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# Advanced Biology

Curriculum Guide

Dunmore School District

Dunmore, PA



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**Advanced Biology**

**Prerequisite:**

- 10<sup>th</sup> Grade Biology K or 10<sup>th</sup> Grade Honors Biology K

This course seeks to prepare young men and women for careers in the Health Fields. It is an intense curriculum which exposes the student to detailed anatomy and the intricacies of the physiological mechanisms that occur within the framework of the human body.

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Year-at-a-glance

<b>Subject: Advanced Biology</b>	<b>Grade Level: 11<sup>th</sup> and 12th</b>	<b>Date Completed: 3/12/2018</b>
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**1<sup>st</sup> Quarter**

<b>Topic</b>	<b>Resources</b>	<b>Anchors/Standards</b>
The Human Body: An Orientation	Approved Textbook <i>Essentials of Human Anatomy and Physiology</i> Worksheets	BIO.A.1.1.1 BIO.A.1.2.1 BIO.A.1.2.2
Basic Chemistry	Approved Textbook <i>Essentials of Human Anatomy and Physiology</i> Worksheets Labs	BIO.A.2.1.1 BIO.A.2.2.1 BIO.A.2.2.2 BIO.A.2.2.3 BIO.A.2.3.1 BIO.A.2.3.2

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**2<sup>nd</sup> Quarter**

Topic	Resources	Anchors/Standards
Part I Cells	Approved Textbook <i>Essentials of Human Anatomy and Physiology</i> Worksheets Labs	BIO.A.1.1.1 BIO.A.1.2.1 BIO.A.1.2.2 BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1
Part II Tissues	Approved Textbook <i>Essentials of Human Anatomy and Physiology</i> Worksheets Labs	BIO.A.1.2.2 BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1

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3<sup>rd</sup> Quarter

Topic	Resources	Anchors/Standards
Skin and Body Membranes	Approved Textbook <i>Essentials of Human Anatomy and Physiology</i> Worksheets Labs	BIO.A.1.2.2 BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1
The Skeletal System	Approved Textbook <i>Essentials of Human Anatomy and Physiology</i> Worksheets Labs	BIO.A.1.2.2 BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1

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**4<sup>th</sup> Quarter**

Topic	Resources	Anchors/Standards
Shark Dissection	Shark Lab Manual	BIO.A.1.2.2 BIO.A.2.1.1 BIO.A.2.2.1 BIO.A.2.2.2 BIO.A.2.2.3 BIO.A.2.3.1 BIO.A.2.3.2 BIO.A.3.1.1 BIO.A.3.2.1 BIO.A.3.2.2 BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1
Cat Dissection (and final test)	Cat Lab Manual	BIO.A.1.2.2 BIO.A.2.1.1 BIO.A.2.2.1 BIO.A.2.2.2 BIO.A.2.2.3 BIO.A.2.3.1 BIO.A.2.3.2 BIO.A.3.1.1 BIO.A.3.2.1 BIO.A.3.2.2 BIO.A.4.1.1 BIO.A.4.1.2 BIO.A.4.1.3 BIO.A.4.2.1

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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<b>The Human Body: An Orientation</b>	<p><b>PA Academic Standards/Anchors: Science</b> BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.</p> <p>BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.</p> <p>BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b> 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension,</p>	<p><b>Essential Knowledge/Skills:</b> Define anatomy and physiology, and name several sub disciplines of these sciences.</p> <p>Describe the levels of structural organization that make up the human body.</p> <p>List the eleven systems of the human body, the organs present in each, and their general functions.</p> <p>Define the important life processes of the human body.</p> <p>Define homeostasis and explain its relationship to interstitial fluid.</p> <p>Describe the components of a feedback system. Contrast the operation of negative and positive</p>	<p><b>Approved textbook</b> Essentials of Human Anatomy and Physiology Chapter 1 The Human Body</p>	<p><b>Teacher prepared tests</b> <b>Quizzes</b> <b>Worksheets</b></p>	<p><b>17 Days</b></p>

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	<p>making connections among ideas and between texts with focus on textual evidence.</p> <p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b></p> <p>3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>feedback systems.</p> <p>Explain why homeostatic imbalances cause disorders.</p> <p>Describe the orientation of the body in the anatomical position.</p> <p>Define each directional term used to describe the human body.</p> <p>Relate the common names to the corresponding anatomical descriptive terms for various regions of the human body.</p> <p>Define the anatomical planes and sections used to describe the human body.</p> <p>Describe the major body cavities, the organs they contain, and their associated linings.</p> <p>Name and describe the nine abdominopelvic regions and the four abdominopelvic quadrants.</p> <p>Describe the principles and importance of medical</p>			
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		<p>imaging procedures in the evaluation of organ functions and diagnosis of disease.</p> <p><b>Vocabulary:</b>          Superficial          Superior          Inferior          Anterior(ventral)          Posterior(dorsal)          Medial          Lateral          Deep          Homeostasis          Sagittal          Transverse          Frontal          Proximal          Distal          Ventral          Dorsal          Caudal          Patellar          Cephalic          Thoracic          Axillary          Occipital          Brachial          Tarsal          Digital          Popliteal          Plantar          Sural</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<b>Basic Chemistry</b>	<p><b>PA Academic Standards/Anchors: Science</b></p> <p>BIO.A.2.1.1 Describe the unique properties of water and how these properties support life on Earth (e.g., freezing point, high specific heat, cohesion).</p> <p>BIO.A.2.2.1 Explain how carbon is uniquely suited to form biological macromolecules.</p> <p>BIO.A.2.2.2 Describe how biological macromolecules form from monomers.</p> <p>BIO.A.2.2.3 Compare the structure and function of carbohydrates, lipids, proteins, and nucleic acids in organisms.</p> <p>BIO.A.2.3.1 Describe the role of an enzyme as a catalyst in regulating a specific biochemical reaction.</p>	<p><b>Essential Knowledge/Skills:</b></p> <p>Nature of matter:</p> <ul style="list-style-type: none"> <li>• List important properties of matter</li> <li>• Define the phases of matter</li> <li>• Identify and define the components of the atom</li> <li>• Utilize the periodic table</li> </ul> <p>Chemical compounds:</p> <ul style="list-style-type: none"> <li>• Distinguish organic from inorganic compounds</li> <li>• Identify the four key elements of living things</li> <li>• Identify the four groups of organic compounds</li> </ul> <p>Nucleic acids:</p> <p>DNA</p> <ul style="list-style-type: none"> <li>• Define DNA</li> <li>• Describe the genetic code</li> <li>• Describe in steps the replication cycle of DNA</li> </ul> <p>RNA</p> <ul style="list-style-type: none"> <li>• Define RNA</li> <li>• Describe its part in DNA replication</li> </ul>	<p><b>Approved textbook</b></p> <p>Essentials of Human Anatomy and Physiology Chapter 2 Basic Chemistry</p>	<p><b>Teacher prepared tests</b></p> <p><b>Quizzes</b></p> <p><b>Worksheets</b></p>	<p><b>20 Days</b></p>

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	<p>BIO.A.2.3.2 Explain how factors such as pH, temperature, and concentration levels can affect enzyme function.</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b> 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b> 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>Protein synthesis: • Use the codons produced to define the proteins synthesized</p> <p><b>Vocabulary:</b> Nucleic acid Macromolecule Lipid Steroid Adenosine triphosphate Carbohydrate Polysaccharide Hydrolysis Dehydration synthesis Metabolism Enzymes Saturated Unsaturated</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<b>Cells</b>	<p><b>PA Academic Standards/Anchors: Science</b></p> <p>BIO.A.1.1.1 Describe the characteristics of life shared by all prokaryotic and eukaryotic organisms.</p> <p>BIO.A.1.2.1 Compare cellular structures and their functions in prokaryotic and eukaryotic cells.</p> <p>BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</p> <p>BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive</p>	<p><b>Essential Knowledge/Skills:</b></p> <p>Cell structure and function</p> <p>Cell structure</p> <ul style="list-style-type: none"> <li>• Diagram and describe the cell</li> <li>• Diagram and describe the membrane</li> <li>• Diagram and describe each organelle</li> </ul> <p>Movement and the cell membrane</p> <ul style="list-style-type: none"> <li>• Describe diffusion</li> <li>• Describe permeability</li> <li>• Describe osmosis</li> <li>• Describe facilitated diffusion</li> <li>• Describe active transport</li> <li>• Identify the areas of the body that each of these would occur</li> <li>• Cell specialization</li> <li>• Define cell specialization</li> </ul> <p><b>Vocabulary:</b></p> <p>Cell Organelle</p>	<p><b>Approved textbook</b></p> <p>Essentials of Human Anatomy and Physiology Chapter 3 Cells and Tissues</p>	<p><b>Teacher prepared tests</b></p> <p><b>Quizzes</b></p> <p><b>Worksheets</b></p> <p><b>Labs</b></p>	<p><b>24 Days</b></p>

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	<p>transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis)</p> <p>BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p> <p>BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation)</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b> 3.5 Reading Informational Text Students read, understand, and respond to informational text—with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b> 3.6 Writing Students write for different purposes and audiences.</p>	<p>Nucleus Selectively Permeable Diffusion Osmosis Facilitated diffusion Active Transport Passive Transport Solute Pumping Exocytosis Endocytosis Phagocytosis Pinocytosis Hypertonic Hypotonic Isotonic DNA RNA mRNA tRNA rRNA DNA Replication Mitosis Protein Synthesis</p>			
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	Students write clear and focused text to convey a well-defined perspective and appropriate content.				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
Tissues	<p><b>PA Academic Standards/Anchors: Science</b></p> <p>BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</p> <p>BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).</p> <p>BIO.A.4.1.3 Describe how</p>	<p><b>Essential Knowledge/Skills:</b></p> <p>Name the four basic types of tissues that make up the human body and describe the characteristics of each.</p> <p>Describe the general features of epithelial tissues.</p> <p>For each different type of epithelium, list its location, structure and function.</p> <p>Describe the general features of connective tissue.</p> <p>Describe the structure, location, and function of the various types of connective tissues.</p> <p>Define a membrane.</p> <p>Describe the classification of membranes.</p> <p>Describe the structural features and functions of nervous tissue.</p>	<p><b>Approved textbook</b></p> <p>Essentials of Human Anatomy and Physiology Chapter 3 Cells and Tissues</p>	<p><b>Teacher prepared tests</b></p> <p><b>Quizzes</b></p> <p><b>Worksheets</b></p> <p><b>Labs</b></p>	18 Days



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	<p>membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p> <p>BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).</p>	<p>Describe the role of tissue repair in restoring homeostasis.</p> <p><b>Vocabulary:</b>            Epithelial            Connective            Muscle tissue            Nervous tissue            Stratified            Cuboidal            Columnar            Transitional            Pseudostratified            Squamous            Areolar            Adipose</p>			
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	PA Academic and Core Standards				
<b>Skin and Body Membranes</b>	<p><b>PA Academic Standards/Anchors: Science</b>            BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</p> <p>BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).</p> <p>BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p>	<p><b>Essential Knowledge/Skills:</b>            Describe the layers of the epidermis and the cells that compose them.</p> <p>Compare the composition of the papillary and reticular regions of the dermis.</p> <p>Explain the basis for different skin colors.</p> <p>Contrast the structure, distribution, and functions of hair, skin, glands, and nails.</p> <p>Describe how the skin contributes to regulation of body temperature, protection, sensation, excretion and absorption, and synthesis of vitamin D.</p> <p>Explain how epidermal wounds and deep wounds heal.</p> <p><b>Vocabulary:</b>            Cutaneous            Mucous            Serous</p>	<p><b>Approved textbook</b>            Essentials of Human Anatomy and Physiology            Chapter 4 Skin and Body Membranes</p>	<p><b>Teacher prepared tests</b>  <b>Quizzes</b>  <b>Worksheets</b>  <b>Labs</b></p>	<b>22 Days</b>

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	<p>BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b> 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b> 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>Peritoneum Pleura Pericardium Epidermis Dermis Hypodermis Melanin Sebaceous Keratin</p>			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<b>The Skeletal System</b>	<p><b>PA Academic Standards/Anchors: Science</b>            BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.4.1.1 Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for a cell.</p> <p>BIO.A.4.1.2 Compare the mechanisms that transport materials across the plasma membrane (i.e., passive transport—diffusion, osmosis, facilitated diffusion; and active transport—pumps, endocytosis, exocytosis).</p> <p>BIO.A.4.1.3 Describe how membrane-bound cellular organelles (e.g., endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within a cell.</p>	<p><b>Essential Knowledge/Skills:</b>            Diagram and describe the chief anatomical structures on a cellular level and gross level for point of reference.</p> <p>Describe the blood and nerve supply of bone.</p> <p>Describe the steps of intramembranous and endochondral ossification.</p> <p>Describe how bone grows in length and thickness.</p> <p>Explain the role of nutrients and hormones in regulating bone growth.</p> <p>Describe the processes involved in bone remodeling.</p> <p>Describe the sequence of events in repair of a fracture.</p> <p>Describe the role of bone in calcium homeostasis.</p> <p>Describe diseases and disorders that affect this</p>	<p><b>Approved textbook</b>            Essentials of Human Anatomy and Physiology            Chapter 5 The Skeletal System</p>	<p><b>Teacher prepared tests</b>  <b>Quizzes</b>  <b>Worksheets</b></p>	<p><b>35 Days</b></p>

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	<p>BIO.A.4.2.1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b> 3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p> <p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b> 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>	<p>system</p> <p>Diagram and describe the chief anatomical structures.</p> <p>Identify the bones of the upper limb and their principal markings.</p> <p>Identify the bones of the lower limb and their principal markings.</p> <p>Describe the structural and functional classifications of joints.</p> <p>Explain the effects of aging on joints.</p> <p>Explain the physiology of the system.</p> <p>Describe diseases and disorders that affect this system.</p> <p><b>Vocabulary:</b> Diaphysis Epiphyses Metaphysis Epiphyseal plate Epiphyseal line</p>			
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		Articular cartilage Periosteum Osteogenic cells Osteoblasts Osteocytes Osteoclasts Haversian System Axial Appendicular Tarsal Patella Femur Girdle Scapula Clavicle Maxilla Mandible Radius Ulna Carpals Sacrum Parietal Occipital Tibia Fibula Phalanges Marrow Ossification			
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<b>Shark Dissection</b>	<p><b>PA Academic Standards/Anchors: Science</b>            BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.2.2.2 Describe how biological macromolecules form from monomers.</p> <p>BIO.A.4.2.1 1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b>            3.5 Reading Informational Text Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p>	<p><b>Essential Knowledge/Skills:</b>            External Anatomy            Muscular System            Digestive System            Respiratory System            Circulatory System            Urogenital System            Nervous System</p> <p><b>Vocabulary: Refer to Manual</b>  <a href="https://www.pc.maricopa.edu/Biology/ppepe/BIO145/lab04.html">https://www.pc.maricopa.edu/Biology/ppepe/BIO145/lab04.html</a></p>	<b>Approved Shark Lab Manual</b>	<b>Lab Practical Examination</b>	<b>20 Days</b>

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	<p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b> 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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General Topic	Anchor Descriptor	Eligible Content, Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time (In Days)
	PA Academic and Core Standards				
<b>Cat Dissection (and final test)</b>	<p><b>PA Academic Standards/Anchors: Science</b>            BIO.A.1.2.2 Describe and interpret relationships between structure and function at various levels of biological organization (i.e., organelles, cells, tissues, organs, organ systems, and multicellular organisms).</p> <p>BIO.A.2.2.2 Describe how biological macromolecules form from monomers.</p> <p>BIO.A.4.2.1 1 Explain how organisms maintain homeostasis (e.g., thermoregulation, water regulation, oxygen regulation).</p> <p><b>PA Core Standards: Reading for Science and Technical Subjects, 6-12</b>            3.5 Reading Informational Text            Students read, understand, and respond to informational text-with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.</p>	<p><b>Essential Knowledge/Skills:</b>            External Anatomy            Muscular System            Digestive System            Respiratory System            Circulatory System            Urogenital System            Nervous System</p> <p><b>Vocabulary: Refer to Manual</b>  <a href="http://cf.edliostatic.com/jLs7OJpWlYiLUgClb7NosYNtadxuApvD.pdf">http://cf.edliostatic.com/jLs7OJpWlYiLUgClb7NosYNtadxuApvD.pdf</a></p>	<b>Approved Cat Lab Manual</b>	<b>Lab Practical Examination</b>	<b>24 Days</b>

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	<p><b>PA Core Standards: Writing for Science and Technical Subjects, 6-12</b> 3.6 Writing Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.</p>				
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**PA 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 6-8**

CC.3.5.6-8.A.

Cite specific textual evidence to support analysis of science and technical texts.

CC.3.5.6-8.B.

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

CC.3.5.6-8.C.

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CC.3.5.6-8.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 6–8 texts and topics.

CC.3.5.6-8.E.

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

CC.3.5.6-8.F.

Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

CC.3.5.6-8.G.

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CC.3.5.6-8.H.

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

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CC.3.5.6-8.I.

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CC.3.5.6-8.J.

By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

**Grades 9-10**

CC.3.5.9-10.A.

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

CC.3.5.9-10.B.

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

CC.3.5.9-10.C.

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

CC.3.5.9-10.D.

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

CC.3.5.9-10.E.

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

CC.3.5.9-10.F.

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

CC.3.5.9-10.G.

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

CC.3.5.9-10.H.

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

CC.3.5.9-10.I.

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

CC.3.5.9-10.J.

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

**Grades 11-12**

CC.3.5.11-12.A.

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

CC.3.5.11-12.B.

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

CC.3.5.11-12.C.

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

CC.3.5.11-12.D.

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

CC.3.5.11-12.E.

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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.

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**PA Core Standards:**

**Writing for Science and Technical Subjects, 6-12**

**3.6 Writing**

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

**Grades 6-8**

**CC.3.6.6-8.A.**

Write arguments focused on discipline-specific content.

- Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- Establish and maintain a formal style.
- Provide a concluding statement or section that follows from and supports the argument presented.

**CC.3.6.6-8.B. \***

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

- Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Establish and maintain a formal style and objective tone.
- Provide a concluding statement or section that follows from and supports the information or explanation presented.

**CC.3.6.6-8.C.**

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

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**CC.3.6.6-8.D.**

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

**CC.3.6.6-8.E.**

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

**CC.3.6.6-8.F.**

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

**CC.3.6.6-8.G.**

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

**CC.3.6.6-8.H.**

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

**CC.3.6.6-8.J.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 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.



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- 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 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.

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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.

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- 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.