
Science 9 Academic

Curriculum Guide

Dunmore School District

Dunmore, PA



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Science 9 Academic

Prerequisite:

- Successful completion of Science 8.

The Science 9 Academic course introduces the principles and concepts of biology. Emphasis is on basic biological chemistry, cell structure and function, metabolism and energy transformation, genetics, evolution, classification, and other related topics. Upon completion, students should be able to demonstrate understanding of life at the molecular and cellular levels. The course focuses on vocabulary building to prepare students for their sophomore Biology course and eventual success on the Biology Keystone Exam.

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Year-at-a-glance

Subject: Science 9 Academic	Grade Level: 9	Date Completed: 3/12/2018
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1st Quarter: Introducing Biology

Topic	Resources	Standards
Biology in the 21st Century The Study of Life Unifying Themes of Biology Scientific Thinking and Processes Biologists' Tools and Technology Biology and Your Future	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.1.10.A 3.3.10.B
Chemistry of Life Atoms, Ions, and Molecules Properties of Water Carbon-Based Molecules Chemical Reactions Enzymes	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.A 3.3.10.B 3.1.10.B 3.4.10.A 3.4.10.B

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2nd Quarter: Cells

Topic	Resources	Standards
Cell Structure and Function Cell Theory Cell Organelles Cell Membrane Diffusion and Osmosis Active Transport, Endocytosis, and Exocytosis	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.B 3.3.10.A
Cells and Energy Chemical Energy and ATP Overview of Photosynthesis Overview of Cell Respiration Fermentation	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.A 3.3.10.B 3.4.10.A 3.1.12.E 3.4.10.B 4.6.10.A 4.6.10.B 4.6.10.C

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3rd Quarter: Genetics

Topic	Resources	Standards
Cell Growth and Division The Cell Cycle Mitosis and Cytokinesis Regulation of the Cell Cycle Asexual Reproduction Multicellular life	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.1.10.A 3.3.10.C 3.3.10.A
Meiosis and Mendel Chromosomes and Meiosis Process of Meiosis Mendel and Heredity Traits, Genes, and Alleles Traits and Probability Meiosis and Genetic Variation	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.B 3.3.10.C
From DNA to Proteins Identifying DNA as the Genetic Material Structure of DNA DNA Replication Transcription Translation Gene Expression and Regulation Mutations	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.A 3.3.10.B 3.3.10.C

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4th Quarter: Evolution

Topic	Resources	Standards
Principles of Evolution Early Ideas About Evolution Darwin's Observations Theory of Natural Selection Evidence of Evolution Evolutionary Biology Today	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.D 3.5.10.A 3.3.10.B 4.7.10.C
The Evolution of Populations Genetic Variation Within Populations Natural Selection in Populations Other Mechanisms of Evolution Speciation Through Isolation Patterns in Evolution	<i>Biology</i> textbook PowerPoint presentations Review Sheets Vocab Quizzes Content Exam	3.3.10.D 3.3.10.C 4.7.10.C
Review and Final Exam		

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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Introduction to Biology: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments. BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.</p> <p>PA Academic Standards: Science 3.1.10.A Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.</p> <ul style="list-style-type: none"> • Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch). • Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems. • Explain the concept of system redesign and apply it to improve technological systems. • Apply the universal systems 	<p>Eligible Content: BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation). 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).</p> <hr/> <p>Essential Knowledge/Skills: Biologists study life in all forms. Unifying themes connect concepts from many fields of biology.</p>	<p><i>Holt McDougal Biology:</i> Chapter 1 sections 1 and 2 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	15 days

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	<p>model to illustrate specific solutions and troubleshoot specific problems.</p> <ul style="list-style-type: none"> Analyze and describe the effectiveness of systems to solve specific problems. <p>3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> Describe the relationship between the structure of organic molecules and the function they serve in living organisms. Identify the specialized structures and regions of the cell and the functions of each. Explain how cells store and use information to guide their functions. Explain cell functions and processes in terms of chemical reactions and energy changes. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p>	<p>Define and give examples of Earth’s biodiversity. Summarize the characteristics that all living things share. Summarize four major unifying themes of biology. Give an example of each of the themes of biology.</p> <p>Vocabulary: Biosphere Biodiversity Species Biology Organism Cell Metabolism DNA System Ecosystem Homeostasis Evolution Adaptation</p>			
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	<p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Chemistry of Life: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.3.10.A Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. <p>3.3.10.B Describe and explain the chemical and structural</p>	<p>Eligible Content: 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.</p> <hr/> <p>Essential Knowledge/Skills: Carbon-based molecules are the foundation of life. Sugar molecules are carbohydrates with hydrocarbon backbones. These serve as the basis for amino acids and other larger organic molecules needed by the cell.</p> <p>Describe the bonding properties of carbon atoms. Compare carbohydrates, lipids, proteins, and nucleic</p>	<p><i>Holt McDougal Biology:</i> Chapter 2 section 3 PowerPoint review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>15 days</p>

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	<p>basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused</p>	<p>acids.</p> <p>Vocabulary: Monomer Polymer Carbohydrate Lipid Fatty Acid Protein Amino Acid Nucleic Acid</p>			
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	text to convey a well-defined perspective and appropriate content.				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Chemistry of Life: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.1.10.B Describe concepts of models as a way to predict and understand science and technology. • Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). • Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability). Apply mathematical models to science and technology.</p>	<p>Eligible Content: 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. 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. BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function. 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.</p>	<p>Holt McDougal Biology: Chapter 2 sections 4 and 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>15 days</p>

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	<p>3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>3.4.10.A Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none"> • Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable. • Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table. • Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations. • Describe phases of matter 	<p>Essential Knowledge/Skills: Life depends on chemical reactions. Chemical reactions are driven by matter and energy flowing through different organizational levels of biological systems which form different products. Enzymes are catalysts for chemical reactions in living things.</p> <p>Describe how bonds break and reform during chemical reactions. Explain why chemical reactions release or absorb energy. Explain the effect of a catalyst on activation energy. Describe how enzymes regulate chemical reactions.</p> <p>Vocabulary: Chemical reactant Reactant Product Bond Energy Equilibrium Activation energy Exothermic Endothermic Catalyst Enzyme Substrate</p>			
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	<p>according to the Kinetic Molecular Theory.</p> <ul style="list-style-type: none"> • Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent). • Recognize formulas for simple inorganic compounds. • Describe various types of chemical reactions by applying the laws of conservation of mass and energy. • Apply knowledge of mixtures to appropriate separation techniques. • Understand that carbon can form several types of compounds. <p>3.4.10.B Analyze energy sources and transfers of heat.</p> <ul style="list-style-type: none"> • Determine the efficiency of chemical systems by applying mathematical formulas. • Use knowledge of chemical reactions to generate an electrical current. • Evaluate energy changes in chemical reactions. • Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion). • Explain resistance, current and 				
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	<p>electro-motive force (Ohm's Law).</p> <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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	PA Academic and Core Standards				
<p>Cell Theory: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.A.1.1 Explain the characteristics common to all organisms.</p> <p>PA Academic Standards: Science 3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and</p>	<p>Eligible Content: BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.</p> <hr/> <p>Essential Knowledge/Skills: Cells are the basic unit of life. Compare cellular structure and their functions in prokaryote and eukaryote cells.</p> <p>Describe developments that lead to the cell theory. Differentiate between eukaryotic and prokaryotic cells.</p> <p>Vocabulary: Cell theory Cytoplasm Organelle Prokaryotic cell Eukaryotic cell</p>	<p><i>Holt McDougal Biology:</i> Chapter 3 section 1 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	5 days

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	<p>respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Cell Organelles: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.3.10.A Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p>	<p>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).</p> <hr/> <p>Essential Knowledge/Skills: Eukaryotic cells share many similarities. Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.</p> <p>Describe the internal structure of eukaryotic cells. Summarize the functions of organelles in plant and animal cells.</p>	<p><i>Holt McDougal Biology:</i> Chapter 3 section 2 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	5 days

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	<p>3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>Vocabulary: Cytoskeleton Nucleus Endoplasmic reticulum Ribosomes Golgi apparatus Vesicle Mitochondrion Vacuole Lysosome Centriole Cell wall Chloroplast</p>			
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	PA Academic and Core Standards				
<p>Cell Membrane and Cell Transport: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.A.2.1 Describe how the unique properties of water support life on Earth. BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.</p> <p>PA Academic Standards: Science 3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p>	<p>Eligible Content: BIO.A.2.1.1 Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion). BIO.A.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.</p> <hr/> <p>Essential Knowledge/Skills: Within cells, special</p>	<p><i>Holt McDougal Biology:</i> Chapter 3 sections 3, 4, and 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	10 days

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	<p>3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>structures are responsible for particular functions. The cell membrane is a barrier that separates a cell from the external environment. Materials move across membranes because of concentration differences. Cells use energy to transport materials that cannot diffuse across a membrane.</p> <p>Describe the structure of the cell membrane. Summarize how chemical signals are transmitted across the cell membrane. Describe passive transport. Distinguish between osmosis, diffusion, and facilitated transport. Describe active transport. Distinguish among endocytosis, phagocytosis, and exocytosis.</p> <p>Vocabulary: Cell membrane Phospholipid Fluid mosaic model Selective permeability Receptor Passive transport Diffusion Concentration gradient Osmosis</p>			
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		Isotonic Hypertonic Hypotonic Facilitated diffusion Active transport Endocytosis Exocytosis Phagocytosis			
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	PA Academic and Core Standards				
<p>Photosynthesis: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.3.10.A Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. <p>3.3.10.B Describe and explain the chemical and structural basis of living organisms. • Describe the relationship</p>	<p>Eligible Content: 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.</p> <hr/> <p>Essential Knowledge/Skills: Photosynthesis is the process in which light energy is transformed into chemical energy; carbon dioxide and water react to form sugar and oxygen. The overall process of photosynthesis produces sugars that store chemical energy. Photosynthesis requires a series of chemical reactions.</p> <p>Relate producers to photosynthesis. Describe the process of photosynthesis. Describe the light-dependent</p>	<p><i>Holt McDougal Biology:</i> Chapter 4 sections 2 and 3 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>

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	<p>between the structure of organic molecules and the function they serve in living organisms.</p> <ul style="list-style-type: none"> • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>3.4.10.A Explain concepts about the structure and properties of matter. • Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable. • Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table.</p> <ul style="list-style-type: none"> • Predict the behavior of gases through the use of Boyle’s, Charles’ or the ideal gas law, in everyday situations. • Describe phases of matter according to the Kinetic Molecular Theory. • Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent). 	<p>reactions in which energy is captured. Describe the light-independent reactions in which sugar is produced.</p> <p>Vocabulary: Photosynthesis Chlorophyll Thylakoid Light-dependent reactions Light-independent reactions Photosystem Electron transport chain ATP synthase Calvin cycle</p>			
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	<ul style="list-style-type: none"> • Recognize formulas for simple inorganic compounds. • Describe various types of chemical reactions by applying the laws of conservation of mass and energy. • Apply knowledge of mixtures to appropriate separation techniques. • Understand that carbon can form several types of compounds. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	<p>Anchor Descriptors: 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.</p> <p>PA Academic Standards: Science 3.1.12.E Evaluate change in nature, physical systems and man made systems. • Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories). • Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire). • Explain</p>	<p>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.</p> <hr/> <p>Essential Knowledge/Skills: Energy flows through systems by means of chemical reactions. Aerobic cellular respiration involves a series of chemical</p>	<p>Holt McDougal Biology: Chapter 4 section 4 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	5 days

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	<p>how correlation of variables does not necessarily imply causation.</p> <ul style="list-style-type: none"> • Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry). <p>3.4.10.B Analyze energy sources and transfers of heat. Determine the efficiency of chemical systems by applying mathematical formulas. Use knowledge of chemical reactions to generate an electrical current.</p> <ul style="list-style-type: none"> • Evaluate energy changes in chemical reactions. • Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion). • Explain resistance, current and electro-motive force (Ohm’s Law). <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making</p>	<p>reactions in which energy in food molecules can be converted into a form that the cell can readily use for life functions. The overall process of cellular respiration converts sugar into ATP using oxygen.</p> <p>Describe the process of cellular respiration. Compare cellular respiration to photosynthesis.</p> <p>Vocabulary: Cellular respiration Aerobic Glycolysis Anaerobic Krebs cycle</p>			
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	<p>connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	Anchor Descriptor: 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.	Holt McDougal Biology: Chapter 4 section 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam	Teacher prepared tests, quizzes, etc. Series available assessments online. (Optional)	5 days
	PA Academic Standards: Science 3.1.12.E Evaluate change in nature, physical systems and man-made systems. <ul style="list-style-type: none"> • Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories). • Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire). • Explain how correlation of variables does not necessarily 				

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	<p>imply causation.</p> <ul style="list-style-type: none"> Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry). <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>the electron transport chain.</p> <p>Vocabulary: Electron transport chain Chloroplast Krebs cycle Plastids</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.</p>	<p>Eligible Content: 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.</p> <hr/> <p>Essential Knowledge/Skills: Anaerobic (without oxygen) cellular respiration follows a different and less efficient chemical pathway to provide energy in cells. Matter and energy are conserved in each change. Fermentation allows the production of a small amount of ATP without oxygen.</p> <p>Describe the process of fermentation. Summarize the importance of fermentation.</p>	<p><i>Holt McDougal Biology:</i> Chapter 4 section 6 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>
	<p>PA Academic Standards: Science 3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-</p>				

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	<p>with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Chemical Energy and ATP: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.</p>	<p>Anchor Descriptor: BIO.B.4.2 Describe interactions and relationships in an ecosystem.</p> <p>PA Academic Standards: Science 4.6.10.A Explain the biotic and abiotic components of an ecosystem and their interaction.</p> <ul style="list-style-type: none"> • Identify the major biomes and explain their similarities and differences. • Compare and contrast the interactions of biotic and abiotic components in an ecosystem. • Analyze the effects of abiotic factors on specific ecosystems. • Describe how the availability of resources affects organisms in an ecosystem. • Explain energy flow in a food chain through an energy pyramid. • Evaluate the efficiency of energy flow in a food chain. • Explain the concept of carrying capacity in an ecosystem. • Explain trophic levels. • Identify a specific environmental impact and predict what change may take place to affect homeostasis. 	<p>Eligible Content: BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids).</p> <hr/> <p>Essential Knowledge/Skills: All cells need chemical energy. Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.</p> <p>Recognize the importance of ATP as an energy-carrying molecule. Identify energy sources used by organisms.</p> <p>Vocabulary: ATP ADP Photosynthesis Chemosynthesis Cellular respiration Fermentation</p>	<p><i>Holt McDougal Biology:</i> Chapter 4 section 1 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	5 days

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	<ul style="list-style-type: none"> • Examine and explain how organisms modify their environments to sustain their needs. • Assess the effects of latitude and altitude on biomes. • Interpret possible causes of population fluctuations. • Explain how erosion and sedimentation have changed the quality of soil related habitats. <p>4.6.10.B Explain how cycles affect the balance in an ecosystem.</p> <ul style="list-style-type: none"> • Describe an element cycle and its role in an ecosystem. • Explain the consequences of interrupting natural cycles. <p>4.6.10.C Analyze how ecosystems change over time.</p> <ul style="list-style-type: none"> • Identify and explain the succession stages in an ecosystem. • Identify causes of succession. • Analyze consequences of interrupting natural cycles. <p>Analyze how ecosystems change over time</p> <ul style="list-style-type: none"> • Identify and explain the succession stages in an ecosystem. • Identify causes of succession. • Analyze consequences of 				
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	<p>interrupting natural cycles. Analyze how ecosystems change over time.</p> <ul style="list-style-type: none"> • Identify and explain the succession stages in an ecosystem. • Identify causes of succession. • Analyze consequences of interrupting natural cycles. <p>Analyze how ecosystems change over time.</p> <ul style="list-style-type: none"> • Identify and explain the succession stages in an ecosystem. • Identify causes of succession. • Analyze consequences of interrupting natural cycles. <p>Analyze how ecosystems change over time.</p> <ul style="list-style-type: none"> • Identify and explain the succession stages in an ecosystem. • Identify causes of succession. • <p>Analyze consequences of interrupting natural cycles.</p> <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and</p>				
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	<p>between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.B.1.2 Explain how genetic information is inherited. BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification). BIO.B.4.1 Describe ecological levels of organization in the biosphere.</p> <p>PA Academic Standards: Science 3.3.10.A Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. 3.3.10.B Describe and explain the chemical and structural	<p>Eligible Content: 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.2.2.1 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.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p> <hr/> <p>Essential Knowledge/Skills: DNA molecules contain genetic information that is</p>	<p><i>Holt McDougal Biology:</i> Chapter 8 sections 1, 2, 3, 4, and 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>

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	<p>basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>3.3.10.C Describe how genetic information is inherited and expressed.</p> <p>Compare and contrast the function of mitosis and meiosis.</p> <ul style="list-style-type: none"> • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, 	<p>found in all cells. Genes are sections of DNA that code for proteins, which are important for cell functioning. DNA was identified as the genetic material through a series of experiments. DNA structure is the same in all organisms. DNA replication copies the genetic information of a cell. Transcription converts a gene into a single-stranded RNA molecule. Translation converts an mRNA message into a polypeptide, or protein.</p> <p>Describe Griffith's discovery of a transforming principle. Explain how Avery identified DNA as the transforming principle. Summarize the experiments of Hershey and Chase that confirmed DNA as the genetic material. Describe the interaction of the four nucleotides that make up DNA. Describe the three-dimensional structure of DNA. Summarize the process of DNA replication. Describe the role of enzymes in DNA replication. Describe the relationship between</p>			
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	<p>sex-influenced traits).</p> <ul style="list-style-type: none"> • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>RNA and DNA. Identify the three kinds of RNA and their functions. Compare transcription to replication. Describe how mRNA codons are translated into amino acids. Summarize the process of protein synthesis.</p> <p>Vocabulary: Bacteriophage Nucleotide Double helix Base pairing rules Replication DNA polymerase Central dogma RNA Transcription RNA polymerase Messenger RNA (mRNA) Ribosomal RNA (rRNA) Transfer RNA (tRNA) Translation Codon Stop codon Start codon Anticodon</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.</p>	<p>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.</p>	<p><i>Holt McDougal Biology:</i> Chapter 5 sections 1, 2, and 3 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>
	<p>PA Academic Standards: Science 3.1.10.A Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.</p> <ul style="list-style-type: none"> • Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch). • Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems. • Explain the concept of system redesign and apply it to improve technological systems. • Apply the universal systems model to illustrate specific solutions and troubleshoot specific problems. • Analyze and describe the effectiveness of systems to solve specific problems. 	<p>Essential Knowledge/Skills: Mitosis is the process in which individual cells multiply, which allows multicellular organisms to grow. Both daughter cells receive identical genetic information from the original parent cell. Cells have distinct phases of growth, reproduction, and normal functions. Cells divide during mitosis and cytokinesis. Cell cycle regulation is necessary for healthy growth.</p> <p>Describe the stages of the cell cycle. Compare rates of division in different cell</p>			

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	<p>3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations’ effects on a trait’s expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p>	<p>types. Identify factors that limit cell size. Describe the structure of a chromosome. Follow chromosomes through the processes of mitosis and cytokinesis. Identify internal and external factors that regulate cell division. Explain cancer in terms of cell cycle.</p> <p>Vocabulary: Cell cycle Mitosis Cytokinesis Chromosome Histone Chromatin Chromatid Centromere Telomere Prophase Metaphase Anaphase Telophase Growth Factor Apoptosis Cancer Benign Malignant Metastasize Carcinogen</p>			
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	<p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.B.1.2 Explain how genetic information is inherited.</p>	<p>Eligible Content: 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).</p> <hr/> <p>Essential Knowledge/Skills: Tissues and organs are produced by cellular division and differentiation, and they work together to meet a multicellular organism's needs. Cells work together to carry out complex functions.</p> <p>Describe the specialization in multicellular organisms. Identify different types of stem cells.</p> <p>Vocabulary: Tissue Organ Organ system Cell differentiation Stem cell</p>	<p><i>Holt McDougal Biology:</i> Chapter 5 section 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>
	<p>PA Academic Standards: Science 3.3.10.A Explain the structural and functional similarities and differences found among living things.</p> <ul style="list-style-type: none"> • Identify and characterize major life forms according to their placement in existing classification groups. • Explain the relationship between structure and function at the molecular and cellular levels. • Describe organizing schemes of classification keys. • Identify and characterize major life forms by kingdom, phyla, class and order. <p>3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different 				

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	<p>reproductive patterns in living things (e.g., budding, spores, fission).</p> <ul style="list-style-type: none"> • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused</p>				
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	text to convey a well-defined perspective and appropriate content.				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>All organisms are made of cells and can be characterized by common aspects of their structure and functioning.</p>	<p>Anchor Descriptor: BIO.B.1.2 Explain how genetic information is inherited. BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.</p>	<p>Eligible Content: BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions.</p>	<p><i>Holt McDougal Biology:</i> Chapter 6 sections 2 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>
	<p>PA Academic Standards: Science 3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. 	<p>Essential Knowledge/Skills: In sexual reproduction, specialized cell division, meiosis, occurs resulting in the production of sex cells (sperm and egg cells). Offspring inherit 23 chromosomes from each parent resulting in 46 total chromosomes. During meiosis, diploid cells undergo two cell divisions that result in haploid cells.</p> <p>Compare and contrast the two rounds of division in meiosis. Describe how haploid cells develop into mature gametes.</p>			

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	<ul style="list-style-type: none"> • Describe mutations’ effects on a trait’s expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing</p>	<p>Vocabulary: Gametogenesis Spermatogenesis Oogenesis Sperm Egg Polar body</p>			
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	<p>Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>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.</p>	<p>Anchor Descriptor: BIO.B.1.2 Explain how genetic information is inherited.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards: Reading for Science and</p>	<p>Eligible Content: BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance.</p> <hr/> <p>Essential Knowledge/Skills: Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. Mendel's research showed that traits are inherited as discrete units. Genes encode proteins that produce a diverse range of traits.</p> <p>Describe the pattern of inheritance that Mendel's data revealed. Summarize Mendel's law of segregation. Explain how there can be many versions of one gene. Describe how genes influence the development of</p>	<p><i>Holt McDougal Biology:</i> Chapter 6 sections 3 and 4 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>5 days</p>

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	<p>Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>traits.</p> <p>Vocabulary: Trait Genetics Purebred Cross Law of segregation Gene Allele Homozygous Heterozygous Genome Genotype Phenotype Dominant Recessive</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>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.</p>	<p>Anchor Descriptor: BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations’ effects on a trait’s expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. 	<p>Eligible Content: 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).</p> <hr/> <p>Essential Knowledge/Skills: Many organisms reproduce by cell division. The information passed from parents to offspring is coded in the DNA molecules that form the chromosomes. Gametes have half the number of chromosomes that body cells have.</p> <p>Compare and contrast binary fission and mitosis. Describe how some eukaryotes reproduce through mitosis. Differentiate between body cells and gametes. Compare and contrast autosomes and sex chromosomes.</p>	<p><i>Holt McDougal Biology:</i> Chapter 5 section 4 Chapter 6 section 1 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>4 days</p>

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	<p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>Vocabulary: Asexual reproduction Binary fission Somatic cell Gamete Homologous chromosome Autosome Sex chromosome Sexual reproduction Fertilization Diploid Haploid Meiosis</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>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.</p>	<p>Anchor Descriptor: BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations’ effects on a trait’s expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards:</p>	<p>Eligible Content: 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).</p> <hr/> <p>Essential Knowledge/Skills: In sexual reproduction, chromosomes can create new genetic combinations through the process of meiosis, which creates new genetic combinations and more genetic variation. Independent assortment and crossing over during meiosis result in genetic diversity.</p> <p>Describe how sexual reproduction creates unique gene combinations. Explain how crossing over during meiosis increases genetic diversity.</p> <p>Vocabulary: Crossing-over</p>	<p><i>Holt McDougal Biology:</i> Chapter 6 section 6 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>4 days</p>

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	<p>Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	Genetic linkage			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>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.</p>	<p>Anchor Descriptor: BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance. BIO.B.2.3 Explain how genetic information is expressed. BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, 	<p>Eligible Content: 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.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype (e.g., silent, nonsense, frame-shift). 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).</p> <hr/> <p>Essential Knowledge/Skills: Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation.</p>	<p><i>Holt McDougal Biology:</i> Chapter 8 section 6 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>4 days</p>

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	<p>sex-influenced traits).</p> <ul style="list-style-type: none"> Describe the role of DNA in protein synthesis as it relates to gene expression. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>Gene expression is carefully regulated in both prokaryotic and eukaryotic cells.</p> <p>Describe how prokaryotes turn genes on and off. Explain how gene expression is regulated in eukaryotic cells.</p> <p>Vocabulary: Promoter Operon Exon Intron</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>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.</p>	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in 	<p>Eligible Content: 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).</p> <hr/> <p>Essential Knowledge/Skills: Environmental factors can also cause mutations in genes, and viable mutations are inherited. Mutations are changes in DNA that may or may not affect phenotype.</p> <p>Distinguish between different types of mutations. Explain why mutations may or may not affect phenotype. List some factors that cause</p>	<p><i>Holt McDougal Biology:</i> Chapter 8 section 7 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>4 days</p>

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	<p>protein synthesis as it relates to gene expression.</p> <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>mutations.</p> <p>Vocabulary: Mutation Point mutation Frameshift mutation Mutagen</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>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.</p>	<p>Anchor Descriptor: BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance. BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in 	<p>Eligible Content: BIO.B.2.1.1 Describe and/or predict observed patterns of inheritance (i.e., dominant, recessive, co-dominance, incomplete dominance, sex-linked, polygenic, and multiple alleles). BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.</p> <hr/> <p>Essential Knowledge/Skills: Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. The inheritance of traits follows the rules of probability.</p> <p>Describe monohybrid and dihybrid crosses. Explain how heredity can be illustrated mathematically.</p> <p>Vocabulary: Punnett square Monohybrid cross</p>	<p><i>Holt McDougal Biology:</i> Chapter 6 section 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>4 days</p>

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	<p>protein synthesis as it relates to gene expression.</p> <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>Testcross Dihybrid cross Law of independent assortment Probability</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.</p>	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.3.10.D Explain the mechanisms of the theory of evolution.</p> <ul style="list-style-type: none"> • analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of evolution. • Explain the role of mutations and gene recombination in changing a population of organisms. • Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance. • describe the factors (e.g., isolation, differential reproduction) affecting gene 	<p>Eligible Content: 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.</p> <hr/> <p>Essential Knowledge/Skills: Evidence of common ancestry among species comes from many sources. Evidence of evolution is found in anatomy, heredity, embryology, and the fossil record. New technology is furthering our understanding of evolution.</p> <p>Recognize the major sources of evidence for evolution. Examine the pattern of features that reveal the history of species. Summarize different types of evidence</p>	<p><i>Holt McDougal Biology:</i> Chapter 10 sections 4 and 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>7 days</p>

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	<p>frequency in a population over time and their consequences.</p> <ul style="list-style-type: none"> • describe and differentiate between the roles of natural selection and genetic drift. • Describe changes that illustrate major events in the earth’s development based on a time line. • explain why natural selection can act only on inherited traits. • Apply the concept of natural selection to illustrate and account for a species’ survival, extinction or change over time. <p>3.5.10.A Relate earth features and processes that change the earth.</p> <ul style="list-style-type: none"> • Illustrate and explain plate tectonics as the mechanism of continental movement and sea floor changes. • Compare examples of change to the earth’s surface over time as they related to continental movement and ocean basin formation (e.g., Delaware, Susquehanna, Ohio Rivers system formations, dynamics). • Interpret topographic maps to identify and describe significant geologic history/structures in Pennsylvania. • Evaluate and interpret 	<p>that support evolution. Recognize the importance of evolution in unifying all branches of biological study.</p> <p>Vocabulary: Biogeography Homologous structure Analogous structure Vestigial structure Paleontology</p>			
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	<p>geologic history using geologic maps.</p> <ul style="list-style-type: none"> • Explain several methods of dating earth materials and structures. • Correlate rock units with general geologic time periods in the history of the earth. • Describe and identify major types of rocks and minerals. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.</p>	<p>Anchor Descriptor: BIO.B.3.1 Explain the mechanisms of evolution. BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.</p> <p>PA Academic Standards: Science 3.3.10.D Explain the mechanisms of the theory of evolution.</p> <ul style="list-style-type: none"> • analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of evolution. • Explain the role of mutations and gene recombination in changing a population of organisms. • Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance. • describe the factors (e.g., isolation, differential 	<p>Eligible Content: BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population. BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.</p> <hr/> <p>Essential Knowledge/Skills: Natural selection occurs only if there is both a variation in the genetic information between organisms in a population and a variation in the expression of that genetic information (trait variation) that leads to differences in performance among individuals. Populations, not individuals, evolve.</p> <p>Describe how natural selection acts on traits in a population. Explain three ways natural selection can</p>	<p><i>Holt McDougal Biology:</i> Chapter 11 section 2 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>7 days</p>

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	<p>reproduction) affecting gene frequency in a population over time and their consequences.</p> <ul style="list-style-type: none"> • describe and differentiate between the roles of natural selection and genetic drift. • Describe changes that illustrate major events in the earth’s development based on a time line. • explain why natural selection can act only on inherited traits. • Apply the concept of natural selection to illustrate and account for a species’ survival, extinction or change over time. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12</p> <p>3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences.</p>	<p>change the distribution of a trait in a population.</p> <p>Vocabulary: Normal distribution Microevolution Directional selection Stabilizing selection Disruptive selection</p>			
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	Students write clear and focused text to convey a well-defined perspective and appropriate content.				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.</p>	<p>Anchor Descriptor: BIO.B.3.1 Explain the mechanisms of evolution. BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution.</p> <p>PA Academic Standards: Science 3.3.10.C Describe how genetic information is inherited and expressed.</p> <ul style="list-style-type: none"> • Compare and contrast the function of mitosis and meiosis. • Describe mutations' effects on a trait's expression. • Distinguish different reproductive patterns in living things (e.g., budding, spores, fission). • Compare random and selective breeding practices and their results (e.g., antibiotic resistant bacteria). • Explain the relationship among DNA, genes and chromosomes. • Explain different types of inheritance (e.g., multiple allele, sex-influenced traits). • Describe the role of DNA in protein synthesis as it relates to 	<p>Eligible Content: BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population. BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.</p> <hr/> <p>Essential Knowledge/Skills: The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. A population shares a common gene pool. Natural selection is not the only mechanism through which populations evolve. New species can arise when populations are isolated.</p> <p>Describe the significance of genetic variation within a population. Identify sources of genetic variation. Explain how gene flow, genetic drift, and sexual selection can lead to the evolution of</p>	<p><i>Holt McDougal Biology:</i> Chapter 11 sections 1, 3, and 5 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>7 days</p>

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	<p>gene expression.</p> <p>3.3.10.D Explain the mechanisms of the theory of evolution.</p> <ul style="list-style-type: none"> • analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of evolution. • Explain the role of mutations and gene recombination in changing a population of organisms. • Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance. • describe the factors (e.g., isolation, differential reproduction) affecting gene frequency in a population over time and their consequences. • describe and differentiate between the roles of natural selection and genetic drift. • Describe changes that illustrate major events in the earth's development based on a time line. • explain why natural selection can act only on inherited traits. • Apply the concept of natural 	<p>populations. Explain how isolation of populations can lead to speciation. Describe how populations can become isolated.</p> <p>Vocabulary: Gene pool Allele frequency Gene flow Genetic drift Bottleneck effect Founder effect Sexual selection Reproductive isolation Speciation Behavioral isolation Geographic isolation Temporal isolation</p>			
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	<p>selection to illustrate and account for a species' survival, extinction or change over time.</p> <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<p>Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.</p>	<p>Anchor Descriptor: BIO.B.3.1 Explain the mechanisms of evolution.</p> <p>PA Academic Standards: Science 3.3.10.B Describe and explain the chemical and structural basis of living organisms.</p> <ul style="list-style-type: none"> • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. <p>3.3.10.D Explain the mechanisms of the theory of evolution.</p> <ul style="list-style-type: none"> • analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of 	<p>Eligible Content: BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population.</p> <hr/> <p>Essential Knowledge/Skills: Darwin proposed natural selection as a mechanism for evolution. Natural selection is the result of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment’s limited supply of the resources, and (4) the increase in number of those organisms that are better able to survive and reproduce in that environment.</p> <p>Compare artificial selection to natural selection. Examine the factors Darwin considered in forming his</p>	<p><i>Holt McDougal Biology:</i> Chapter 10 section 3 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	<p>7 days</p>

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	<p>evolution.</p> <ul style="list-style-type: none"> • Explain the role of mutations and gene recombination in changing a population of organisms. • Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance. • describe the factors (e.g., isolation, differential reproduction) affecting gene frequency in a population over time and their consequences. • describe and differentiate between the roles of natural selection and genetic drift. • Describe changes that illustrate major events in the earth's development based on a time line. • explain why natural selection can act only on inherited traits. • Apply the concept of natural selection to illustrate and account for a species' survival, extinction or change over time. <p>PA Core Standards: Reading for Science and Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and</p>	<p>theory of natural selection. Summarize the four principles of natural selection.</p> <p>Vocabulary: Artificial selection Heritability Natural selection Population Fitness</p>			
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	<p>respond to informational text- with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12</p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.	<p>Anchor Descriptor: 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.</p> <p>PA Academic Standards: Science 3.3.10.D Explain the mechanisms of the theory of evolution.</p> <ul style="list-style-type: none"> • analyze data from fossil records, similarities in anatomy and physiology, embryological studies and DNA studies that are relevant to the theory of evolution. • Explain the role of mutations and gene recombination in changing a population of organisms. • Compare modern day descendants of extinct species and propose possible scientific accounts for their present appearance. • describe the factors (e.g., 	<p>Eligible Content: 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.</p> <hr/> <p>Essential Knowledge/Skills: There were theories of biological and geologic change before Darwin. Darwin’s voyage provided insights into evolution. Natural selection leads to adaptations.</p> <p>Examine early ideas about evolution. Identify three geological theories that influenced scientific debate over evolution. Describe how Darwin arrived at his idea</p>	<p><i>Holt McDougal Biology:</i> Chapter 10 sections 1 and 2 Chapter 11 section 6 PowerPoint presentations Review sheets Vocabulary quizzes Content exam</p>	<p>Teacher prepared tests, quizzes, etc.</p> <p>Series available assessments online. (Optional)</p>	7 days

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	<p>isolation, differential reproduction) affecting gene frequency in a population over time and their consequences.</p> <ul style="list-style-type: none"> • describe and differentiate between the roles of natural selection and genetic drift. • Describe changes that illustrate major events in the earth's development based on a time line. • explain why natural selection can act only on inherited traits. • Apply the concept of natural selection to illustrate and account for a species' survival, extinction or change over time. <p>4.7.10.C Identify and explain why adaptations can lead to specialization.</p> <ul style="list-style-type: none"> • Explain factors that could lead to a species' increase or decrease. • Explain how management practices may influence the success of specific species. • Identify and explain criteria used by scientists for categorizing organisms as threatened, endangered or extinct. <p>PA Core Standards: Reading for Science and</p>	<p>about species variation. Recognize how Darwin's discoveries supported Lyell's ancient-Earth theory.</p> <p>Vocabulary: Evolution Species Fossil Catastrophism Gradualism Uniformitarianism Variation Adaptation</p>			
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	<p>Technical Subjects, 6-12 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p>PA Core Standards: Writing for Science and Technical Subjects, 6-12 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
Review and Final Exam					10 days

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PA Core Standards:

Reading for Science and Technical Subjects, 6-12

3.5 Reading Informational Text

Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

Grades 9-10

CC.3.5.9-10.A.

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CC.3.5.9-10.B.

Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

CC.3.5.9-10.C.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CC.3.5.9-10.D.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.9-10.E.

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

CC.3.5.9-10.F.

Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CC.3.5.9-10.G.

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Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CC.3.5.9-10.H.

Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

CC.3.5.9-10.I.

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CC.3.5.9-10.J.

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Grades 11-12

CC.3.5.11-12.A.

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

CC.3.5.11-12.B.

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CC.3.5.11-12.C.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CC.3.5.11-12.D.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

CC.3.5.11-12.E.

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

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CC.3.5.11-12.F.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

CC.3.5.11-12.G.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CC.3.5.11-12.H.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CC.3.5.11-12.I.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CC.3.5.11-12.J.

By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

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PA Core Standards:

Writing for Science and Technical Subjects, 6-12

3.6 Writing

Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.

Grades 9-10

CC.3.6.9-10.A.

Write arguments focused on discipline-specific content.

- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.9-10B. *

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

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- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

CC.3.6.9-10.C.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.9-10.D.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience

CC.3.6.9-10.E.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.3.6.9-10.F.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.9-10.G.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CC.3.6.9-10.H.

Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.9-10.I.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Grades 11-12

CC.3.6.11-12.A.

Write arguments focused on discipline-specific content.

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- Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
- Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

CC.3.6.11-12. B *Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic)

CC.3.6.11-12.C.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.11-12.D.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CC.3.6.11-12.E.

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Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CC.3.6.11-12.F.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.11-12.G.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

CC.3.6.11-12.H.

Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.11-12.I.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.