Biology Academic K

Curriculum Guide

Dunmore School District

Dunmore, PA

Biology Academic K

Prerequisite:

- Successful completion of Science 9 Academic or Science 9 Honors

Students in this course will develop an understanding of the major themes of biology such as the characteristics of life, chemistry of life, cellular biology, genetics, evolution, anatomy and ecology. Course work will include inquiry-based labs and hands-on activities that will reinforce topics taught during the year. At the end of the year, students will be given the Biology Keystone Exam

Dunmore School District
Curriculum Guide

Year-at-a-glance

Subject: Biology Academic K	**Grade Level: 10**	**Date Completed: 2/13/2014**

1st Quarter

Topic	Resources	Anchors
Unifying Characteristics of life	*Biology:* Miller/Levine sections 1.2, 1.3, 7.1, 7.2	BIO.A.1.1, BIO.A.1.2, 3.1.B.A1, 3.1.B.C2 4.1.3.A, 4.1.4.A
Organization of Multicellular Life	*Biology:* Miller/Levine Sections 7.1, 7.2	BIO.A.1.1, BIO.A.1.2, 3.1.B.A1 3.1.B.A5 3.1.B.C2, 4.1.4.A , 3.1.B.A5 3.1.B.A6, 3.1.B.A
Properties of Water	*Biology:* Miller/Levine Sections 2.2	BIO.A.2.1, BIO.A.2.2, BIO.A.2.3, 3.1.B.A8, 3.1.B.A5, 4.2.5.C
Organic Chemistry	*Biology:* Miller/Levine Sections 2.3, 2.4, 12.1, 12.2, 13.1	BIO.A.2.1, BIO.A.2.2, BIO.A.2.3, 3.1.B.A7, 3.2.C.A2, 3.1.B.A7, 3.1.B.A8, 3.1.B.A2, 3.1.C.A2, 3.1.C.A7, 3.1.B.A7, 3.1.B.A2, 3.1.C.A2, 3.1.C.A7

2nd Quarter

Topic	Resources	Anchors
Energy, ATP and Cellular Respiration	*Biology:* Miller/Levine Sections 8.1, 9.1, 9.2, 9.3	BIO.A.3.1, BIO.A.3.2, 3.1.B.A2, 3.1.B.A5, 3.1.C.A1
Photosynthesis	*Biology:* Miller/Levine Sections 8.2, 8.3, 9.2	BIO.A.3.1, BIO.A.3.2, 3.1.B.A2, 3.1.B.A2 3.1.B.A5 3.1.C.A1 4.1.10.C 3.1.B.A2 3.1.C.A1 3.1.C.A2
Homeostasis and Cellular Transport	*Biology:* Miller/Levine Sections 7.2, 7.3, 7.4	BIO.A.4.1, BIO.A.4.2, 3.1.B.A5, 3.1.B.A2, 3.1.B.A4, 3.1.B.A7, 3.2.C.A1, 3.2.P.B6, 3.1.B.A5, 3.1.B.A2, 3.1.B.A7, 3.2.C.A1, 3.2.P.B6, 3.1.B.A8, 3.1.B.A5, 4.5.4.D, 4.2.4.C

3rd Quarter

Topic	Resources	Anchors
Genes and Protein Synthesis	*Biology:* Miller/Levine Sections 12.2, 13.1, 13.2	BIO.B.1.1., BIO.B.1.2, 3.1.B.A4, 3.1.B.A5, 3.1.B.B2, 3.1.B.B3, 3.1.B.B5, 3.1.B.C2, 3.1.C.C2
Cell Cycle and Mitosis	*Biology:* Miller/Levine Sections 10.2	BIO.B.1.1., BIO.B.1.2, 3.1.B.A4, 3.1.B.A5, 3.1.B.B2, 3.1.B.B3, 3.1.B.B5, 3.1.B.C2, 3.1.C.C2
Genes, Alleles and Meiosis	*Biology:* Miller/Levine Sections 11.1, 11.2, 11.4	BIO.B.2.1, BIO.B.2.2, BIO.B.2.3, BIO.B.2.4, 3.1.B.B1, 3.1.B.B3, 3.1.B.B5, 3.1.B.C2, 3.1.C.C2
Inheritance	*Biology:* Miller/Levine Sections 11.2, 11.3	BIO.B.2.1, BIO.B.2.2, BIO.B.2.3, BIO.B.2.4, 3.1.B.B1, 3.1.B.B5, 3.1.B.B2, 3.1.B.B3, 3.1.C.C2
Mutations and Chromosomes	*Biology:* Miller/Levine Sections 13.3	BIO.B.2.1, BIO.B.2.2, BIO.B.2.3, BIO.B.2.4, 3.1.B.B5, 3.1.B.B1, 3.1.B.B2, 3.1.B.B3, 3.1.C.C2
Genetic Engineering	*Biology:* Miller/Levine Sections 15.1, 15.3	BIO.B.2.1, BIO.B.2.2, BIO.B.2.3, BIO.B.2.4, 3.1.B.B4 4.4.7.A 4.4.10.A 4,.4.12.A 4,.4.7.B 4.4.10.B, 4.4.12.B

4th Quarter

Topic	Resources	Anchors
Mechanisms and Evidence for Evolution	*Biology:* Miller/Levine Sections 16.3, 16.4, 17.2, 17.3	BIO.B.3.1, BIO.B.3.2, BIO.B3.3, 3.1.B.C1, 3.1.B.C2, 3.1.B.B1, 3.1.B.C3, 3.1.B.C1, 3.1.B.B3, 3.1.B.A9
Ecosystems and Biomes	*Biology:* Miller/Levine Sections 3.1, 4.4	BIO.B.4.1, BIO.B.4.2, 4.1.4.A, 4.1.7.A, 4.1.10.A, 4.1.7.C, 4.4.6.A4,.5.3.D
Ecosystem Interactions and Cycles of Matter	*Biology:* Miller/Levine Sections 4.2, 3.3, 3.4	BIO.B.4.1, BIO.B.4.2, 4.1.4.C, 4.1.7.C, 4.1.10.C, 4.1.12.C, 4.1.3.C, 4.1.5.C, 4.1.5.A
Ecosystem Response to Change	*Biology:* Miller/Levine Sections 4.3, 5.1, 5.2	BIO.B.4.1, BIO.B.4.2, 4.1.10.A, 4.1.10.B, 4.1.12.A, 4.1.4.A, 4.1.12.C, 4.1.4.E, 4.1.7.E, 4.1.10.E, 4.5.10.D, 4.2.8.A, 4.2.10.A, 4.2.12.A, 4.2.10.B, 4.2.12.B, 4.2.10.C, 4.2.12.C, 4.3.12.A, 4.3.10.B, 4.5.10.B, 4.5.12.B, 4.5.4.C, 4.5.7.C
Review and Final Exam		

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.A.1 Basic Biological Principles	**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. **PA Academic Standards:** **Science** 3.1.B.A1 Describe the common characteristics of life. 3.1.B.C2 Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. 4.1.3.A Differentiate between the living and nonliving components in an environment. 4.1.4.A Explain how living things are dependent upon other living and nonliving things for survival. 3.1.B.A5 Relate the structure of cell organelles to their function 3.1.B.A6 Explain how cells differentiate in multicellular	**Eligible Content:** BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms. BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms). **Essential Knowledge/Skills:** Describe concepts of models as a way to predict and understand science and technology.	**Approved textbook** *Biology,* Miller Levine chapters: 1.1, 1.2, 1.3, 7.1, 7.2, 2.2, 2.3, 2.4, 12.1, 12.2, 13.1	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	organisms. **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. **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.	Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). Differentiate between the living and nonliving components in an environment. Explain how living things are dependent upon other living and nonliving things for survival. Identify similarities and differences between living organisms, ranging from single-celled to multicellular organisms through the use of microscopes, video, and other media. **Vocabulary:** Cells Endoplasmic Eukaryote Extracellular Golgi apparatus Multicellular Organ Organ systems Organelle Prokaryote Reticulum Ribosome Tissues			

		Unicellular Active transport Adhesion Carrier protein Cohesion Concentration Diffusion Endocytosis Exocytosis Facilitated diffusion Gradient Impermeable Osmosis Passive transport Permeable Plasma/Cell membrane Pump			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.A.2 The Chemical Basis for Life	**Anchor Descriptor:** BIO.A.2.1 Describe how the unique properties of water support life on Earth. BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules). BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell. **PA Academic Standards: Science** 3.1.B.A2 Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. 3.1.B.A5 Relate the structure of cell organelles to their function, 3.1.B.A7 Analyze the importance of carbon to the structure of biological macromolecules, 3.1.B.A8 Describe how the unique properties of water	**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.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules. BIO.A.2.2.2 Describe how biological macromolecules form from monomers. BIO.A.2.2.3 Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms. 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.	**Approved textbook** *Biology,* Miller Levine chapters: 2.3, 2.4, 12.1, 12.2, 13.1	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	support life. 3.1.C.A2 Describe how changes in energy affect the rate of chemical reactions. 3.1.C.A7 Illustrate the formation of carbohydrates, lipids, proteins, and nucleic acids, 3.2.C.A2 Compare the electron configurations for the first twenty elements of the periodic table. 4.2.5.C Identify physical, chemical, and biological factors that affect water quality. **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. **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	**Essential Knowledge/Skills** Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. Demonstrate the repeating patterns that occur in biological polymers. Describe how the unique properties of water support life. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane. Identify physical, chemical, and biological factors that affect water quality. Analyze the importance of carbon to the structure of biological macromolecules. Compare and contrast the functions and structures of			

	content.	proteins, lipids, carbohydrates, and nucleic acids. Explain the consequences of extreme changes in pH and temperature on cell proteins. Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. Draw Lewis dot structures for simple molecules and ionic compounds. Explain the important role of ATP in cell metabolism. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Explain why many biological macromolecules such as ATP and lipids contain high energy bonds. Explain the importance of enzymes as catalysts in cell reactions. Identify how factors such as pH and temperature may affect enzyme function. Illustrate the formation of carbohydrates, lipids,			

		proteins, and nucleic acids. Describe how changes in energy affect the rate of chemical reactions. **Vocabulary:** Amino acid Biological macromolecules Carbohydrates Catalyst Dehydration Enzymes Hydrolysis Lipids Monomers Nucleic acids ADP/ATP Glucose Organic molecule			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.A.3 Bioenergetics	**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. **PA Academic Standards: Science** 3.1.B.A2 Explain the important role of ATP in cell metabolism, 3.1.B.A5 Relate the structure of cell organelles to their function, 3.1.C.A1 Explain the chemistry of metabolism., 4.1.10.C Evaluate the efficiency of energy flow within a food web **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	**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. **Essential Knowledge/Skills:** Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. Explain the important role of ATP in cell metabolism. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Explain why many biological macromolecules such as ATP and lipids contain high	**Approved textbook** *Biology,* Miller Levine chapters: 8.1, 9.1, 9.2, 9.3, 8.2, 8.3, 7.2, 7.3, 7.4	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	textual evidence. **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.	energy bonds. Explain the importance of enzymes as catalysts in cell reactions. Identify how factors such as pH and temperature may affect enzyme function. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane. Explain the chemistry of metabolism. Describe how changes in energy affect the rate of chemical reactions Evaluate the efficiency of energy flow within a food web. Describe how energy is converted from one form to another as it moves through a food web (photosynthetic, geothermal).			

		Vocabulary: Aerobic Bioenergetics Cellular respiration Electron Glycolysis Krebs cycle Mitochondria Transport chain Electron transport chain Chloroplast Plastids Cellular respiration Chemosynthesis Community Cycling of matter Energy pyramid Flow of energy Food web Photosynthesis			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.A.4 Homeostasis and Transport	**Anchor Descriptor:** BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell. BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments. **PA Academic Standards: Science** 3.1.B.A5 Describe transport mechanisms across the plasma membrane. 3.1.B.A2 Explain the important role of ATP in cell metabolism. 3.2.C.A1 Explain the chemistry of metabolism. 3.1.B.A8 Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. 4.2.4.C Explain how freshwater organisms are adapted to their environment.	**Eligible Content:** BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell. BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis). BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell. BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation)	**Approved textbook** *Biology,* Miller Levine chapters: 7.2, 7.3, 7.4, 12.2, 13.1, 13.2, 10.2, 11.1, 11.2, 11.4, 13.3, 15.1, 15.3	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	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. **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.	**Essential Knowledge/Skills:** Identify the initial reactants, final products, and general purposes of photosynthesis and cellular respiration. Explain the important role of ATP in cell metabolism. Describe the relationship between photosynthesis and cellular respiration in photosynthetic organisms. Explain why many biological macromolecules such as ATP and lipids contain high energy bonds. Explain the importance of enzymes as catalysts in cell reactions. Identify how factors such as pH and temperature may affect enzyme function Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane			

		Analyze the importance of carbon to the structure of biological macromolecules. CHANGE AND CONSTANCY Recognize that systems within cells and multicellular organisms interact to maintain homeostasis. PATTERNS Demonstrate the repeating patterns that occur in biological polymers. SYSTEMS Describe how the unique properties of water support life. Differentiate between physical properties and chemical properties. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures. Explain the relationship of an element's position on the periodic table to its atomic number, ionization energy, electro-negativity, atomic size, and classification of elements. Use electro-negativity to explain the difference between polar and nonpolar covalent bonds. Explain how freshwater organisms are adapted to			

		their environment Describe a waste stream. • Identify sources of waste derived from the use of natural resources. • Identify those items that can be recycled and those that can not. • Describe how everyday activities may affect the environment. **Vocabulary:** Active transport Adhesion Carrier protein Cohesion Concentration Diffusion Endocytosis Exocytosis Facilitated diffusion Gradient Impermeable Osmosis Passive transport Permeable Plasma/Cell membrane Pumps Homeostasis			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.B.1 Cell Growth and Reproduction	**Anchor Descriptor:** BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis. BIO.B.1.2 Explain how genetic information is inherited. **PA Academic Standards: Science** 3.1.B.A4 Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. 3.1.B.A5 Explain the role of water in cell metabolism. 3.1.B.B2 Compare and contrast the function of mitosis and meiosis. 3.1.B.B3 Describe the basic structure of DNA, including the role of hydrogen bonding. 3.1.B.B5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance. 3.1.B.C2 Analyze how increasingly complex,	**Eligible Content:** BIO.B.1.1.1 Describe the events that occur during the cell cycle: interphase, nuclear division (i.e., mitosis or meiosis), cytokinesis BIO.B.1.1.2 Compare the processes and outcomes of mitotic and meiotic nuclear divisions. BIO.B.1.2.1 Describe how the process of DNA replication results in the transmission and/or conservation of genetic information. BIO.B.1.2.2 Explain the functional relationships between DNA, genes, alleles, and chromosomes and their roles in inheritance. **Essential Knowledge/Skills:** Summarize the stages of the cell cycle. Examine how interactions among the different molecules in the cell cause the distinct stages of the cell cycle which can also be influenced by other signaling molecules. Explain	**Approved textbook** *Biology,* Miller Levine chapters: 5.1, 7.2, 12.2, 13.1, 13.2, 10.2, 11.1	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	multicellular organisms evolved once cells with nuclei developed. 3.1.C.C2 Use molecular models to demonstrate gene mutation and recombination at the molecular level. **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. **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.	the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle. Relate the structure of cell organelles to their function (energy capture and release, transport, waste removal, protein synthesis, movement, etc). Explain the role of water in cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in			

		a great variety of possible gene combinations in offspring. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic code. Describe how transcription and translation result in gene expression. Differentiate among the end products of replication, transcription, and translation. Cite evidence to support that the genetic code is universal. PATTERNS Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance. Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles) CONSTANCY AND CHANGE Explain how the processes of replication, transcription, and			

		translation are similar in all organisms. Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life. Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of singlecelled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population Use molecular models to demonstrate gene mutation and recombination at the molecular level.			

		Vocabulary: Anaphase Cell cycle Cytokinesis Diploid Interphase Metaphase Mitosis Nuclear division Prophase Telophase DNA sequence Gene Genetic Information Inheritance Nucleotide Protein RNA Semiconservative replication Translation Transcription Uracil			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.B.2 Genetics	**Anchor Descriptor:** BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance. BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification). BIO.B.2.3 Explain how genetic information is expressed. BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics. **PA Academic Standards: Science** 3.1.B.B5 Explain how the processes of replication, transcription, and translation are similar in all organisms. 3.1.B.B1 Describe the basic processes of transcription and translation. 3.1.B.B2 Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible gene combinations in offspring.	**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.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.2.2.1 Describe how the processes of transcription and translation are similar in all organisms. BIO.B.2.2.2 Describe the role of ribosomes, endoplasmic reticulum, Golgi apparatus, and the nucleus in the production of specific types of proteins. BIO.B.2.3.1 Describe how genetic mutations alter the DNA sequence and may or may not affect phenotype	**Approved textbook** *Biology,* Miller Levine 2006 Pearson chapters: 12.2, 13.1, 13.2, 10.2, 11.1, 11.2, 11.3, 15	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	3.1.B.B3 Describe the basic structure of DNA, including the role of hydrogen bonding. 3.1.C.C2 Use molecular models to demonstrate gene mutation and recombination at the molecular level. 3.1.C.B3 Describe the structure of the DNA and RNA molecules 3.1.B.C2 Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. 3.1.B.B4 Explain how genetic technologies have impacted the fields of medicine, forensics, and agriculture. 4.4.7.A Describe how agricultural practices, the environment, and the availability of natural resources are related. 4.4.10.A Explain the relationships between and among the components of the food and fiber system. (i.e., production, processing, research and development, marketing, distribution, and regulations.) 4.4.12.A Research and analyze the social, political, economic, and environmental factors that affect agricultural systems.	(e.g., silent, nonsense, frame-shift). **Essential Knowledge/Skills:** Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules. Explain the basic process of DNA replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. Explain how mutations can alter genetic information and the possible consequences on resultant cells. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance of meiosis in sexual reproduction. Compare and contrast the function of mitosis and meiosis. Illustrate that the sorting and recombining of genes in sexual reproduction results in a great variety of possible			

	4.4.7.B Describe the economic importance of agriculture to society. 4.4.10.B Analyze the effects of agriculture on a society's economy, environment, standard of living, and foreign trade 4.4.12.B Research and evaluate laws and policies that affect the food and fiber system. **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. **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.	gene combinations in offspring. Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic code. Describe how transcription and translation result in gene expression. Differentiate among the end products of replication, transcription, and translation. Cite evidence to support that the genetic code is universal. PATTERNS Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance. Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles) CONSTANCY AND CHANGE Explain how the processes of replication, transcription, and translation are similar in all			

		organisms. Explain how gene actions, patterns of heredity, and reproduction of cells and organisms account for the continuity of life. Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of single celled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population. Describe the structure of the DNA and RNA molecules. Use molecular models to demonstrate gene mutation and recombination at the molecular level.			

		Explain the relationships between and among the components of the food and fiber system. (i.e., production, processing, research and development, marketing, distribution, and regulations.) Analyze the effects of agriculture on a society's economy, environment, standard of living, and foreign trade **Vocabulary:** Allele Chromosome DNA Dominant allele Gene Gene expression Genotype Recessive allele Trait Phenotype Crossing-over Deletion Duplication Haploid cells Homologous chromosomes Insertion Inversion Meiosis Nondisjunction Translocation Variation			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.B.3 Theory of Evolution	**Anchor Descriptor:** BIO.B.3.1 Explain the mechanisms of evolution. BIO.B.3.2 Analyze the sources of evidence for biological evolution. BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of the theory of evolution. **PA Academic Standards: Science** 3.1.B.C2 Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed 3.1.B.B1 Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. 3.1.B.C3 Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution 3.1.B.C1 Describe species as reproductively distinct groups of	**Eligible Content:** BIO.B.3.1.1 Explain how natural selection can impact allele frequencies of a population. BIO.B.3.1.2 Describe the factors that can contribute to the development of new species (e.g., isolating mechanisms, genetic drift, founder effect, migration). BIO.B.3.1.3 Explain how genetic mutations may result in genotypic and phenotypic variations within a population BIO.B.3.2.1 Interpret evidence supporting the theory of evolution (i.e., fossil, anatomical, physiological, embryological, biochemical, and universal genetic code). BIO.B.3.3.1 Distinguish between the scientific terms: hypothesis, inference, law, theory, principle, fact, and observation.	**Approved textbook** *Biology,* Miller Levine chapters: 16.3, 16.4, 17.2, 17.3, 16.2, 16.1	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**20 days**

	organisms. 3.1.B.B3 Differentiate among the end products of replication, transcription, and translation. 3.1.B.A9 Describe how the unique properties of water support life. **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. **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.	**Essential Knowledge/Skills:** Explain that the information passed from parents to offspring is transmitted by means of genes which are coded in DNA molecules. Explain the basic process of DNA replication. Describe the basic processes of transcription and translation. Explain how crossing over, jumping genes, and deletion and duplication of genes results in genetic variation. Explain how mutations can alter genetic information and the possible consequences on resultant cells Describe the basic structure of DNA, including the role of hydrogen bonding. Explain how the process of DNA replication results in the transmission and conservation of the genetic code. Describe how transcription and translation result in gene expression. Differentiate among the end products of replication, transcription, and translation. Cite evidence to support that the genetic code is universal.			

		Describe species as reproductively distinct groups of organisms. Analyze the role that geographic isolation can play in speciation. Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population. Describe how the degree of kinship between species can be inferred from the similarity in their DNA sequences. Describe the theory suggesting that life on Earth arose as a single, primitive prokaryote about 4 billion years ago and that for the next 2 billion years, a huge diversity of singlecelled organisms evolved. Analyze how increasingly complex, multicellular organisms evolved once cells with nuclei developed. Describe how mutations in sex cells may be passed on to successive generations and that the resulting phenotype may help, harm, or have little or no effect on the offspring's			

		success in its environment. Describe the relationship between environmental changes and changes in the gene pool of a population. CONSTANCY AND CHANGE Compare and contrast various theories of evolution. Interpret data from fossil records, anatomy and physiology, and DNA studies relevant to the theory of evolution. PATTERNS Discuss the implications of a universal genetic code for evolution. **Vocabulary:** Endemic species Founder effect Genetic drift Migration Mutation Natural/Human disturbances Natural selection Nonnative species Resilient Succession Analogous structures Embryology Homologous structures Molecular level Transitional forms Vestigial			

		Natural selection Allele frequency Adaptation: • Anatomical • Behavioral • Physiological • Biochemical • Embryological • Universal genetic code Coevolution Divergent evolution Gradualism			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
BIO.B.4 Ecology	**Anchor Descriptors:** BIO.B.4.1 Describe ecological levels of organization in the biosphere. BIO.B.4.2 Describe interactions and relationships in an ecosystem. **PA Academic Standards:** **Science** 4.1.4.A Explain how living things are dependent upon other living and nonliving things for survival. 4.1.7.A Describe the relationships between biotic and abiotic components of an ecosystem. 4.1.10.A Explain the concept of carrying capacity in an ecosystem. 4.1.7.C Explain the flow of energy within an ecosystem. 4.4.6.A Explain how different plants and animals in the United States have specific growing requirements related to climate and soil conditions. 4.5.3.D Describe how waste is generated. 4.1.3.A Differentiate between the living and nonliving	**Eligible Content:** BIO.B.4.1.1 Describe the levels of ecological organization (i.e., organism, population, community, ecosystem, biome, and biosphere). BIO.B.4.1.2 Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems. BIO.B.4.2.1 Describe how energy flows through an ecosystem (e.g., food chains, food webs, energy pyramids). BIO.B.4.2.2 Describe biotic interactions in an ecosystem (e.g., competition, predation, symbiosis). BIO.B.4.2.3 Describe how matter recycles through an ecosystem (i.e., water cycle, carbon cycle, oxygen cycle, and nitrogen cycle). BIO.B.4.2.4 Describe how ecosystems change in response to natural and human disturbances (e.g., climate changes, introduction of nonnative species,	**Approved textbook** *Biology,* Miller Levine chapters: 3.1, 3.2, 3.3, 3.4, 4.2, 4.3, 5.1, 5.2	**Teacher prepared tests, quizzes, etc.** **Series available assessments online. (Optional)**	**25 days**

	components in an environment. 4.1.4.B Identify how matter cycles through an ecosystem. 4.2.10.A Examine the interactions between abiotic and biotic factors within a watershed. 4.1.4.C Explain how most life on earth gets its energy from the sun. 4.4.5.C Investigate the factors influencing plant and animal growth. (e.g., soil, water, nutrients, and light) 4.4.3.C Use scientific inquiry to investigate what animals and plants need to grow. 4.1.10.B Explain the consequences of interrupting natural cycles. 4.1.12.A Analyze the significance of biological diversity in an ecosystem. 4.3.10.B Analyze how humans manage and distribute natural resources. 4.5.12.B Evaluate pest management using methods such as cost/benefit analysis, cumulative effects analysis, environmental impact analysis, ethical analysis, and risk analysis. 4.5.7.C Explain how human	pollution, fires). BIO.B.4.2.5 Describe the effects of limiting factors on population dynamics and potential species extinction. **Essential Knowledge/Skills:** Explain how living things are dependent upon other living and nonliving things for survival. Analyze the significance of biological diversity in an ecosystem. Evaluate the efficiency of energy flow within a food web. Describe how energy is converted from one form to another as it moves through a food web (photosynthetic, geothermal). Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem Explain the consequences of interrupting natural cycles. Analyze how humans influence the pattern of natural changes (e.g. primary / secondary succession and desertification) in ecosystems over time			

	actions affect the health of the environment. **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. **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.	Examine the interactions between abiotic and biotic factors within a watershed Evaluate the advantages and disadvantages of using renewable and nonrenewable resources. Analyze how humans manage and distribute natural resources. Use scientific inquiry to investigate what animals and plants need to grow Describe the impact of integrated pest management practices on the environment. Explain how human actions affect the health of the environment. Evaluate various methods of managing waste as related to economic, environmental, and technological factors. **Vocabulary:** Carrying capacity Density dependent Density independent Ecosystem Limiting factors Population Resource availability Biogeochemical cycles			

		Biosynthesis Community Consumer Decomposers Food chain/web Mathematical model Producer Cycling of matter Flow of energy Community Cycling of matter Energy pyramid Carbon cycle Chemical processes Geological processes Geosphere Hydrologic cycle Nitrogen cycle Physical processes Intraspecific competition Interspecific competition Predation Resource partitioning			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
Review and Final Exams					**15 days**

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.
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.

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.

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.

- 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 selfgenerated 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.

- 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.

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.