Science 9 Academic

Curriculum Guide

Dunmore School District

Dunmore, PA



Science 9 Academic

Prerequisite:

• Successful completion of Science 8.

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

Year-at-a-glance

Subject: Science 9 Academic Grade Level: 9 Date Completed: 3/12/2018

1st Quarter: Introducing Biology

Topic	Resources	Standards
Biology in the 21st Century	Biology textbook	3.1.10.A
The Study of Life	PowerPoint presentations	3.3.10.B
Unifying Themes of Biology	Review Sheets	
Scientific Thinking and Processes	Vocab Quizzes	
Biologists' Tools and Technology	Content Exam	
Biology and Your Future		
Chemistry of Life	Biology textbook	3.3.10.A
Atoms, Ions, and Molecules	PowerPoint presentations	3.3.10.B
Properties of Water	Review Sheets	3.1.10.B
Carbon-Based Molecules	Vocab Quizzes	3.4.10.A
Chemical Reactions	Content Exam	3.4.10.B
Enzymes		
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2nd Quarter: Cells

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

3rd Quarter: Genetics

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

4th Quarter: Evolution

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

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core Standards	Essential Knowledge, Skills & Vocabulary			Time (In Days)
Introduction to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	15 days
Biology:	BIO.A.4.2 Explain mechanisms	BIO.A.4.2.1 Explain how	Biology:	tests, quizzes, etc.	
All organisms are	that permit organisms to	organisms maintain	Chapter 1 sections 1		
made of cells and	maintain biological balance	homeostasis (e.g.,	and 2	Series available	
can be	between their internal and	thermoregulation, water	PowerPoint	assessments online.	
characterized by	external environments.	regulation, oxygen	presentations	(Optional)	
common aspects	BIO.A.4.1 Identify and describe	regulation).	Review sheets		
of their structure	the cell structures involved in	BIO.A.4.1.1 Describe how the	Vocabulary quizzes		
and functioning.	transport of materials into, out	structure of the plasma	Content exam		
	of, and throughout a cell.	membrane allows it to			
		function as a regulatory			
	PA Academic Standards:	structure and/or protective			
	Science	barrier for a cell.			
	3.1.10.A Discriminate among	BIO.A.4.1.2 Compare the			
	the concepts of systems,	mechanisms that transport			
	subsystems, feedback and	materials across the plasma			
	control in solving technological	membrane (i.e., passive			
	problems.	transport—diffusion,			
	Identify the function of	osmosis, facilitated diffusion;			
	subsystems within a larger	and active transport—			
	system (e.g., role of thermostat	pumps, endocytosis,			
	in an engine, pressure switch).	exocytosis).			
	Describe the interrelationships				
	among inputs, processes,				
	outputs, feedback and control in	Essential Knowledge/Skills:			
	specific systems.	Biologists study life in all			
	• Explain the concept of system	forms. Unifying themes			
	redesign and apply it to improve	connect concepts from many			
	technological systems.	fields of biology.			
	Apply the universal systems				

	Curriculum Guide	_
model to illustrate specific	Define and give examples of	
solutions and troubleshoot	Earth's biodiversity.	
specific problems.	Summarize the	
Analyze and describe the	characteristics that all living	
effectiveness of systems to s	olve things share. Summarize four	
specific problems.	major unifying themes of	
3.3.10.B Describe and explai	n biology. Give an example of	
the chemical and structural	each of the themes of	
basis of living organisms.	biology.	
Describe the relationship		
between the structure of	Vocabulary:	
organic molecules and the	Biosphere	
function they serve in living	Biodiversity	
organisms.	Species	
Identify the specialized	Biology	
structures and regions of the	Organism	
cell and the functions of eac	n. Cell	
Explain how cells store and	Metabolism	
use information to guide the	ir DNA	
functions.	System	
Explain cell functions and	Ecosystem	
processes in terms of chemic	cal Homeostasis	
reactions and energy change	s. Evolution	
	Adaptation	
PA Core Standards:		
Reading for Science and		
Technical Subjects, 6-12		
3.5 Reading Informational Te	ext	
Students read, understand, a	and	
respond to informational te	t-	
with emphasis on		
comprehension, making		
connections among ideas an	d	
between texts with focus on		
textual evidence.		

	dards: Writing for Fechnical Subjects,		
6-12	,		
3.6 Writing			
Students writ	e for different		
purposes and	audiences.		
Students writ	e clear and focused		
text to conve	y a well-defined		
perspective a	nd appropriate		
content.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core Standards	Essential Knowledge, Skills & Vocabulary			Time (In Days)
Chemistry of Life:	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	15 days
All organisms are	BIO.A.3.1 Identify and describe	BIO.A.3.1.1 Describe the	Biology:	tests, quizzes, etc.	
made of cells and	the cell structures involved in	fundamental roles of plastids	Chapter 2 section 3		
can be	processing energy.	(e.g., chloroplasts) and	PowerPoint	Series available	
characterized by	BIO.A.3.2 Identify and describe	mitochondria in energy	presentations	assessments	
common aspects	how organisms obtain and	transformations.	Review sheets	online. (Optional)	
of their structure	transform energy for their life	BIO.A.3.2.1 Compare the	Vocabulary quizzes		
and functioning.	processes.	basic transformation of	Content exam		
		energy during photosynthesis			
	PA Academic Standards:	and cellular respiration.			
	Science	BIO.A.3.2.2 Describe the role			
	3.3.10.A Explain the structural	of ATP in biochemical			
	and functional similarities and	reactions.			
	differences found among living				
	things.				
	Identify and characterize	Essential Knowledge/Skills:			
	major life forms according to	Carbon-based molecules are			
	their placement in existing	the foundation of life.			
	classification groups.	Sugar molecules are			
	Explain the relationship	carbohydrates with			
	between structure and function	hydrocarbon backbones.			
	at the molecular and cellular	These serve as the basis for			
	levels.	amino acids and other larger			
	Describe organizing schemes	organic molecules needed by			
	of classification keys.	the cell.			
	Identify and characterize				
	major life forms by kingdom,	Describe the bonding			
	phyla, class and order.	properties of carbon atoms.			
	3.3.10.B Describe and explain	Compare carbohydrates,			
	the chemical and structural	lipids, proteins, and nucleic			

	Curriculum Guide		
basis of living organisms.	acids.		
 Describe the relationship 			
between the structure of	Vocabulary:		
organic molecules and the	Monomer		
function they serve in living	Polymer		
organisms.	Carbohydrate		
 Identify the specialized 	Lipid		
structures and regions of the	Fatty Acid		
cell and the functions of each.	Protein		
 Explain how cells store and 	Amino Acid		
use information to guide their	Nucleic Acid		
functions.			
Explain cell functions and			
processes in terms of chemical			
reactions and energy changes.			
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			

		Curriculum Guide		
text to co	onvey a well-defined			
perspect	ive and appropriate			
content.				

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core Standards	Essential Knowledge, Skills & Vocabulary			Time (In Days)
Chemistry of Life:	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	15 days
All organisms are	BIO.A.2.2 Describe and interpret	BIO.A.2.2.1 Explain how	Biology:	tests, quizzes, etc.	
made of cells and	relationships between structure	carbon is uniquely suited to	Chapter 2 sections 4		
can be	and function at various levels of	form biological	and 5	Series available	
characterized by	biochemical organization (i.e.,	macromolecules.	PowerPoint	assessments	
common aspects	atoms, molecules, and	BIO.A.2.2.2 Describe how	presentations	online. (Optional)	
of their structure	macromolecules).	biological macromolecules	Review sheets		
and functioning.	BIO.A.2.3 Explain how enzymes	form from monomers.	Vocabulary quizzes		
	regulate biochemical reactions	Describe how biological	Content exam		
	within a cell.	macromolecules form from			
		monomers.			
	PA Academic Standards:	BIO.A.2.2.3 Compare the			
	Science	structure and function of			
	3.1.10.B Describe concepts of	carbohydrates, lipids,			
	models as a way to predict and	proteins, and nucleic acids in			
	understand science and	organisms.			
	technology.	BIO.A.2.3.2 Explain how			
	 Distinguish between different 	factors such as pH,			
	types of models and modeling	temperature, and			
	techniques and apply their	concentration levels can			
	appropriate use in specific	affect enzyme function.			
	applications (e.g., kinetic gas	BIO.A.2.3.1 Describe the role			
	theory, DNA).	of an enzyme as a catalyst in			
	Examine the advantages of	regulating a specific			
	using models to demonstrate	biochemical reaction.			
	processes and outcomes (e.g.,	BIO.A.2.3.2 Explain how			
	blue print analysis, structural	factors such as pH,			
	stability). Apply mathematical	temperature, and			
	models to science and	concentration levels can			
	technology.	affect enzyme function.			

	Curriculum Guide		
3.3.10.B Describe and explain	Essential Knowledge/Skills:		
the chemical and structural	Life depends on chemical		
basis of living organisms.	reactions. Chemical		
 Describe the relationship 	reactions are driven by		
between the structure of	matter and energy flowing		
organic molecules and the	through different		
function they serve in living	organizational levels of		
organisms.	biological systems which		
 Identify the specialized 	form different products.		
structures and regions of the	Enzymes are catalysts for		
cell and the functions of each.	chemical reactions in living		
 Explain how cells store and 	things.		
use information to guide their			
functions.	Describe how bonds break		
Explain cell functions and	and reform during chemical		
processes in terms of chemical	reactions. Explain why		
reactions and energy changes.	chemical reactions release or		
	absorb energy. Explain the		
3.4.10.A Explain concepts about	effect of a catalyst on		
the structure and properties of	activation energy. Describe		
matter.	how enzymes regulate		
Know that atoms are	chemical reactions.		
composed of even smaller sub-			
atomic structures whose	Vocabulary:		
properties are measurable.	Chemical reactant		
Explain the repeating pattern	Reactant		
of chemical properties by using	Product		
the repeating patterns of atomic	Bond Energy		
structure within the periodic	Equilibrium		
table.	Activation energy		
Predict the behavior of gases	Exothermic		
through the use of Boyle's,	Endothermic		
Charles' or the ideal gas law, in	Catalyst		
everyday situations.	Enzyme		
Describe phases of matter	Substrate		

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	according to the Kinetic			
	Molecular Theory.			
	 Explain the formation of 			
	compounds and their resulting			
	properties using bonding			
	theories (ionic and covalent).			
	 Recognize formulas for simple 			
i	norganic compounds.			
	 Describe various types of 			
	chemical reactions by applying			
	the laws of conservation of mass			
	and energy.			
	 Apply knowledge of mixtures 			
	to appropriate separation			
	techniques.			
	 Understand that carbon can 			
1	form several types of			
	compounds.			
	3.4.10.B Analyze energy sources			
	and transfers of heat.			
	Determine the efficiency of			
	chemical systems by applying			
	mathematical formulas.			
	 Use knowledge of chemical 			
	reactions to generate an			
	electrical current.			
	• Evaluate energy changes in			
	chemical reactions.			
	• Use knowledge of			
	conservation of energy and			
	momentum to explain common			
	ohenomena (e.g., refrigeration			
	system, rocket propulsion).			
	 Explain resistance, current and 			

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electro-motive force (Ohm's			
Law).			
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.			

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
Cell Theory: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.	Anchor Descriptor: BIO.A.1.1 Explain the characteristics common to all organisms. PA Academic Standards: Science 3.3.10.B Describe and explain the chemical and structural basis of living organisms. • Describe the relationship between the structure of organic molecules and the function they serve in living organisms. • Identify the specialized structures and regions of the cell and the functions of each. • Explain how cells store and use information to guide their functions. • Explain cell functions and processes in terms of chemical reactions and energy changes. PA Core Standards: Reading for Science and Technical Subjects, 6-12	Eligible Content: BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms. Essential Knowledge/Skills: Cells are the basic unit of life. Compare cellular structure and their functions in prokaryote and eukaryote cells. Describe developments that lead to the cell theory. Differentiate between eukaryotic and prokaryotic cells. Vocabulary: Cell theory Cytoplasm Organelle Prokaryotic cell Eukaryotic cell	Holt McDougal Biology: Chapter 3 section 1 PowerPoint presentations Review sheets Vocabulary quizzes Content exam	Teacher prepared tests, quizzes, etc. Series available assessments online. (Optional)	5 days
	3.5 Reading Informational Text Students read, understand, and				

respond to informational textwith emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.			
PA Core Standards: Writing for Science and Technical Subject 6-12 3.6 Writing			
Students write for different purposes and audiences. Students write clear and focus	ed		
text to convey a well-defined perspective and appropriate content.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Cell Organelles:	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
All organisms are	BIO.A.1.1 Explain the	BIO.A.1.1.1 Describe the	Biology:	tests, quizzes, etc.	
made of cells and	characteristics common to all	characteristics of life shared	Chapter 3 section 2		
can be	organisms.	by all prokaryotic and	PowerPoint	Series available	
characterized by	BIO.A.1.2 Describe relationships	eukaryotic organisms.	presentations	assessments	
common aspects	between structure and function	BIO.A.1.2.2 Describe and	Review sheets	online. (Optional)	
of their structure	at biological levels of	interpret relationships	Vocabulary quizzes		
and functioning.	organization.	between structure and	Content exam		
		function at various levels of			
	PA Academic Standards:	biological organization (i.e.,			
	Science	organelles, cells, tissues,			
	3.3.10.A Explain the structural	organs, organ systems, and			
	and functional similarities and	multicellular organisms).			
	differences found among living				
	things.				
	 Identify and characterize 	Essential Knowledge/Skills:			
	major life forms according to	Eukaryotic cells share many			
	their placement in existing	similarities. Multicellular			
	classification groups.	organisms have a			
	 Explain the relationship 	hierarchical structural			
	between structure and function	organization, in which any			
	at the molecular and cellular	one system is made up of			
	levels.	numerous parts and is itself			
	 Describe organizing schemes 	a component of the next			
	of classification keys.	level.			
	Identify and characterize				
	major life forms by kingdom,	Describe the internal			
	phyla, class and order.	structure of eukaryotic cells.			
		Summarize the functions of			
	PA Core Standards:	organelles in plant and			
	Reading for Science and	animal cells.			
	Technical Subjects, 6-12				

3.5 Reading Informational Text	Vocabulary:
Students read, understand, and	Cytoskeleton
respond to informational text-	Nucleus
with emphasis on	Endoplasmic reticulum
comprehension, making	Ribosomes
connections among ideas and	Golgi apparatus
between texts with focus on	Vesicle
textual evidence.	Mitochondrion
	Vacuole
PA Core Standards: Writing for	Lysosome
Science and Technical Subjects,	Centriole
6-12	Cell wall
3.6 Writing	Chloroplast
Students write for different	
purposes and audiences.	
Students write clear and focused	
text to convey a well-defined	
perspective and appropriate	
content.	

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Cell Membrane	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	10 days
and Cell	BIO.A.2.1 Describe how the	BIO.A.2.1.1 Describe the	Biology:	tests, quizzes, etc.	
Transport:	unique properties of water	unique properties of water	Chapter 3 sections 3, 4,		
All organisms are	support life on Earth.	and how these properties	and 5	Series available	
made of cells and	BIO.A.4.1 Identify and describe	support life on Earth (e.g.,	PowerPoint	assessments	
can be	the cell structures involved in	freezing point, high specific	presentations	online. (Optional)	
characterized by	transport of materials into, out	heat, cohesion).	Review sheets		
common aspects	of, and throughout a cell.	BIO.A.4.1.1 Describe how the	Vocabulary quizzes		
of their structure		structure of the plasma	Content exam		
and functioning.	PA Academic Standards:	membrane allows it to			
	Science	function as a regulatory			
	3.3.10.B Describe and explain	structure and/or protective			
	the chemical and structural	barrier for a cell.			
	basis of living organisms.	BIO.A.4.1.2 Compare the			
	Describe the relationship	mechanisms that transport			
	between the structure of	materials across the plasma			
	organic molecules and the	membrane (i.e., passive			
	function they serve in living	transport—diffusion,			
	organisms.	osmosis, facilitated diffusion;			
	Identify the specialized	and active transport—			
	structures and regions of the	pumps, endocytosis,			
	cell and the functions of each.	exocytosis).			
	Explain how cells store and	BIO.A.4.1.3 Describe how			
	use information to guide their	membrane-bound cellular			
	functions.	organelles (e.g., endoplasmic			
	Explain cell functions and	reticulum, Golgi apparatus)			
	processes in terms of chemical	facilitate the transport of			
	reactions and energy changes.	materials within a cell.			
	PA Core Standards:				
	Reading for Science and	Essential Knowledge/Skills:			
	Technical Subjects, 6-12	Within cells, special			

3.5 Reading Informational Text Students read, understand, and respond to informational textwith 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.

structures are responsible for particular functions. The cell membrane is a barrier that separates a cell from the external environment. Materials move across membranes because of concentration differences. Cells use energy to transport materials that cannot diffuse across a membrane.

Describe the structure of the cell membrane. Summarize how chemical signals are transmitted across the cell membrane. Describe passive transport. Distinguish between osmosis, diffusion, and facilitated transport. Describe active transport. Distinguish among endocytosis, phagocytosis, and exocytosis.

Vocabulary:

Cell membrane
Phospholipid
Fluid mosaic model
Selective permeability
Receptor
Passive transport
Diffusion
Concentration gradient
Osmosis

	Isotonic		
	Hypertonic		
	Hypotonic		
	Facilitated diffusion		
	Active transport		
	Endocytosis		
	Exocytosis		
	Phagocytosis		

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Photosynthesis:	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
All organisms are	BIO.A.3.1 Identify and describe	BIO.A.3.1.1 Describe the	Biology:	tests, quizzes, etc.	
made of cells and	the cell structures involved in	fundamental roles of plastids	Chapter 4 sections 2		
can be	processing energy.	(e.g., chloroplasts) and	and 3	Series available	
characterized by	BIO.A.3.2 Identify and describe	mitochondria in energy	PowerPoint	assessments	
common aspects	how organisms obtain and	transformations.	presentations	online. (Optional)	
of their structure	transform energy for their life	BIO.A.3.2.1 Compare the	Review sheets		
and functioning.	processes.	basic transformation of	Vocabulary quizzes		
		energy during photosynthesis	Content exam		
	PA Academic Standards:	and cellular respiration.			
	Science	BIO.A.3.2.2 Describe the role			
	3.3.10.A Explain the structural	of ATP in biochemical			
	and functional similarities and	reactions.			
	differences found among living				
	things.				
	Identify and characterize	Essential Knowledge/Skills:			
	major life forms according to	Photosynthesis is the			
	their placement in existing	process in which light energy			
	classification groups.	is transformed into chemical			
	Explain the relationship	energy; carbon dioxide and			
	between structure and function	water react to form sugar			
	at the molecular and cellular	and oxygen. The overall			
	levels.	process of photosynthesis			
	Describe organizing schemes	produces sugars that store			
	of classification keys.	chemical energy.			
	Identify and characterize	Photosynthesis requires a			
	major life forms by kingdom,	series of chemical reactions.			
	phyla, class and order.				
	3.3.10.B Describe and explain	Relate producers to			
	the chemical and structural	photosynthesis. Describe the			
	basis of living organisms. •	process of photosynthesis.			
	Describe the relationship	Describe the light-dependent			

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between the structure of	reactions in which energy is		
organic molecules and the	captured. Describe the light-		
function they serve in living	independent reactions in		
organisms.	which sugar is produced.		
 Identify the specialized 			
structures and regions of the	Vocabulary:		
cell and the functions of each.	Photosynthesis		
 Explain how cells store and 	Chlorophyll		
use information to guide their	Thylakoid		
functions.	Light-dependent reactions		
 Explain cell functions and 	Light-independent reactions		
processes in terms of chemical	Photosystem		
reactions and energy changes.	Electron transport chain		
3.4.10.A Explain concepts about	ATP synthase		
the structure and properties of	Calvin cycle		
matter. • Know that atoms are			
composed of even smaller sub-			
atomic structures whose			
properties are measurable. •			
Explain the repeating pattern of			
chemical properties by using the			
repeating patterns of atomic			
structure within the periodic			
table.			
 Predict the behavior of gases 			
through the use of Boyle's,			
Charles' or the ideal gas law, in			
everyday situations.			
 Describe phases of matter 			
according to the Kinetic			
Molecular Theory.			
 Explain the formation of 			
compounds and their resulting			
properties using bonding		,	
theories (ionic and covalent).		1	

	Curriculum Guide		
Recognize formulas for simple			
inorganic compounds.			
Describe various types of			
chemical reactions by applying			
the laws of conservation of mass			
and energy.			
Apply knowledge of mixtures			
to appropriate separation			
techniques.			
Understand that carbon can			
form several types of			
compounds.			
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.			
DA Core Standards Writing for			
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
All organisms are	Anchor Descriptors:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
made of cells and	BIO.A.2.3 Explain how enzymes	BIO.A.2.3.1 Describe the role	Biology:	tests, quizzes, etc.	
can be	regulate biochemical reactions	of an enzyme as a catalyst in	Chapter 4 section 4		
characterized by	within a cell.	regulating a specific	PowerPoint	Series available	
common aspects	BIO.A.3.1 Identify and describe	biochemical reaction.	presentations	assessments	
of their structure	the cell structures involved in	BIO.A.2.3.2 Explain how	Review sheets	online. (Optional)	
and functioning.	processing energy.	factors such as pH,	Vocabulary quizzes		
	BIO.A.3.2 Identify and describe	temperature, and	Content exam		
	how organisms obtain and	concentration levels can			
	transform energy for their life	affect enzyme function.			
	processes.	BIO.A.3.1.1 Describe the			
		fundamental roles of plastids			
	PA Academic Standards:	(e.g., chloroplasts) and			
	Science	mitochondria in energy			
	3.1.12.E Evaluate change in	transformations.			
	nature, physical systems and	BIO.A.3.2.1 Compare the			
	man made systems.	basic transformation of			
	Evaluate fundamental science	energy during photosynthesis			
	and technology concepts and	and cellular respiration.			
	their development over time	BIO.A.3.2.2 Describe the role			
	(e.g., DNA, cellular respiration,	of ATP in biochemical			
	unified field theory, energy	reactions.			
	measurement, automation,				
	miniaturization, Copernican and				
	Ptolemaic universe theories).	Essential Knowledge/Skills:			
	Analyze how models, systems	Energy flows through			
	and technologies have changed	systems by means of			
	over time (e.g., germ theory,	chemical reactions. Aerobic			
	theory of evolution, solar	cellular respiration involves			
	system, cause of fire). • Explain	a series of chemical			

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how correlation of variables	reactions in which energy in			
does not necessarily imply	food molecules can be			
causation.	converted into a form that			
 Evaluate the patterns of 	the cell can readily use for			
change within a technology	life functions. The overall			
(e.g., changes in engineering in	process of cellular			
the automotive industry).	respiration converts sugar			
	into ATP using oxygen.			
3.4.10.B Analyze energy sources				
and transfers of heat.	Describe the process of			
Determine the efficiency of	cellular respiration. Compare			
chemical systems by applying	cellular respiration to			
mathematical formulas.	phoosynthesis.			
Use knowledge of chemical				
reactions to generate an	Vocabulary:			
electrical current.	Cellular respiration			
Evaluate energy changes in	Aerobic			
chemical reactions.	Glycolysis			
Use knowledge of	Anaerobic			
conservation of energy and	Krebs cycle			
momentum to explain common				
phenomena (e.g., refrigeration				
system, rocket propulsion).				
Explain resistance, current and				
electro-motive force (Ohm's				
Law).				
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		1		

connections among ideas and		
between texts with focus on		
textual evidence.		
PA Core Standards: Writing for		
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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.		

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
All organisms are	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
made of cells and	BIO.A.2.3 Explain how enzymes	BIO.A.2.3.1 Describe the role	Biology:	tests, quizzes, etc.	
can be	regulate biochemical reactions	of an enzyme as a catalyst in	Chapter 4 section 5		
characterized by	within a cell.	regulating a specific	PowerPoint	Series available	
common aspects	BIO.A.3.1 Identify and describe	biochemical reaction.	presentations	assessments	
of their structure	the cell structures involved in	BIO.A.2.3.2 Explain how	Review sheets	online. (Optional)	
and functioning.	processing energy.	factors such as pH,	Vocabulary quizzes		
	BIO.A.3.2 Identify and describe	temperature, and	Content exam		
	how organisms obtain and	concentration levels can			
	transform energy for their life	affect enzyme function.			
	processes.	BIO.A.3.1.1 Describe the			
		fundamental roles of plastids			
	PA Academic Standards:	(e.g., chloroplasts) and			
	Science	mitochondria in energy			
	3.1.12.E Evaluate change in	transformations.			
	nature, physical systems and	BIO.A.3.2.1 Compare the			
	man-made systems.	basic transformation of			
	Evaluate fundamental science	energy during photosynthesis			
	and technology concepts and	and cellular respiration.			
	their development over time				
	(e.g., DNA, cellular respiration,				
	unified field theory, energy	Essential Knowledge/Skills:			
	measurement, automation,	Energy is transferred from			
	miniaturization, Copernican and	one system to another as a			
	Ptolemaic universe theories).	result of chemical reactions.			
	Analyze how models, systems	Cellular respiration is an			
	and technologies have changed	aerobic process with two			
	over time (e.g., germ theory,	main stages.			
	theory of evolution, solar				
	system, cause of fire).	Describe the process of			
	Explain how correlation of	glycolysis. Describe the			
	variables does not necessarily	details of the Krebs cycle and			

	Curriculum Guide		
imply causation.	the electron transport chain.		
 Evaluate the patterns of 			
change within a technology	Vocabulary:		
(e.g., changes in engineering in	Electron transport chain		
the automotive industry).	Chloroplast		
	Krebs cycle		
PA Core Standards:	Plastids		
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
All organisms are	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
made of cells and	BIO.A.3.2 Identify and describe	BIO.A.3.2.1 Compare the	Biology:	tests, quizzes, etc.	
can be	how organisms obtain and	basic transformation of	Chapter 4 section 6		
characterized by	transform energy for their life	energy during photosynthesis	PowerPoint	Series available	
common aspects	processes.	and cellular respiration.	presentations	assessments	
of their structure		BIO.A.3.2.2 Describe the role	Review sheets	online. (Optional)	
and functioning.	PA Academic Standards:	of ATP in biochemical	Vocabulary quizzes		
	Science	reactions.	Content exam		
	3.3.10.B Describe and explain				
	the chemical and structural				
	basis of living organisms.	Essential Knowledge/Skills:			
	Describe the relationship	Anaerobic (without oxygen)			
	between the structure of	cellular respiration follows a			
	organic molecules and the	different and less efficient			
	function they serve in living	chemical pathway to provide			
	organisms.	energy in cells. Matter and			
	Identify the specialized	energy are conserved in each			
	structures and regions of the	change. Fermentation allows			
	cell and the functions of each.	the production of a small			
	Explain how cells store and	amount of ATP without			
	use information to guide their	oxygen.			
	functions.				
	Explain cell functions and	Describe the process of			
	processes in terms of chemical	fermentation. Summarize the			
	reactions and energy changes.	importance of fermentation.			
	PA Core Standards:	Vocabulary:			
	Reading for Science and	Anaerobic			
	Technical Subjects, 6-12	Fermentation			
	3.5 Reading Informational Text	Lactic acid			
	Students read, understand, and				
	respond to informational text-				

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with emphasis on comprehension, making connections among idea between texts with focutextual evidence.	s and		
PA Core Standards: Wri Science and Technical S 6-12 3.6 Writing Students write for differ purposes and audiences Students write clear and text to convey a well-de perspective and approp content.	ent . focused fined		

General Topic	Anchor Descriptor PA Academic and Core	Eligible Content, Essential Knowledge,	Resources & Activities	Assessments	Suggested Time
	Standards	Skills & Vocabulary			(In Days)
Chemical Energy	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
and ATP:	BIO.B.4.2 Describe interactions	BIO.B.4.2.1 Describe how	Biology:	tests, quizzes, etc.	
Organisms grow,	and relationships in an	energy flows through an	Chapter 4 section 1		
reproduce, and	ecosystem.	ecosystem (e.g., food chains,	PowerPoint	Series available	
perpetuate their		food webs, energy	presentations	assessments	
species by	PA Academic Standards: Science	pyramids).	Review sheets	online. (Optional)	
obtaining	4.6.10.A Explain the biotic and		Vocabulary quizzes		
necessary	abiotic components of an		Content exam		
resources through	ecosystem and their interaction.	Essential Knowledge/Skills:			
interdependent	 Identify the major biomes and 	All cells need chemical			
relationships with	explain their similarities and	energy. Photosynthesis and			
other organisms	differences.	cellular respiration			
and the physical	Compare and contrast the	(including anaerobic			
environment.	interactions of biotic and abiotic	processes) provide most of			
	components in an ecosystem.	the energy for life processes.			
	Analyze the effects of abiotic				
	factors on specific ecosystems.	Recognize the importance of			
	Describe how the availability	ATP as an energy-carrying			
	of resources affects organisms in	molecule. Identify energy			
	an ecosystem.	sources used by organisms.			
	Explain energy flow in a food	, 0			
	chain through an energy	Vocabulary:			
	pyramid.	ATP			
	Evaluate the efficiency of	ADP			
	energy flow in a food chain.	Photosynthesis			
	Explain the concept of carrying	Chemosynthesis			
	capacity in an ecosystem.	Cellular respiration			
	Explain trophic levels.	Fermentation			
	Identify a specific				
	environmental impact and				
	predict what change may take				
	place to affect homeostasis.				

	Curriculain Guide		
Examine and explain how			
organisms modify their			
environments to sustain their			
needs.			
Assess the effects of latitude			
and altitude on biomes.			
 Interpret possible causes of 			
population fluctuations.			
Explain how erosion and			
sedimentation have changed the			
quality of soil related habitats.			
4.6.10.B Explain how cycles			
affect the balance in an			
ecosystem.			
Describe an element cycle and			
its role in an ecosystem.			
Explain the consequences of			
interrupting natural cycles.			
4.6.10.C Analyze how			
ecosystems change over time.			
Identify and explain the			
succession stages in an			
ecosystem.			
• Identify causes of succession.			
Analyze consequences of			
interrupting natural cycles.			
Analyze how ecosystems change			
over time			
Identify and explain the			
succession stages in an			
ecosystem.			
• Identify causes of succession.			
Analyze consequences of			

		Curriculum Guide		
interrupt	ing natural cycles.			
Analyze h	now ecosystems change			
over time	2.			
• Identify	and explain the			
successio	n stages in an			
ecosyster	n.			
• Identify	causes of succession.			
• Analyze	consequences of			
interrupt	ing natural cycles.			
Analyze h	now ecosystems change			
over time	2.			
• Identify	and explain the			
successio	n stages in an			
ecosyster	n.			
• Identify	causes of succession.			
• Analyze	e consequences of			
interrupt	ing natural cycles.			
Analyze h	now ecosystems change			
over time	2.			
• Identify	and explain the			
successio	n stages in an			
ecosyster	n.			
• Identify	causes of succession. •			
Analyze o	consequences of			
interrupt	ing natural cycles.			
PA Core S	Standards:			
Reading	for Science and			
Technica	l Subjects, 6-12			
3.5 Readi	ng Informational Text			
Students	read, understand, and			
respond t	to informational text-			
with emp	hasis on			
compreh	ension, making			
connection	ons among ideas and			

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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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
All organisms are	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
made of cells and	BIO.B.1.2 Explain how genetic	BIO.B.1.2.1 Describe how the	Biology:	tests, quizzes, etc.	
can be	information is inherited.	process of DNA replication	Chapter 8 sections 1, 2,		
characterized by	BIO.B.2.2 Explain the process of	results in the transmission	3, 4, and 5	Series available	
common aspects	protein synthesis (i.e.,	and/or conservation of	PowerPoint	assessments	
of their structure	transcription, translation, and	genetic information.	presentations	online. (Optional)	
and functioning.	protein modification).	BIO.B.1.2.2 Explain the	Review sheets		
	BIO.B.4.1 Describe ecological	functional relationships	Vocabulary quizzes		
	levels of organization in the	between DNA, genes, alleles,	Content exam		
	biosphere.	and chromosomes and their			
		roles in inheritance.			
	PA Academic Standards:	BIO.B.2.2.1 Describe how the			
	Science	processes of transcription			
	3.3.10.A Explain the structural	and translation are similar in			
	and functional similarities and	all organisms.			
	differences found among living	BIO.B.2.2.2 Describe the role			
	things.	of ribosomes, endoplasmic			
	 Identify and characterize 	reticulum, Golgi apparatus,			
	major life forms according to	and the nucleus in the			
	their placement in existing	production of specific types			
	classification groups.	of proteins.			
	Explain the relationship	BIO.A.4.1.3 Describe how			
	between structure and function	membrane-bound cellular			
	at the molecular and cellular	organelles (e.g., endoplasmic			
	levels.	reticulum, Golgi apparatus)			
	 Describe organizing schemes 	facilitate the transport of			
	of classification keys.	materials within a cell.			
	Identify and characterize				
	major life forms by kingdom,				
	phyla, class and order.	Essential Knowledge/Skills:			
	3.3.10.B Describe and explain	DNA molecules contain			
	the chemical and structural	genetic information that is			

	Curriculum Guide	
basis of living organisms.	found in all cells. Genes are	
 Describe the relationship 	sections of DNA that code	
between the structure of	for proteins, which are	
organic molecules and the	important for cell	
function they serve in living	functioning. DNA was	
organisms.	identified as the genetic	
 Identify the specialized 	material through a series of	
structures and regions of the	experiments. DNA structure	
cell and the functions of each.	is the same in all organisms.	
 Explain how cells store and 	DNA replication copies the	
use information to guide their	genetic information of a cell.	
functions.	Transcription converts a	
 Explain cell functions and 	gene into a single-stranded	
processes in terms of chemical	RNA molecule. Translation	
reactions and energy changes.	converts an mRNA message	
	into a polypeptide, or	
3.3.10.C Describe how genetic	protein.	
information is inherited and		
expressed.	Describe Griffith's discovery	
Compare and contrast the	of a transforming principle.	
function of mitosis and meiosis.	Explain how Avery identified	
 Describe mutations' effects on 	DNA as the transforming	
a trait's expression.	principle. Summarize the	
Distinguish different	experiments of Hershey and	
reproductive patterns in living	Chase that confirmed DNA as	
things (e.g., budding, spores,	the genetic material.	
fission).	Describe the interaction of	
Compare random and	the four nucleotides that	
selective breeding practices and	make up DNA. Describe the	
their results (e.g., antibiotic	three-dimensional structure	
resistant bacteria).	of DNA. Summarize the	
Explain the relationship among	process of DNA replication.	
DNA, genes and chromosomes.	Describe the role of enzymes	
Explain different types of	in DNA replication. Describe	
inheritance (e.g., multiple allele,	the relationship between	

	Curriculum Guide		
sex-influenced traits).	RNA and DNA. Identify the		
 Describe the role of DNA in 	three kinds of RNA and their		
protein synthesis as it relates to	functions. Compare		
gene expression.	transcription to replication.		
	Describe how mRNA codons		
PA Core Standards:	are translated into amino		
Reading for Science and	acids. Summarize the process		
Technical Subjects, 6-12	of protein synthesis.		
3.5 Reading Informational Text			
Students read, understand, and	Vocabulary:		
respond to informational text-	Bacteriophage		
with emphasis on	Nucleotide		
comprehension, making	Double helix		
connections among ideas and	Base pairing rules		
between texts with focus on	Replication		
textual evidence.	DNA polymerase		
	Central dogma		
PA Core Standards: Writing for	RNA		
Science and Technical Subjects,	Transcription		
6-12	RNA polymerase		
3.6 Writing	Messenger RNA (mRNA)		
Students write for different	Ribosomal RNA (rRNA)		
purposes and audiences.	Transfer RNA (tRNA)		
Students write clear and focused	Translation		
text to convey a well-defined	Codon		
perspective and appropriate	Stop codon		
content.	Start codon		
	Anticodon		

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
All organisms are	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
made of cells and	BIO.B.1.1 Describe the three	BIO.B.1.1.1 Describe the	Biology:	tests, quizzes, etc.	
can be	stages of the cell cycle:	events that occur during the	Chapter 5 sections 1, 2,		
characterized by	interphase, nuclear division,	cell cycle: interphase, nuclear	and 3	Series available	
common aspects	cytokinesis.	division (i.e., mitosis or	PowerPoint	assessments	
of their structure		meiosis), cytokinesis.	presentations	online. (Optional)	
and functioning.	PA Academic Standards:	BIO.B.1.1.2 Compare the	Review sheets		
	Science	processes and outcomes of	Vocabulary quizzes		
	3.1.10.A Discriminate among the	mitotic and meiotic nuclear	Content exam		
	concepts of systems,	divisions.			
	subsystems, feedback and				
	control in solving technological				
	problems.	Essential Knowledge/Skills:			
	Identify the function of	Mitosis is the process in			
	subsystems within a larger	which individual cells			
	system (e.g., role of thermostat	multiply, which allows			
	in an engine, pressure switch).	multicellular organisms to			
	Describe the interrelationships	grow. Both daughter cells			
	among inputs, processes,	receive identical genetic			
	outputs, feedback and control in	information from the			
	specific systems.	original parent cell. Cells			
	Explain the concept of system	have distinct phases of			
	redesign and apply it to improve	growth, reproduction, and			
	technological systems.	normal functions. Cells			
	 Apply the universal systems 	divide during mitosis and			
	model to illustrate specific	cytokinesis. Cell cycle			
	solutions and troubleshoot	regulation is necessary for			
	specific problems.	healthy growth.			
	Analyze and describe the				
	effectiveness of systems to solve	Describe the stages of the			
	specific problems.	cell cycle. Compare rates of			
		division in different cell			

 	Curriculum Guide	 	
3.3.10.C Describe how genetic	types. Identify factors that		
information is inherited and	limit cell size. Describe the		
expressed.	structure of a chromosome.		
 Compare and contrast the 	Follow chromosomes		
function of mitosis and meiosis.	through the processes of		
 Describe mutations' effects on 	mitosis and cytokinesis.		
a trait's expression.	Identify internal and external		
 Distinguish different 	factors that regulate cell		
reproductive patterns in living	division. Explain cancer in		
things (e.g., budding, spores,	terms of cell cycle.		
fission).			
 Compare random and 	Vocabulary:		
selective breeding practices and	Cell cycle		
their results (e.g., antibiotic	Mitosis		
resistant bacteria).	Cytokinesis		
 Explain the relationship among 	Chromosome		
DNA, genes and chromosomes.	Histone		
 Explain different types of 	Chromatin		
inheritance (e.g., multiple allele,	Chromatid		
sex-influenced traits).	Centromere		
 Describe the role of DNA in 	Telomere		
protein synthesis as it relates to	Prophase		
gene expression.	Metaphase		
	Anaphase		
PA Core Standards:	Telophase		
Reading for Science and	Growth Factor		
Technical Subjects, 6-12	Apoptosis		
3.5 Reading Informational Text	Cancer		
Students read, understand, and	Benign		
respond to informational text-	Malignant		
with emphasis on	Metastasize		
comprehension, making	Carcinogen		
connections among ideas and			
between texts with focus on			
textual evidence.			1

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.		

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
All organisms are	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
made of cells and	BIO.B.1.2 Explain how genetic	BIO.A.1.2.2 Describe and	Biology:	tests, quizzes, etc.	
can be	information is inherited.	interpret relationships	Chapter 5 section 5		
characterized by		between structure and	PowerPoint	Series available	
common aspects	PA Academic Standards:	function at various levels of	presentations	assessments	
of their structure	Science	biological organization (i.e.,	Review sheets	online. (Optional)	
and functioning.	3.3.10.A Explain the structural	organelles, cells, tissues,	Vocabulary quizzes		
	and functional similarities and	organs, organ systems, and	Content exam		
	differences found among living	multicellular organisms).			
	things.				
	Identify and characterize				
	major life forms according to	Essential Knowledge/Skills:			
	their placement in existing	Tissues and organs are			
	classification groups.	produced by cellular division			
	Explain the relationship	and differentiation, and they			
	between structure and function	work together to meet a			
	at the molecular and cellular	multicellular organism's			
	levels.	needs. Cells work together			
	Describe organizing schemes	to carry out complex			
	of classification keys.	functions.			
	Identify and characterize				
	major life forms by kingdom,	Describe the specialization in			
	phyla, class and order.	multicellular organisms.			
	2.2.40 C.D	Identify different types of			
	3.3.10.C Describe how genetic	stem cells.			
	information is inherited and				
	expressed.	Vocabulary:			
	• Compare and contrast the function of mitosis and meiosis.	Tissue			
	 Describe mutations' effects on 	Organ			
		Organ system			
	a trait's expression.	Cell differentiation			
	Distinguish different	Stem cell			

	Curriculum Guide		
reproductive patterns in living			
things (e.g., budding, spores,			
fission).			
Compare random and			
selective breeding practices and			
their results (e.g., antibiotic			
resistant bacteria).			
Explain the relationship among			
DNA, genes and chromosomes.			
 Explain different types of 			
inheritance (e.g., multiple allele,			
sex-influenced traits).			
Describe the role of DNA in			
protein synthesis as it relates to			
gene expression.			
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.		

General Topic	Anchor Descriptor PA Academic and Core Standards	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
All organisms are made of cells and can be characterized by common aspects of their structure and functioning.			Holt McDougal Biology: Chapter 6 sections 2 PowerPoint presentations Review sheets Vocabulary quizzes Content exam	Teacher prepared tests, quizzes, etc. Series available assessments online. (Optional)	

	Curriculum Guide		
Describe mutations' effects on	Vocabulary:		
a trait's expression.	Gametogenesis		
 Distinguish different 	Spermatogenesis		
reproductive patterns in living	Oogenesis		
things (e.g., budding, spores,	Sperm		
fission).	Egg		
 Compare random and 	Polar body		
selective breeding practices and			
their results (e.g., antibiotic			
resistant bacteria).			
Explain the relationship among			
DNA, genes and chromosomes.			
Explain different types of			
inheritance (e.g., multiple allele,			
sex-influenced traits).			
Describe the role of DNA in			
protein synthesis as it relates to			
gene expression.			
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.		

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Heredity refers to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	5 days
specific	BIO.B.1.2 Explain how genetic	BIO.B.1.2.2 Explain the	Biology:	tests, quizzes, etc.	
mechanisms by	information is inherited.	functional relationships	Chapter 6 sections 3		
which		between DNA, genes, alleles,	and 4	Series available	
characteristics or	PA Academic Standards:	and chromosomes and their	PowerPoint	assessments	
traits are passed	Science	roles in inheritance.	presentations	online. (Optional)	
from one	3.3.10.C Describe how genetic		Review sheets		
generation to the	information is inherited and		Vocabulary quizzes		
next via genes,	expressed.	Essential Knowledge/Skills:	Content exam		
and explains why	Compare and contrast the	Each chromosome consists			
offspring	function of mitosis and meiosis.	of a single very long DNA			
resemble, but are	Describe mutations' effects on	molecule, and each gene on			
not identical to,	a trait's expression.	the chromosome is a			
their parents.	Distinguish different	particular segment of that			
	reproductive patterns in living	DNA. The instructions for			
	things (e.g., budding, spores,	forming species'			
	fission).	characteristics are carried in			
	Compare random and	DNA. Mendel's research			
	selective breeding practices and	showed that traits are			
	their results (e.g., antibiotic	inherited as discrete units.			
	resistant bacteria).	Genes encode proteins that			
	Explain the relationship among	produce a diverse range of			
	DNA, genes and chromosomes.	traits.			
	Explain different types of				
	inheritance (e.g., multiple allele,	Describe the pattern of			
	sex-influenced traits).	inheritance that Mendel's			
	Describe the role of DNA in	data revealed. Summarize			
	protein synthesis as it relates to	Mendel's law of segregation.			
	gene expression.	Explain how there can be			
		many versions of one gene.			
	PA Core Standards:	Describe how genes			
	Reading for Science and	influence the development of			

Technical Subjects, 6-12	traits.		
3.5 Reading Informational Text			
Students read, understand, and			
respond to informational text-	Vocabulary:		
with emphasis on	Trait		
comprehension, making	Genetics		
connections among ideas and	Purebred		
between texts with focus on	Cross		
textual evidence.	Law of segregation		
	Gene		
PA Core Standards: Writing for	Allele		
Science and Technical Subjects,	Homozygous		
6-12	Heterozygous		
3.6 Writing	Genome		
Students write for different	Genotype		
purposes and audiences.	Phenotype		
Students write clear and focused	Dominant		
text to convey a well-defined	Recessive		
perspective and appropriate			
content.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Heredity refers to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	4 days
specific	BIO.B.2.1 Compare Mendelian	BIO.B.2.1.2 Describe	Biology:	tests, quizzes, etc.	
mechanisms by	and non-Mendelian patterns of	processes that can alter	Chapter 5 section 4		
which	inheritance.	composition or number of	Chapter 6 section 1	Series available	
characteristics or		chromosomes (i.e., crossing-	PowerPoint	assessments	
traits are passed	PA Academic Standards:	over, nondisjunction,	presentations	online. (Optional)	
from one	Science	duplication, translocation,	Review sheets		
generation to the	3.3.10.C Describe how genetic	deletion, insertion, and	Vocabulary quizzes		
next via genes,	information is inherited and	inversion).	Content exam		
and explains why	expressed.				
offspring	Compare and contrast the				
resemble, but are	function of mitosis and meiosis.	Essential Knowledge/Skills:			
not identical to,	Describe mutations' effects on	Many organisms reproduce			
their parents.	a trait's expression.	by cell division. The			
	Distinguish different	information passed from			
	reproductive patterns in living	parents to offspring is coded			
	things (e.g., budding, spores,	in the DNA molecules that			
	fission).	form the chromosomes.			
	Compare random and	Gametes have half the			
	selective breeding practices and	number of chromosomes			
	their results (e.g., antibiotic	that body cells have.			
	resistant bacteria).				
	Explain the relationship among	Compare and contrast binary			
	DNA, genes and chromosomes.	fission and mitosis. Describe			
	Explain different types of	how some eukaryotes			
	inheritance (e.g., multiple allele,	reproduce through mitosis.			
	sex-influenced traits).	Differentiate between body			
	Describe the role of DNA in	cells and gametes. Compare			
	protein synthesis as it relates to	and contrast autosomes and			
	gene expression.	sex chromosomes.			

DA Coro Standards		1	
PA Core Standards:			
Reading for Science and	Vocabulary:		
Technical Subjects, 6-12	Asexual reproduction		
3.5 Reading Informational Te	kt Binary fission		
Students read, understand, a	nd Somatic cell		
respond to informational text	- Gamete		
with emphasis on	Homologous chromosome		
comprehension, making	Autosome		
connections among ideas and	Sex chromosome		
between texts with focus on	Sexual reproduction		
textual evidence.	Fertilization		
	Diploid		
PA Core Standards: Writing f	or Haploid		
Science and Technical Subject	ts, Meiosis		
6-12			
3.6 Writing			
Students write for different			
purposes and audiences.			
Students write clear and focu	sed		
text to convey a well-defined			
perspective and appropriate			
content.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Heredity refers to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	4 days
specific	BIO.B.2.1 Compare Mendelian	BIO.B.2.1.2 Describe	Biology:	tests, quizzes, etc.	
mechanisms by	and non-Mendelian patterns of	processes that can alter	Chapter 6 section 6		
which	inheritance.	composition or number of	PowerPoint	Series available	
characteristics or		chromosomes (i.e., crossing-	presentations	assessments	
traits are passed	PA Academic Standards:	over, nondisjunction,	Review sheets	online. (Optional)	
from one	Science	duplication, translocation,	Vocabulary quizzes		
generation to the	3.3.10.C Describe how genetic	deletion, insertion, and	Content exam		
next via genes,	information is inherited and	inversion).			
and explains why	expressed.				
offspring	Compare and contrast the				
resemble, but are	function of mitosis and meiosis.	Essential Knowledge/Skills:			
not identical to,	Describe mutations' effects on	In sexual reproduction,			
their parents.	a trait's expression.	chromosomes can create			
	Distinguish different	new genetic combinations			
	reproductive patterns in living	through the process of			
	things (e.g., budding, spores,	meiosis, which creates new			
	fission).	genetic combinations and			
	Compare random and	more genetic variation.			
	selective breeding practices and	Independent assortment and			
	their results (e.g., antibiotic	crossing over during meiosis			
	resistant bacteria).	result in genetic diversity.			
	Explain the relationship among				
	DNA, genes and chromosomes.	Describe how sexual			
	Explain different types of	reproduction creates unique			
	inheritance (e.g., multiple allele,	gene combinations. Explain			
	sex-influenced traits).	how crossing over during			
	Describe the role of DNA in	meiosis increases genetic			
	protein synthesis as it relates to	diversity.			
	gene expression.				
		Vocabulary:			
	PA Core Standards:	Crossing-over			

	Curricularii Galae		
Reading for Science and	Genetic linkage		
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Heredity refers to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	4 days
specific	BIO.B.2.1 Compare Mendelian	BIO.B.2.1.2 Describe	Biology:	tests, quizzes, etc.	
mechanisms by	and non-Mendelian patterns of	processes that can alter	Chapter 8 section 6		
which	inheritance.	composition or number of	PowerPoint	Series available	
characteristics or	BIO.B.2.3 Explain how genetic	chromosomes (i.e., crossing-	presentations	assessments	
traits are passed	information is expressed.	over, nondisjunction,	Review sheets	online. (Optional)	
from one	BIO.B.2.4 Apply scientific	duplication, translocation,	Vocabulary quizzes		
generation to the	thinking, processes, tools, and	deletion, insertion, and	Content exam		
next via genes,	technologies in the study of	inversion).			
and explains why	genetics.	BIO.B.2.3.1 Describe how			
offspring		genetic mutations alter the			
resemble, but are	PA Academic Standards:	DNA sequence and may or			
not identical to,	Science	may not affect phenotype			
their parents.	3.3.10.C Describe how genetic	(e.g., silent, nonsense, frame-			
	information is inherited and	shift).			
	expressed.	BIO.B.2.4.1 Explain how			
	Compare and contrast the	genetic engineering has			
	function of mitosis and meiosis.	impacted the fields of			
	Describe mutations' effects on	medicine, forensics, and			
	a trait's expression.	agriculture (e.g., selective			
	Distinguish different	breeding, gene splicing,			
	reproductive patterns in living	cloning, genetically modified			
	things (e.g., budding, spores,	organisms, gene therapy).			
	fission).				
	Compare random and				
	selective breeding practices and	Essential Knowledge/Skills:			
	their results (e.g., antibiotic	Although DNA replication is			
	resistant bacteria).	tightly regulated and			
	Explain the relationship among	remarkably accurate, errors			
	DNA, genes and chromosomes.	do occur and result in			
	Explain different types of	mutations, which are also a			
	inheritance (e.g., multiple allele,	source of genetic variation.			

	Curriculum Guide		
sex-influenced traits).	Gene expression is carefully		
 Describe the role of DNA in 	regulated in both		
protein synthesis as it relates to	prokaryotic and eukaryotic		
gene expression.	cells.		
PA Core Standards:	Describe how prokaryotes		
Reading for Science and	turn genes on and off.		
Technical Subjects, 6-12	Explain how gene expression		
3.5 Reading Informational Text	is regulated in eukaryotic		
Students read, understand, and	cells.		
respond to informational text-			
with emphasis on	Vocabulary:		
comprehension, making	Promoter		
connections among ideas and	Operon		
between texts with focus on	Exon		
textual evidence.	Intron		
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Heredity refers to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	4 days
specific	BIO.B.2.1 Compare Mendelian	BIO.B.2.1.2 Describe	Biology:	tests, quizzes, etc.	
mechanisms by	and non-Mendelian patterns of	processes that can alter	Chapter 8 section 7		
which	inheritance.	composition or number of	PowerPoint	Series available	
characteristics or	BIO.B.2.4 Apply scientific	chromosomes (i.e., crossing-	presentations	assessments	
traits are passed	thinking, processes, tools, and	over, nondisjunction,	Review sheets	online. (Optional)	
from one	technologies in the study of	duplication, translocation,	Vocabulary quizzes		
generation to the	genetics.	deletion, insertion, and	Content exam		
next via genes,		inversion).			
and explains why	PA Academic Standards:	BIO.B.2.4.1 Explain how			
offspring	Science	genetic engineering has			
resemble, but are	3.3.10.C Describe how genetic	impacted the fields of			
not identical to,	information is inherited and	medicine, forensics, and			
their parents.	expressed.	agriculture (e.g., selective			
	Compare and contrast the	breeding, gene splicing,			
	function of mitosis and meiosis.	cloning, genetically modified			
	Describe mutations' effects on	organisms, gene therapy).			
	a trait's expression.				
	Distinguish different				
	reproductive patterns in living	Essential Knowledge/Skills:			
	things (e.g., budding, spores,	Environmental factors can			
	fission).	also cause mutations in			
	Compare random and	genes, and viable mutations			
	selective breeding practices and	are inherited. Mutations are			
	their results (e.g., antibiotic	changes in DNA that may or			
	resistant bacteria).	may not affect phenotype.			
	Explain the relationship among				
	DNA, genes and chromosomes.	Distinguish between different			
	Explain different types of	types of mutations. Explain			
	inheritance (e.g., multiple allele,	why mutations may or may			
	sex-influenced traits).	not affect phenotype. List			
	Describe the role of DNA in	some factors that cause			

protein synthesis as it relates to	mutations.		
gene expression.			
	Vocabulary:		
PA Core Standards:	Mutation		
Reading for Science and	Point mutation		
Technical Subjects, 6-12	Frameshift mutation		
3.5 Reading Informational Text	Mutagen		
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Heredity refers to	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	4 days
specific	BIO.B.2.1 Compare Mendelian	BIO.B.2.1.1 Describe and/or	Biology:	tests, quizzes, etc.	
mechanisms by	and non-Mendelian patterns of	predict observed patterns of	Chapter 6 section 5		
which	inheritance.	inheritance (i.e., dominant,	PowerPoint	Series available	
characteristics or	BIO.B.3.3 Apply scientific	recessive, co-dominance,	presentations	assessments	
traits are passed	thinking, processes, tools, and	incomplete dominance, sex-	Review sheets	online. (Optional)	
from one	technologies in the study of the	linked, polygenic, and	Vocabulary quizzes		
generation to the	theory of evolution.	multiple alleles).	Content exam		
next via genes,		BIO.B.3.3.1 Distinguish			
and explains why	PA Academic Standards:	between the scientific terms:			
offspring	Science	hypothesis, inference, law,			
resemble, but are	3.3.10.C Describe how genetic	theory, principle, fact, and			
not identical to,	information is inherited and	observation.			
their parents.	expressed.				
	Compare and contrast the				
	function of mitosis and meiosis.	Essential Knowledge/Skills:			
	Describe mutations' effects on	Environmental factors also			
	a trait's expression.	affect expression of traits,			
	Distinguish different	and hence affect the			
	reproductive patterns in living	probability of occurrences of			
	things (e.g., budding, spores,	traits in a population. The			
	fission).	inheritance of traits follows			
	Compare random and	the rules of probability.			
	selective breeding practices and				
	their results (e.g., antibiotic	Describe monohybrid and			
	resistant bacteria).	dihybrid crosses. Explain how			
	Explain the relationship among	heredity can be illustrated			
	DNA, genes and chromosomes.	mathematically.			
	Explain different types of	,			
	inheritance (e.g., multiple allele,	Vocabulary:			
	sex-influenced traits).	Punnett square			
	Describe the role of DNA in	Monohybrid cross			

 	Curriculum Guide	 	
protein synthesis as it relates to	Testcross		
gene expression.	Dihybrid cross		
	Law of independent		
PA Core Standards:	assortment		
Reading for Science and	Probability		
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.			
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General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Biological	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	7 days
evolution	BIO.B.3.2 Analyze the sources of	BIO.B.3.2.1 Interpret	Biology:	tests, quizzes, etc.	
explains both the	evidence for biological	evidence supporting the	Chapter 10 sections 4		
unity and	evolution.	theory of evolution (i.e.,	and 5	Series available	
diversity of	BIO.B.3.3 Apply scientific	fossil, anatomical,	PowerPoint	assessments	
species and	thinking, processes, tools, and	physiological, embryological,	presentations	online. (Optional)	
provides a	technologies in the study of the	biochemical, and universal	Review sheets		
unifying principle	theory of evolution.	genetic code).	Vocabulary quizzes		
for the history		BIO.B.3.3.1 Distinguish	Content exam		
and diversity of	PA Academic Standards:	between the scientific terms:			
life on Earth.	Science	hypothesis, inference, law,			
	3.3.10.D Explain the	theory, principle, fact, and			
	mechanisms of the theory of	observation.			
	evolution.				
	analyze data from fossil				
	records, similarities in anatomy	Essential Knowledge/Skills:			
	and physiology, embryological	Evidence of common			
	studies and DNA studies that are	ancestry among species			
	relevant to the theory of	comes from many sources.			
	evolution.	Evidence of evolution is			
	Explain the role of mutations	found in anatomy, heredity,			
	and gene recombination in	embryology, and the fossil			
	changing a population of	record. New technology is			
	organisms.	furthering our			
	Compare modern day	understanding of evolution.			
	descendants of extinct species				
	and propose possible scientific	Recognize the major sources			
	accounts for their present	of evidence for evolution.			
	appearance.	Examine the pattern of			
	 describe the factors (e.g., 	features that reveal the			
	isolation, differential	history of species. Summarize			
	reproduction) affecting gene	different types of evidence			

	Curriculum Guide		
frequency in a population			
time and their consequen			
describe and differentiate	, ,		
between the roles of natu	ral branches of biological study.		
selection and genetic drift			
Describe changes that	Vocabulary:		
illustrate major events in t	the Biogeography		
earth's development base	d on a Homologous structure		
time line.	Analogous structure		
explain why natural sele	ction Vestigial structure		
can act only on inherited t	raits. Paleontology		
Apply the concept of nat	tural		
selection to illustrate and			
account for a species' surv	vival,		
extinction or change over	time.		
3.5.10.A Relate earth feat	ures		
and processes that change	e the		
earth.			
Illustrate and explain pla	ate		
tectonics as the mechanis	m of		
continental movement an	d sea		
floor changes.			
Compare examples of ch	nange		
to the earth's surface over	r time		
as they related to contine	ntal		
movement and ocean bas	in		
formation (e.g., Delaware,	,		
Susquehanna, Ohio Rivers	;		
system formations, dynam	nics).		
Interpret topographic m	aps to		
identify and describe signi	ficant		
geologic history/structure	s in		
Pennsylvania.			
Evaluate and interpret			

	Curriculum Guide		
geologic history using geologic			
maps.			
 Explain several methods of 			
dating earth materials and			
structures.			
 Correlate rock units with 			
general geologic time periods in			
the history of the earth.			
 Describe and identify major 			
types of rocks and minerals.			
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Biological	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	7 days
evolution	BIO.B.3.1 Explain the	BIO.B.3.1.1 Explain how	Biology:	tests, quizzes, etc.	
explains both the	mechanisms of evolution.	natural selection can impact	Chapter 11 section 2		
unity and	BIO.B.3.3 Apply scientific	allele frequencies of a	PowerPoint	Series available	
diversity of	thinking, processes, tools, and	population.	presentations	assessments	
species and	technologies in the study of the	BIO.B.3.3.1 Distinguish	Review sheets	online. (Optional)	
provides a	theory of evolution.	between the scientific terms:	Vocabulary quizzes		
unifying principle		hypothesis, inference, law,	Content exam		
for the history	PA Academic Standards:	theory, principle, fact, and			
and diversity of	Science	observation.			
life on Earth.	3.3.10.D Explain the				
	mechanisms of the theory of				
	evolution.	Essential Knowledge/Skills:			
	 analyze data from fossil 	Natural selection occurs only			
	records, similarities in anatomy	if there is both a variation in			
	and physiology, embryological	the genetic information			
	studies and DNA studies that are	between organisms in a			
	relevant to the theory of	population and a variation in			
	evolution.	the expression of that			
	Explain the role of mutations	genetic information (trait			
	and gene recombination in	variation) that leads to			
	changing a population of	differences in performance			
	organisms.	among individuals.			
	Compare modern day	Populations, not individuals,			
	descendants of extinct species	evolve.			
	and propose possible scientific				
	accounts for their present	Describe how natural			
	appearance.	selection acts on traits in a			
	 describe the factors (e.g., 	population. Explain three			
	isolation, differential	ways natural selection can			

reproduction) affecting gene	change the distribution of a		
frequency in a population over	trait in a population.		
time and their consequences.			
 describe and differentiate 	Vocabulary:		
between the roles of natural	Normal distribution		
selection and genetic drift.	Microevolution		
 Describe changes that 	Directional selection		
illustrate major events in the	Stabilizing selection		
earth's development based on a	Disruptive selection		
time line.			
 explain why natural selection 			
can act only on inherited traits.			
 Apply the concept of natural 			
selection to illustrate and			
account for a species' survival,			
extinction or change over time.			
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 for text to convey a well-define perspective and appropriate content.	ed		

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Biological	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	7 days
evolution	BIO.B.3.1 Explain the	BIO.B.3.1.1 Explain how	Biology:	tests, quizzes, etc.	
explains both the	mechanisms of evolution.	natural selection can impact	Chapter 11 sections 1,		
unity and	BIO.B.3.3 Apply scientific	allele frequencies of a	3, and 5	Series available	
diversity of	thinking, processes, tools, and	population.	PowerPoint	assessments	
species and	technologies in the study of the	BIO.B.3.3.1 Distinguish	presentations	online. (Optional)	
provides a	theory of evolution.	between the scientific terms:	Review sheets		
unifying principle		hypothesis, inference, law,	Vocabulary quizzes		
for the history	PA Academic Standards:	theory, principle, fact, and	Content exam		
and diversity of	Science	observation.			
life on Earth.	3.3.10.C Describe how genetic				
	information is inherited and				
	expressed.	Essential Knowledge/Skills:			
	Compare and contrast the	The traits that positively			
	function of mitosis and meiosis.	affect survival are more			
	Describe mutations' effects on	likely to be reproduced, and			
	a trait's expression.	thus are more common in			
	Distinguish different	the population. A population			
	reproductive patterns in living	shares a common gene pool.			
	things (e.g., budding, spores,	Natural selection is not the			
	fission).	only mechanism through			
	Compare random and	which populations evolve.			
	selective breeding practices and	New species can arise when			
	their results (e.g., antibiotic	populations are isolated.			
	resistant bacteria).	populations are isolated.			
	Explain the relationship among	Describe the significance of			
	DNA, genes and chromosomes.	genetic variation within a			
	Explain different types of	population. Identify sources			
	inheritance (e.g., multiple allele,	of genetic variation. Explain			
	sex-influenced traits).	how gene flow, genetic drift,			
	Describe the role of DNA in	and sexual selection can lead			
	protein synthesis as it relates to	to the evolution of			

	Curriculum Guide		
gene expression.	populations. Explain how		
	isolation of populations can		
3.3.10.D Explain the	lead to speciation. Describe		
mechanisms of the theory	of how populations can become		
evolution.	isolated.		
analyze data from fossil			
records, similarities in anat	tomy Vocabulary:		
and physiology, embryolog	gical Gene pool		
studies and DNA studies th	nat are Allele frequency		
relevant to the theory of	Gene flow		
evolution.	Genetic drift		
Explain the role of mutat	ions Bottleneck effect		
and gene recombination in	Founder effect		
changing a population of	Sexual selection		
organisms.	Reproductive isolation		
Compare modern day	Speciation		
descendants of extinct spe	cies Behavioral isolation		
and propose possible scier	ntific Geographic isolation		
accounts for their present	Temporal isolation		
appearance.			
describe the factors (e.g.	,		
isolation, differential			
reproduction) affecting ge	ne		
frequency in a population	over		
time and their consequen	ces.		
describe and differentiat	e		
between the roles of natur	al		
selection and genetic drift.			
Describe changes that			
illustrate major events in t	he		
earth's development based	d on a		
time line.			
explain why natural selection	ction		
can act only on inherited to	raits.		
Apply the concept of nat	ural		

	Curriculum Guide		
selection to illustrate and			
account for a species' survival,			
extinction or change over time.			
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.			

General Topic	Anchor Descriptor	Eligible Content,	Resources & Activities	Assessments	Suggested
	PA Academic and Core	Essential Knowledge,			Time
	Standards	Skills & Vocabulary			(In Days)
Biological	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	7 days
evolution	BIO.B.3.1 Explain the	BIO.B.3.1.1 Explain how	Biology:	tests, quizzes, etc.	
explains both the	mechanisms of evolution.	natural selection can impact	Chapter 10 section 3		
unity and		allele frequencies of a	PowerPoint	Series available	
diversity of	PA Academic Standards:	population.	presentations	assessments	
species and	Science		Review sheets	online. (Optional)	
provides a	3.3.10.B Describe and explain		Vocabulary quizzes		
unifying principle	the chemical and structural	Essential Knowledge/Skills:	Content exam		
for the history	basis of living organisms.	Darwin proposed natural			
and diversity of	Describe the relationship	selection as a mechanism for			
life on Earth.	between the structure of	evolution. Natural selection			
	organic molecules and the	is the result of four factors:			
	function they serve in living	(1) the potential for a			
	organisms.	species to increase in			
	Identify the specialized	number,			
	structures and regions of the	(2) the genetic variation of			
	cell and the functions of each.	individuals in a species due			
	Explain how cells store and	to mutation and sexual			
	use information to guide their	reproduction,			
	functions.	(3) competition for an			
	Explain cell functions and	environment's limited			
	processes in terms of chemical	supply of the resources, and			
	reactions and energy changes.	(4) the increase in number of			
		those organisms that are			
	3.3.10.D Explain the	better able to survive and			
	mechanisms of the theory of	reproduce in that			
	evolution.	environment.			
	analyze data from fossil				
	records, similarities in anatomy	Compare artificial selection			
	and physiology, embryological	to natural selection. Examine			
	studies and DNA studies that are	the factors Darwin			
	relevant to the theory of	considered in forming his			

	Curriculum Gu	iue	
evolution.	theory of natural selection	n.	
Explain the role of muta	ations Summarize the four		
and gene recombination i	in principles of natural		
changing a population of	selection.		
organisms.			
Compare modern day	Vocabulary:		
descendants of extinct sp	ecies Artificial selection		
and propose possible scie	entific Heritability		
accounts for their present	t Natural selection		
appearance.	Population		
• describe the factors (e.g	g., Fitness		
isolation, differential			
reproduction) affecting ge	ene		
frequency in a population	over		
time and their consequer	nces.		
describe and differentia	ite		
between the roles of natu	ıral		
selection and genetic drif	t.		
Describe changes that			
illustrate major events in	the		
earth's development base	ed on a		
time line.			
explain why natural sele	ection		
can act only on inherited	traits.		
Apply the concept of na	itural		
selection to illustrate and			
account for a species' sur	vival,		
extinction or change over	time.		
PA Core Standards:			
Reading for Science and			
Technical Subjects, 6-12			
3.5 Reading Informationa	l Text		
Students read, understan	d, 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.		

General Topic	Anchor Descriptor	Eligible Content,	Resources &	Assessments	Suggested
	PA Academic and Core	Essential Knowledge, Skills & Vocabulary	Activities		Time (In Days)
	Standards	Skills & Vocabulary			(III Days)
Biological	Anchor Descriptor:	Eligible Content:	Holt McDougal	Teacher prepared	7 days
evolution explains	BIO.B.3.2 Analyze the sources of	BIO.B.3.2.1 Interpret	Biology:	tests, quizzes, etc.	
both the unity and	evidence for biological	evidence supporting the	Chapter 10 sections		
diversity of	evolution.	theory of evolution (i.e.,	1 and 2	Series available	
species and	BIO.B.3.3 Apply scientific	fossil, anatomical,	Chapter 11 section 6	assessments online.	
provides a	thinking, processes, tools, and	physiological, embryological,	PowerPoint	(Optional)	
unifying principle	technologies in the study of the	biochemical, and universal	presentations		
for the history and	theory of evolution.	genetic code).	Review sheets		
diversity of life on		BIO.B.3.3.1 Distinguish	Vocabulary quizzes		
Earth.	PA Academic Standards:	between the scientific terms:	Content exam		
	Science	hypothesis, inference, law,			
	3.3.10.D Explain the	theory, principle, fact, and			
	mechanisms of the theory of	observation.			
	evolution.				
	analyze data from fossil				
	records, similarities in anatomy	Essential Knowledge/Skills:			
	and physiology, embryological	There were theories of			
	studies and DNA studies that are	biological and geologic			
	relevant to the theory of	change before Darwin.			
	evolution.	Darwin's voyage provided			
	Explain the role of mutations	insights into evolution.			
	and gene recombination in	Natural selection leads to			
	changing a population of	adaptations.			
	organisms.				
	Compare modern day	Examine early ideas about			
	descendants of extinct species	evolution. Identify three			
	and propose possible scientific	geological theories that			
	accounts for their present	influenced scientific debate			
	appearance.	over evolution. Describe how			
	• describe the factors (e.g.,	Darwin arrived at his idea			

 	Curriculum Guide	 	
isolation, differential	about species variation.	 	
reproduction) affecting gene	Recognize how Darwin's		
frequency in a population over	discoveries supported Lyell's		
time and their consequences.	ancient-Earth theory.		
 describe and differentiate 			
between the roles of natural			
selection and genetic drift.	Vocabulary:		
 Describe changes that 	Evolution		
illustrate major events in the	Species		
earth's development based on a	Fossil		
time line.	Catastrophism		
 explain why natural selection 	Gradualism		
can act only on inherited traits.	Uniformitarianism		
 Apply the concept of natural 	Variation		
selection to illustrate and	Adaptation		
account for a species' survival,			
extinction or change over time.			
4.7.10.C Identify and explain			
why adaptations can lead to			
specialization.			
Explain factors that could lead			
to a species' increase or			
decrease.			
Explain how management			
practices may influence the			
success of specific species.			
Identify and explain criteria			
used by scientists for			
categorizing organisms as			
threatened, endangered or			
extinct.			
PA Core Standards:			
Reading for Science and			

	Curriculum duide					
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.						

General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested
	PA Academic and Core Standards				Time (In Days)
Review and Final Exam					10 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.