that although cells within a multicellular organism have the same genes, the cells differ based on which genes are expressed.
    7. How Cells Are Used in the Body
        - In this section, you will use a model to show how mitosis allows organisms to grow in size and replace old or damaged cells. You will also describe how the process of differentiation allows stem cells to become a variety of specialized cells.
    8. Disruptions of the Cell Cycle
        - In this section, you will explain that disruptions of the cell cycle lead to diseases such as cancer.
    9. The Map is Not the Territory
        - In this section, you will analyze the differences between a model of mitosis and the actual process of mitosis as it occurs in cells.
    10. Mitosis Apply
        - In this section, you will apply the phases of mitosis to develop a plan to repair damage to an organism.
    11. Mitosis Review and Reflect
    12. Mitosis Unit Test
8. **Genetic Variation**
    1. Genetic Variation Unit Introduction
    2. Genetic Variation from Meiosis
        - In this section, you will describe how inheritable genetic variations may result from new genetic combinations through meiosis.
    3. Genetic Variation from Errors
        - In this section, you will apply the idea that inheritable genetic variations may result from viable errors occurring during replication.
    4. Environmental Genetic Variation

- In this section, you will apply the idea that inheritable genetic variations may result from mutations caused by environmental factors.

5. Genetic Mutations Produce Variation
    - In this section, you will describe the links between evidence and a claim, such as that genetic mutations produce genetic variations between cells or organisms.
6. Genetic Variations Can Be Inherited
    - In this section, you will describe the links between evidence and a claim, such as that genetic variations produced by mutation and meiosis can be inherited.
7. Sources of New DNA Combinations
    - In this section, you will explain that new combinations of DNA can arise from several sources, including meiosis, errors during replication, and mutations caused by environmental factors.
8. Sources of new DNA Combinations Discussion
9. Organizing Data About Expressed Traits
    - In this section, you will organize population data by the frequency, distribution, and variation of expressed traits.
10. Analyzing Data About Traits
    - In this section, you will use statistical analyses of data to determine the relationship between a trait's occurrence within a population and environmental factors.
11. Expressed Traits
    - In this section, you will analyze data to explain the distribution of expressed traits.
12. Genetic Variation Apply
    - In this section, you will draw a model that represents each of the mutations learned in this unit.
13. Genetic Variation Review and Reflect
14. Genetic Variation Unit Test

9. **Biology A Semester Review and Exam**
    1. Biology A Semester Review
    2. Biology A Semester Exam

Semester B Summary:

Honors Biology B is designed to give the student a strong basis for understanding the world. The course consists of a varied curriculum that provides the student the opportunity to explore, compare, research, reflect, and make real-world connections. The curriculum, which meets Next Generation Science Standards (NGSS), engages students in problem-solving and scientific investigation and provides opportunities for both hands-on exploration and virtual simulation. During this course, the student will study the science of life. The student will explore the idea that living things are extremely diverse in form, yet are unified by certain core characteristics that they all share. In learning about these core characteristics, the student will be able to critically evaluate data and information related to biological problems, connect many ideas to the student's own life, and see the world in a new way. Throughout the course, the student will engage in activities to encourage critical thinking, including using multiple examples to generate broader generalizations, exploring an increased complexity of conceptual relationships, and studying content appropriate for college preparation studies.

Semester B Outline

1. **Course Overview**
    1. Biology B Course Overview
2. **Carbon Cycle**
    1. Carbon Cycle Unit Introduction
    2. Modeling the Carbon Cycle
        - In this section, you will identify parts of a model for the cycling of carbon.
    3. Living Things and the Carbon Cycle
        - In this section, you will describe the exchange of carbon between organisms and the environment in a model for the cycling of carbon.
    4. Storage of Carbon
        - In this section, you will describe the role of carbon storage in organisms in a model for the cycling of carbon.
    5. Cell Work and Carbon
        - In this section, you will describe the roles of photosynthesis and cellular respiration in a model for the cycling of carbon.
    6. Model Versus Real Life
        - In this section, you will distinguish between models of the carbon cycle and the actual carbon cycle.
    7. Carbon Cycle Apply
        - In this section, you will describe how animals and plants perform cellular respiration and photosynthesis, how carbon is cycled, and how it relates to the global carbon cycle.
    8. Carbon Cycle Review and Reflect
    9. Carbon Cycle Unit Test
3. **Energy Flow**
    1. Energy Flow Unit Introduction
    2. Cycling of Matter and Energy
        - In this section, you will identify claims about the cycling of matter and flow of energy among organisms in an ecosystem.
        - In this section, you will explain how microorganisms affect the health of both organisms and ecosystems.
    3. Cycling of Matter and Energy Flow
        - In this section, you will describe how claims about the cycling of matter and flow of energy among organisms in an ecosystem can be expressed as a mathematical relationship.
    4. Trophic Levels
        - In this section, you will describe the transfer of matter and flow of energy between organisms and their environment.
    5. Ten Percent Rule
        - In this section, you will identify the relative proportion of organisms at each trophic level.
    6. Life Processes
        - In this section, you will use the mathematical representation of a food web to account for the energy not transferred to higher trophic levels. You will also describe the inefficiencies in the transfer of matter and energy.
    7. Recycling of Matter
        - In this section, you will explain how energy from photosynthesis and respiration drives the cycling of matter and flow of energy under aerobic or anaerobic conditions within an ecosystem.
    8. Describing the Flow of Energy
        - In this section, you will explain the cycling of matter and flow of energy in

aerobic and anaerobic conditions in terms of the conservation of matter and energy.

9. Chemosynthesis
    - In this section, you will justify a revised explanation about the cycling of matter and the flow of energy in aerobic and anaerobic conditions.
10. Energy Flow Apply
11. Energy Flow Review and Reflect
12. Energy Flow Unit Test

4. **Biodiversity**
    1. Biodiversity Unit Introduction
    2. Classification of Living Things
        - In this section, you will define taxonomy.
        - In this section, you will describe the importance of a standardized taxonomic system to the scientific community.
    3. History of Classification
        - In this section, you will explain the historical development of classification systems.
        - In this section, you will learn about the functions and processes of two groups of organisms, protists and fungi.
        - In this section, you will learn about the functions and processes of two groups of organisms, plants and animals.
        - In this section, you will compare and contrast the organisms in the kingdoms that make up the Eukarya domain
    4. Carrying Capacity
        - In this section, you will describe a mathematical model of the carrying capacity of an ecosystem.
    5. Affecting Carrying Capacity
        - In this section, you will describe the effects of various factors on mathematical models of carrying capacities of ecosystems.
    6. Impacting Carrying Capacity
        - In this section, you will identify the interdependence of factors in a mathematical model of carrying capacity.
    7. Biodiversity at Population Levels
        - In this section, you will explain the effects of various factors on biodiversity and population levels in a model of an ecosystem.
    8. Biodiversity at Different Scales
        - In this section, you will identify changes over time in the biodiversity of an ecosystem using a mathematical model.
    9. Disturbances in Ecosystems
        - In this section, you will describe the effects of disturbances in ecosystems using mathematical models.
    10. Ecosystem Interactions
        - In this section, you will evaluate an explanation for ecosystem behavior in stable conditions.
    11. Complex Ecosystem Transformations
        - In this section, you will evaluate an explanation for ecosystem behavior in changing conditions.
    12. Effects of Changing Conditions
        - In this section, you will evaluate an explanation for changes in an ecosystem.
    13. Modest Disturbances in Ecosystems
        - In this section, you will evaluate an explanation for ecosystem response to modest disturbance.

14. Extreme Disturbances in Ecosystems
    - In this section, you will evaluate an explanation for ecosystem response to extreme disturbance.
15. Biodiversity Apply
    - In this section, you will develop a plan to protect coral reefs and counteract climate change.
16. Biodiversity Review and Reflect
17. Biodiversity Unit Test

5. **Biodiversity Portfolio**
    1. Biodiversity Portfolio 1
        - In this portfolio activity, you will use databases to develop, research, and analyze a solution to an environmental problem.
    2. Biodiversity Portfolio 2
        - In this section, you will gather information about examples of the negative impact of human activities on the environment.
        - In this section, you will brainstorm possible solutions for reducing impacts of human activities on the environment.
        - In this section, you will design a solution for reducing impacts of human activities on the environment.
    3. Biodiversity Portfolio 3
        - In this section, you will create or revise a simulation that can be used to test the solution for reducing impacts of human activities on the environment.
    4. Biodiversity Portfolio 4
        - In this section, you will use test results to design improvements to the solution for reducing impacts of human activities on the environment.
        - In this section, you will analyze the effectiveness of a solution for reducing impacts of human activities on the environment.
    5. Biodiversity Portfolio 5
        - In this section, you will evaluate a solution for reducing impacts of human activities on the environment.
        - In this section, you will identify how natural events and human activities have influenced local and global ecosystems that affect the flora and fauna of Virginia.
6. **Biological Evolution**
    1. Biological Evolution Unit Introduction
    2. How Resources Affect Evolution
        - In this section, you will identify and describe factors that affect evolution, including that competition for limited resources can arise as a species increases in number.
    3. Genetic Variation and Evolution
        - In this section, you will identify and describe factors that affect evolution, including that individuals in a species have genetic variation that is passed on to their offspring.
    4. Differential Reproduction
        - In this section, you will identify and describe factors that affect evolution, including that individuals can have specific traits that give them a competitive advantage relative to other individuals in the species.
    5. Modeling Evolution
        - In this section, you will describe the four factors that affect the process of evolution.
    6. Evolution Versus Natural Selection
        - In this section, you will explain the difference between natural selection and

biological evolution.

7. Environmental Change
    - In this section, you will examine how changes in environmental conditions may result in an increase in the number of individuals of some species, the emergence of new species over time, and the extinction of other species.
8. Group Behavior
    - In this section, you will assess the validity, reliability, strengths, and weaknesses of evidence about the outcomes of group behavior.
9. Effects of Change
    - In this section, you will analyze the effects of environmental changes on the number of individuals of a species, the number of species in an environment, and the emergence or extinction of a species.
10. Biological Evolution Apply
11. Evolution Review and Reflect
12. Biological Evolution Unit Test

7. **Natural Selection**
    1. Natural Selection Unit Introduction
    2. Natural Selection Over Time
        - In this section, you will organize data to support the claim that organisms with an advantageous heritable trait tend to increase in a population in proportion to organisms lacking this trait.
    3. Distribution of Traits
        - In this section, you will use statistical analyses of data to determine patterns of change in numerical distribution of traits in a population over various time and population scales.
    4. Heredity and Reproductive Success
        - In this section, you will use data analyses as evidence to support claims about natural selection as the cause of increases and decreases in heritable traits in a population over time.
    5. High Altitude Living
        - In this section, you will use data analyses as evidence to support claims about the changes in distribution of adaptations of traits in a population.
    6. Competitive Advantage
        - In this section, you will use evidence to explain that individuals can have specific traits that give a competitive advantage relative to other individuals in the species.
    7. Evolution of the Influenze Virus
        - In this section, you will use a variety of valid and reliable sources to support the claim that natural selection leads to adaptations of populations.
    8. Color and Natural Selection
        - In this section, you will distinguish between cause and correlation in an explanation of how natural selection allows species to adapt to changes in their environment.
    9. Transitional Fossils
        - In this section, you will distinguish between cause and correlation in an explanation of how natural selection allows species to adapt to changes in their environment.
    10. Natural Selection Apply
        - In this section, you will describe how the pocket mouse has adapted to changes in its environment and any influences on genetics that may have occurred.
    11. Natural Selection Review and Reflect

12. Natural Selection Unit Test

8. **Biological Evolution Evidence**
    1. Evolution Evidence Unit Introduction
    2. Biological Evolution Evidence
        - In this section, you will identify and communicate evidence for common ancestry and biological evolution, including information derived from DNA sequences.
    3. Fossil Record and Embryology
        - In this section, you will identify and communicate evidence for common ancestry and biological evolution, including patterns in the fossil record and in anatomy and embryos.
    4. Animal Phylogenetic Tree Portfolio 1
        - In this portfolio activity, you will learn how evolutionary biologists use the characteristics of organisms to explain how they evolved. You will take the role of an evolutionary biologist to explain the ancestry and evolution of an imaginary alien species. You will then apply your knowledge of evolution and model the lineage of this alien species.
        - In this section, you will define and describe animal phylogeny.
        - In this section, you will define and describe cladograms.
    5. Animal Phylogenetic Tree Portfolio 2
        - In this section, you will interpret a phylogenetic tree diagram of an animal in order to identify common ancestry and biological evolution.
        - In this section, you will create a phylogenetic tree for an imaginary animal and explain the possible common ancestry and biological evolution.
    6. Animal Phylogenetic Tree Portfolio 3
        - In this section, you will evaluate and update the phylogenetic tree based on new evidence and explain the rationale for the changes.
    7. Evidence of Evolution
        - In this section, you will observe and communicate the patterns of evidence for causal relationships relating to biological evolution and common ancestry.
    8. Evolution Evidence Apply
    9. Biological Evolution Evidence Review
    10. Biological Evolution Evidence Unit Test
9. **Biology B Semester Review and Exam**
    1. Semester Review
    2. Biology B Semester Exam