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

<u>Year-at-a-glance</u>

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

Торіс	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,	BIO.A.2.1, BIO.A.2.2, BIO.A.2.3,
	13.1	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

Торіс	Resources	Anchors
Energy, ATP and Cellular Respiration	Biology: Miller/Levine Sections 8.1, 9.1, 9.2,	BIO.A.3.1, BIO.A.3.2, 3.1.B.A2,
	9.3	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

Торіс	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

Торіс	Resources	Anchors
Mechanisms and Evidence for Evolution	Biology: Miller/Levine Sections 16.3, 16.4,	BIO.B.3.1, BIO.B.3.2, BIO.B3.3,
	17.2, 17.3	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	Anchor Descriptor:	Eligible Content:	Approved textbook	Teacher prepared	20 days
Biological	BIO.A.1.1 Explain the	BIO.A.1.1.1 Describe the	Biology, Miller Levine	tests, quizzes, etc.	
Principles	characteristics	characteristics of life	chapters: 1.1, 1.2,		
	common to all	shared by all prokaryotic and	1.3, 7.1, 7.2, 2.2, 2.3,	Series available	
	organisms.	eukaryotic	2.4, 12.1, 12.2, 13.1	assessments online.	
	BIO.A.1.2 Describe relationships	organisms.		(Optional)	
	between structure and	BIO.A.1.2.1 Compare cellular			
	function at biological	structures and their			
	levels of organization.	functions in prokaryotic and eukaryotic			
	PA Academic Standards:	cells			
	Science	BIO.A.1.2.2 Describe and			
	3.1.B.A1 Describe the common	interpret relationships			
	characteristics of life.	between structure and			
	3.1.B.C2 Analyze how	function at various			
	increasingly complex,	levels of biological			
	multicellular organisms evolved	organization (i.e.,			
	once cells with nuclei	organelles, cells, tissues,			
	developed.	organs, organ			
	4.1.3.A Differentiate between	systems, and multicellular			
	the living and nonliving	organisms).			
	components in an environment.				
	4.1.4.A Explain how living things				
	are dependent upon other living	Essential Knowledge/Skills:			
	and nonliving things for survival.	Describe concepts of models			
	3.1.B.A5 Relate the structure of	as a way to predict and			
	cell organelles to their function	understand science and			
	3.1.B.A6 Explain how cells	technology.			
	differentiate in multicellular				

organisms.	Distinguish between different
	types of models and
PA Core Standards:	modeling techniques and
Reading for Science and	apply their appropriate use in
Technical Subjects, 6-12	specific applications (e.g.,
3.5 Reading Informational Text	kinetic gas theory, DNA).
Students read, understand, and	Differentiate between the
respond to informational text-	living and nonliving
with emphasis on comprehension,	components in an
making connections among ideas	environment.
and between texts with focus on	Explain how living things are
textual evidence.	dependent upon other living
PA Core Standards: Writing for	and nonliving things for
Science and Technical Subjects,	survival.
6-12	Identify similarities and
3.6 Writing	differences between living
Students write for different	organisms, ranging from
purposes and audiences.	single-celled to multicellular
Students write clear and focused	organisms through the use of
text to convey a well-defined	microscopes, video, and other media.
perspective and appropriate	other media.
content.	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	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core Standards	Essential Knowledge, Skills & Vocabulary			Time (In Days)
BIO.A.2 The	Anchor Descriptor:	Eligible Content:	Approved textbook	Teacher prepared	20 days
Chemical Basis for	BIO.A.2.1 Describe how the	BIO.A.2.1.1 Describe the	Biology, Miller Levine	tests, quizzes, etc.	_
Life	unique properties of	unique properties of water	chapters: 2.3, 2.4, 12.1,		
	water support life on	and how these properties	12.2, 13.1	Series available	
	Earth.	support life on		assessments	
	BIO.A.2.2 Describe and interpret	Earth (e.g., freezing point,		online. (Optional)	
	relationships between	high specific			
	structure and	heat, cohesion).			
	function at various	BIO.A.2.2.1 Explain how			
	levels of biochemical	carbon is uniquely suited to			
	organization (i.e.,	form biological			
	atoms, molecules, and	macromolecules.			
	macromolecules).	BIO.A.2.2.2 Describe how			
	BIO.A.2.3 Explain how enzymes	biological macromolecules			
	regulate biochemical reactions	form from monomers.			
	within a cell.	BIO.A.2.2.3 Compare the			
		structure and function			
	PA Academic Standards:	of carbohydrates, lipids,			
	Science	proteins, and			
	3.1.B.A2 Identify the initial	nucleic acids in organisms.			
	reactants, final products, and	BIO.A.2.3.1 Describe the role			
	general purposes of	of an enzyme as			
	photosynthesis and cellular	a catalyst in regulating a			
	respiration.	specific biochemical reaction.			
	3.1.B.A5 Relate the structure of	BIO.A.2.3.2 Explain how			
	cell organelles to their function,	factors such as pH,			
	3.1.B.A7 Analyze the importance	temperature, and			
	of carbon to the structure of	concentration levels can			
	biological macromolecules,	affect enzyme function.			
	3.1.B.A8 Describe how the	-			
	unique properties of water				

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	support life.	Essential Knowledge/Skills		
	3.1.C.A2 Describe how changes	Recognize that systems		
	in energy affect the rate of	within cells and multicellular		
	chemical reactions.	organisms interact to		
	3.1.C.A7 Illustrate the formation	maintain homeostasis.		
	of carbohydrates, lipids,	Demonstrate the repeating		
	proteins, and nucleic acids,	patterns that occur in		
	3.2.C.A2 Compare the electron	biological polymers.		
	configurations for the first	Describe how the unique		
	twenty elements of the periodic	properties of water support		
	table.	life.		
	4.2.5.C Identify physical,	Relate the structure of cell		
	chemical, and biological factors	organelles to their function		
	that affect water quality.	(energy capture and release,		
		transport, waste removal,		
	PA Core Standards:	protein synthesis,		
	Reading for Science and	movement, etc).		
	Technical Subjects, 6-12	Explain the role of water in		
	3.5 Reading Informational Text	cell metabolism.		
	Students read, understand, and	Explain how the cell		
	respond to informational text-	membrane functions as a		
	with emphasis on comprehension,	regulatory structure and		
	making connections among ideas	protective barrier for the cell.		
	and between texts with focus on	Describe transport		
	textual evidence.	mechanisms across the		
		plasma membrane.		
	PA Core Standards: Writing for	Identify physical, chemical,		
	Science and Technical Subjects,	and biological factors that		
	6-12	affect water quality.		
	3.6 Writing	Analyze the importance of		
	Students write for different	carbon to the structure of		
	purposes and audiences. Students write clear and focused	biological macromolecules.		
		Compare and contrast the		
	text to convey a well-defined	functions and structures of		
	perspective and appropriate			

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	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
BIO.A.3	Anchor Descriptor:	Eligible Content:	Approved textbook	Teacher prepared	20 days
Bioenergetics	BIO.A.3.1 Identify and describe	BIO.A.3.1.1 Describe the	Biology, Miller Levine	tests, quizzes, etc.	
	the cell structures	fundamental roles of plastids	chapters: 8.1, 9.1, 9.2,		
	involved in processing	(e.g., chloroplasts) and	9.3, 8.2, 8.3, 7.2, 7.3,	Series available	
	energy.	mitochondria in	7.4	assessments	
	BIO.A.3.2 Identify and describe	energy transformations.		online. (Optional)	
	how organisms obtain	BIO.A.3.2.1 Compare the			
	and transform energy	basic transformation of			
	for their life processes.	energy during photosynthesis			
		and cellular			
	PA Academic Standards:	respiration.			
	Science	BIO.A.3.2.2 Describe the role			
	3.1.B.A2 Explain the important	of ATP in biochemical			
	role of ATP in cell metabolism,	reactions.			
	3.1.B.A5 Relate the structure of				
	cell organelles to their function,				
	3.1.C.A1 Explain the chemistry	Essential Knowledge/Skills:			
	of metabolism.,	Identify the initial reactants,			
	4.1.10.C Evaluate the efficiency	final products, and general			
	of energy flow within a food	purposes of photosynthesis			
	web	and cellular respiration.			
		Explain the important role of			
	PA Core Standards:	ATP in cell metabolism.			
	Reading for Science and	Describe the relationship			
	Technical Subjects, 6-12	between photosynthesis and			
	3.5 Reading Informational Text	cellular respiration in			
	Students read, understand, and	photosynthetic organisms.			
	respond to informational text-	Explain why many biological			
	with emphasis on comprehension,	macromolecules such as ATP			
	making connections among ideas	and lipids contain high			
	and between texts with focus on				

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textual evidence.	energy bonds.		
	Explain the importance of		
PA Core Standards: Writing for	enzymes as catalysts in cell		
Science and Technical Subjects,	reactions.		
6-12	Identify how factors such as		
3.6 Writing	pH and temperature may		
Students write for different	affect enzyme function.		
purposes and audiences.	Relate the structure of cell		
Students write clear and focused	organelles to their function		
text to convey a well-defined	(energy capture and release,		
perspective and appropriate	transport, waste removal,		
content.	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).		
	Scotternal.		

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

PA Core Standards:	Essential Knowledge/Skills:		
Reading for Science and	Identify the initial reactants,		
Technical Subjects, 6-12	final products, and general		
3.5 Reading Informational Text	purposes of photosynthesis		
Students read, understand, and	and cellular respiration.		
respond to informational text-	Explain the important role of		
with emphasis on comprehension,	ATP in cell metabolism.		
making connections among ideas	Describe the relationship		
and between texts with focus on	between photosynthesis and		
textual evidence.	cellular respiration in		
	photosynthetic organisms.		
PA Core Standards: Writing for	Explain why many biological		
Science and Technical Subjects,	macromolecules such as ATP		
6-12 2 CM/ IV	and lipids contain high		
3.6 Writing Students write for different	energy bonds. Explain the		
purposes and audiences.	importance of enzymes as		
Students write clear and focused	catalysts in cell reactions.		
text to convey a well-defined	Identify how factors such as		
perspective and appropriate	pH and temperature may		
content.	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
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
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support life. Differentiate between physical properties and chemical properties. Differentiate between pure
Differentiate between physical properties and chemical properties. Differentiate between pure
physical properties and chemical properties. Differentiate between pure
chemical properties. Differentiate between pure
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	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
BIO.B.1 Cell	Anchor Descriptor:	Eligible Content:	Approved textbook	Teacher prepared	20 days
Growth and	BIO.B.1.1 Describe the three	BIO.B.1.1.1 Describe the		tests, quizzes, etc.	
Reproduction	stages of the cell cycle:	events that occur during the	Biology, Miller Levine		
	interphase, nuclear division,	cell cycle: interphase, nuclear	chapters: 5.1, 7.2, 12.2,	Series available	
	cytokinesis.	division (i.e., mitosis or	13.1, 13.2, 10.2, 11.1	assessments	
	BIO.B.1.2 Explain how genetic	meiosis), cytokinesis		online. (Optional)	
	information is inherited.	BIO.B.1.1.2 Compare the			
		processes and outcomes of			
	PA Academic Standards:	mitotic and meiotic nuclear			
	Science	divisions.			
	3.1.B.A4 Explain the role of	BIO.B.1.2.1 Describe how the			
	mitosis in the formation of new	process of DNA replication			
	cells and its importance in	results in the transmission			
	maintaining chromosome	and/or conservation of			
	number during asexual	genetic information.			
	reproduction.	BIO.B.1.2.2 Explain the			
	3.1.B.A5 Explain the role of	functional relationships			
	water in cell metabolism.	between DNA, genes, alleles,			
	3.1.B.B2 Compare and contrast	and chromosomes and their			
	the function of mitosis and	roles in inheritance.			
	meiosis.				
	3.1.B.B3 Describe the basic				
	structure of DNA, including the	Essential Knowledge/Skills:			
	role of hydrogen bonding.	Summarize the stages of the			
	3.1.B.B5 Describe how	cell cycle. Examine how			
	Mendel's laws of segregation	interactions among the			
	and independent assortment	different molecules in the cell			
	can be observed through	cause the distinct stages of			
	patterns of inheritance.	the cell cycle which can also			
	3.1.B.C2 Analyze how	be influenced by other			
	increasingly complex,	signaling molecules. Explain			

Biology Academic K

once cells with nuclei developed.formation of new cells and its importance in maintaining3.1.C.C2 Use molecular models to demonstrate gene mutation and recombination at the molecular level.formation of new cells and its importance in maintainingPA 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.Relate the structure of cell organelles to their function organelles to their function 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 forestive and anomoniate and analyze the importancePA Core Standards: Students write clear and focused text to convey a well-defined persetive and anomoniateA Core Standards: students write clear and focused text to convey a well-defined persetive and anomoniatePA Core Standards: students write clear and focused text to convey a well-defined persetive and anomoniatePan Con			ſ	,1
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3.1.C.C2 Use molecular models to demonstrate gene mutation and recombination at the molecular level.chromosome number during asexual reproduction. Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.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.Relate the structure of cell organelies 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				
to demonstrate gene mutation and recombination at the molecular level.asexual reproduction.PA Core Standards: Reading for Science and Technical Subjects, G-12 3. 6 Writing Students write for different purposes and audiences.asexual reproduction.PA Core Standards: (cycle.Relate the stages of viral cycles to the cell cycle.cycle.Reading for Science and Technical Subjects, G-12 3. 6 Writing Students write for different purposes and audiences.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 transport mechanisms and andiences. Students write clear and focused text to convey a well-defined perspective and appropriate				
and recombination at the molecular level.Compare and contrast a virus and a cell. Relate the stages of viral cycles to the cell cycle.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.Compare and contrast a virus and a cell. Relate the stages of viral cycles to the 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 meiosi results in the formation of haploid gametes and analyze the importance	3.1.C.C2 Use molecular models	chromosome number during		
molecular level.and a cell. Relate the stages of viral cycles to the cell cycle.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 idea and between texts with focus on textual evidence.and a cell. Relate the stages of viral cycles to the 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	to demonstrate gene mutation	asexual reproduction.		
PA Core Standards:of viral cycles to the cellReading for Science andcycle.Reading for Science andRelate the structure of cellJ.5. Reading Informational Textorganelles to their functionStudents read, understand, andtransport, waste removal,respond to informational text-protein synthesis,with emphasis on comprehension,movement, etc). Explain thenaking connections among ideasand between texts with focus onand between texts with focus onregulatory structure andprotective barrier for the cell.Describe transportScience and Technical Subjects,evidence.6-12students write for differentpurposes and audiences.plasma membrane.Students write for differentpusposes and audiences.Students write for differentpusposes ofmethanisms across theplasma membrane.Describe how the process ofmeiosis results in theformation of haploid gametesand analyze the importance	and recombination at the	Compare and contrast a virus		
PA Core Standards:cycle.Reading for Science and Technical Subjects, 6-12Relate the structure of cell organelles to their function3.5 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.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.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 anopropriatecycle.Relate the structure of cell organelles to their function (energy capture and release, transport, making connections arrong ideas and between texts with focus on textual evidence.Relate the structure of cell metabolism. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance	molecular level.	and a cell. Relate the stages		
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.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 viral cycles to the cell		
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3.5 Reading Informational Text Students read, understand, and respond to informational text- with emphasis on comprehension, making connections among idea and between texts with focus on textual evidence.(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 transportPA 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 persoretive and appropriate(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	Reading for Science and	Relate the structure of cell		
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 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 movement, etc). Explain the role of water in cell metabolism. Explain how the cell metabolism. Explain how the cell metabolism. Explain how the cell metabolism. Explain the role of water in cell movement, etc). Explain the role of water in cell metabolism. Explain how the cell metabolism. Explain how the cell metabolism. Explain how the process of metabolism. Explain how the process of meiosis results in the formation of haploid gametes and analyze the importance 	Students read, understand, and	transport, waste removal,		
making connections among ideas and between texts with focus on textual evidence.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	-	protein synthesis,		
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textual evidence.Interadoustin. Explain how the cell membrane functions as a regulatory structure and protective barrier for the cell. Describe transport mechanisms across the plasma membrane.A Core Standards: Writing for Science and Technical Subjects, 6-12protective barrier for the cell. Describe transport mechanisms across the plasma membrane.3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriateplasma membrane. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance		role of water in cell		
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Science and Technical Subjects, 6-12Describe transport mechanisms across the plasma membrane.3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriateDescribe transport mechanisms across the plasma membrane. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance		regulatory structure and		
6-12mechanisms across the plasma membrane.3.6 Writingplasma membrane.Students write for different purposes and audiences.Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance	-	protective barrier for the cell.		
3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate	-	Describe transport		
Students write for different purposes and audiences. Describe how the process of meiosis results in the formation of haploid gametes and analyze the importance		mechanisms across the		
purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate	5	plasma membrane.		
Students write clear and focused text to convey a well-defined perspective and appropriate		Describe how the process of		
text to convey a well-defined perspective and appropriate and analyze the importance		meiosis results in the		
perspective and appropriate and analyze the importance		formation of haploid gametes		
perspective and appropriate of mejosis in sexual		and analyze the importance		
content.		of meiosis in sexual		
reproduction. Compare and		reproduction. Compare and		
contrast the function of		contrast the function of		
mitosis and meiosis. Illustrate		mitosis and meiosis. Illustrate		
that the sorting and		that the sorting and		
recombining of genes in		–		
sexual reproduction results in		sexual reproduction results in		

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	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		
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	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.		
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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:	Eligible Content:	Approved textbook	Teacher prepared	20 days
	BIO.B.2.1 Compare Mendelian	BIO.B.2.1.1 Describe and/or	Biology, Miller Levine	tests, quizzes, etc.	
	and non-Mendelian patterns of	predict observed patterns of	2006 Pearson		
	inheritance.	inheritance (i.e., dominant,	chapters: 12.2, 13.1,	Series available	
	BIO.B.2.2 Explain the process of	recessive, co-dominance,	13.2, 10.2, 11.1, 11.2,	assessments	
	protein synthesis (i.e.,	incomplete dominance, sex-	11.3, 15	online. (Optional)	
	transcription, translation, and	linked, polygenic, and			
	protein modification).	multiple alleles).			
	BIO.B.2.3 Explain how genetic	BIO.B.2.1.2 Describe			
	information is expressed.	processes that can alter			
	BIO.B.2.4 Apply scientific	composition or number of			
	thinking, processes, tools, and	chromosomes (i.e., crossing-			
	technologies in the study of	over, nondisjunction,			
	genetics.	duplication, translocation,			
		deletion, insertion, and			
	PA Academic Standards:	inversion).			
	Science	BIO.B.2.2.1 Describe how the			
	3.1.B.B5 Explain how the	processes of transcription			
	processes of replication,	and translation are similar in			
	transcription, and translation	all organisms.			
	are similar in all organisms.	BIO.B.2.2.2 Describe the role			
	3.1.B.B1 Describe the basic	of ribosomes, endoplasmic			
	processes of transcription and	reticulum, Golgi apparatus,			
	translation.	and the nucleus in the			
	3.1.B.B2 Illustrate that the	production of specific types			
	sorting and recombining of	of proteins.			
	genes in sexual reproduction	BIO.B.2.3.1 Describe how			
	results in a great variety of	genetic mutations alter the			
	possible gene combinations in	DNA sequence and may or			
	offspring.	may not affect phenotype			

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	3.1.B.B3 Describe the basic	(e.g., silent, nonsense, frame-	I	
	structure of DNA, including the	shift).		
	role of hydrogen bonding.		I	
	3.1.C.C2 Use molecular models			
	to demonstrate gene mutation	Essential Knowledge/Skills:		
	and recombination at the	Explain that the information		
	molecular level.	passed from parents to		
	3.1.C.B3 Describe the structure	offspring is transmitted by		
	of the DNA and RNA molecules	means of genes which are		
	3.1.B.C2 Analyze how	coded in DNA molecules.		
	increasingly complex,	Explain the basic process of		
	multicellular organisms evolved	DNA replication. Describe the		
	once cells with nuclei	basic processes of		
	developed.	transcription and translation.		
	3.1.B.B4 Explain how genetic	Explain how crossing over,		
	technologies have impacted the	jumping genes, and deletion		
	fields of medicine, forensics, and	and duplication of genes		
	agriculture.	results in genetic variation.		
	4.4.7.A Describe how	Explain how mutations can		
	agricultural practices, the	alter genetic information and		
	environment, and the	the possible consequences		
	availability of natural resources	on resultant cells.		
	are related.	Describe how the process of		
	4.4.10.A Explain the	meiosis results in the	1	
	relationships between and			
	among the components of the	formation of haploid gametes		
	food and fiber system. (i.e.,	and analyze the importance		
		of meiosis in sexual		
	production, processing, research	reproduction. Compare and	1	
	and development, marketing,	contrast the function of		
	distribution, and regulations.)	mitosis and meiosis. Illustrate	1	
	4.4.12.A Research and analyze	that the sorting and		
	the social, political, economic,	recombining of genes in		
	and environmental factors that	sexual reproduction results in		
	affect agricultural systems.	a great variety of possible		

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4.4.7.B Describe the economic	gene combinations in		
importance of agriculture to	offspring.		
society.	Describe the basic structure		
4.4.10.B Analyze the effects of	of DNA, including the role of		
agriculture on a society's	hydrogen bonding. Explain		
economy, environment,	how the process of DNA		
standard of living, and foreign	replication results in the		
trade 4.4.12.B Research and	transmission and		
evaluate laws and policies that	conservation of the genetic		
affect the food and fiber system.	code. Describe how		
	transcription and translation		
PA Core Standards:	result in gene expression.		
Reading for Science and	Differentiate among the end		
Technical Subjects, 6-12	products of replication,		
3.5 Reading Informational Text	transcription, and		
Students read, understand, and	translation. Cite evidence to		
respond to informational text-	support that the genetic code		
with emphasis on comprehension,	is universal.		
making connections among ideas	PATTERNS Describe how		
and between texts with focus on	Mendel's laws of segregation		
textual evidence.	and independent assortment		
DA Cana Standarda, Wiriting for	can be observed through		
PA Core Standards: Writing for	patterns of inheritance.		
Science and Technical Subjects,	Distinguish among observed		
6-12 3.6 Writing	inheritance patterns caused		
Students write for different	by several types of genetic		
purposes and audiences.	traits (dominant, recessive,		
Students write clear and focused	codominant, sex-linked,		
text to convey a well-defined	polygenic, incomplete		
perspective and appropriate	dominance, multiple alleles)		
content.	CONSTANCY AND CHANGE		
	Explain how the processes of		
	replication, transcription, and		
	translation are similar in all		

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	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.	
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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
Vanation

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	StandardsAnchor Descriptor:BIO.B.3.1 Explain the mechanisms of evolution.BIO.B.3.2 Analyze the sources of evidence for biological evolution.BIO.B.3.2 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 	Skills & Vocabulary 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)	(In Days) 20 days
	reproductively distinct groups of				

organisms.		Essential Knowledge/Skills:		
	fferentiate among	Explain that the information		
	oducts of replication,	passed from parents to		
	on, and translation.	offspring is transmitted by		
3.1.B.A9 De	escribe how the	means of genes which are		
unique pro	perties of water	coded in DNA molecules.		
support life	2.	Explain the basic process of		
		DNA replication. Describe the		
PA Core Sta	andards:	basic processes of		
Reading for	r Science and	transcription and translation.		
Technical S	Subjects, 6-12	Explain how crossing over,		
3.5 Reading	Informational Text	jumping genes, and deletion		
Students re-	ad, understand, and	and duplication of genes		
-	informational text-	results in genetic variation.		
	asis on comprehension,	Explain how mutations can		
-	nections among ideas	alter genetic information and		
	en texts with focus on	the possible consequences		
textual evid	lence.	on resultant cells		
		Describe the basic structure		
	andards: Writing for	of DNA, including the role of		
	d Technical Subjects,	hydrogen bonding. Explain		
6-12		how the process of DNA		
3.6 Writing		replication results in the		
	rite for different	transmission and		
	nd audiences.	conservation of the genetic		
	rite clear and focused	code. Describe how		
	vey a well-defined	transcription and translation		
content.	and appropriate	result in gene expression.		
content.		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		

			1
	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		
1	Vestigial		
	Natural/Human disturbances Natural selection Nonnative species Resilient Succession Analogous structures Embryology Homologous structures		

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

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

action	s affect the health of the	Examine the interactions		
	nment.	between abiotic and biotic		
		factors within a watershed		
PA Co	re Standards:	Evaluate the advantages and		
	ng for Science and	disadvantages of using		
	ical Subjects, 6-12	renewable and		
	ading Informational Text	nonrenewable resources.		
	nts read, understand, and	Analyze how humans manage		
	nd to informational text-	and distribute natural		
	mphasis on	resources.		
	ehension, making	Use scientific inquiry to		
	ctions among ideas and	investigate what animals and		
	en texts with focus on	plants need to grow		
textua	l evidence.	Describe the impact of		
		integrated pest management		
PA Cor	re Standards: Writing for	practices on the		
Scienc	e and Technical Subjects,	environment.		
6-12		Explain how human actions		
3.6 Wr	riting	affect the health of the		
Studer	nts write for different	environment.		
purpos	ses and audiences.	Evaluate various methods of		
Studer	nts write clear and focused	managing waste as related to		
text to	convey a well-defined	economic, environmental,		
perspe	ective and appropriate	and technological factors.		
conter	nt.			
		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	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Review and Final					15 days
Exams					

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.