

DETROIT PUBLIC SCHOOLS

Curriculum Instructional Sequence

**BIOLOGY**  
**Grade 9 - Science**

Office of Scientific Studies

DETROIT PUBLIC SCHOOLS  
OFFICE OF SCIENTIFIC STUDIES  
**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Molecules to Organisms: Cells –Structures and Functions, Levels of Organization**  
**Semester One**

Pacing	District Core Outcomes	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 1</b>	Review and Procedural Lessons	Review Prerequisite Objectives and Practice Standardized High School Classroom Procedures.	
<b>Week 2</b>	Review and Procedural Lessons	Review Prerequisite Objectives and Practice Standardized High School Classroom Procedures.	
<b>Week 3</b>	<b>11.</b> Compare and contrast ways in which selected cells are specialized to carry out life functions.	<p><b>L2.p1</b> – Cells: All organisms are composed of cells, from just one cell to many cells. Water accounts for more than two-thirds of the weight of a cell, which gives cells many of their properties. In multi-cellular organisms, specialized cells perform specialized functions. Organs and organ systems are composed of cells and function to serve the needs of organisms for food, air and waste removal. The ways in which cells function is similar in all living organisms. (prerequisite)</p> <p><b>B2.3A</b> – Describe and explain how cells, using chemical reactions, function in a narrow range of conditions, such as temperature and pH, to perform life functions.</p> <p><b>B2.3B</b> - Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.</p> <p><b>B2.3C</b> - Explain how stability is aided or challenged by changing chemical, physical and environmental conditions.</p>	<p><b>Focus Question</b> – What is a cell and why is important in living organisms?</p> <p><b>Focus Question</b> - How do the structures of organisms help them to perform life's functions?</p> <p>*Explain how the structures of organisms help to perform life's functions.</p> <p>*Describe cell processes that are important to maintain life.</p>
<b>Week 4</b>		<p><b>B2.r6c</b> - Recognize and explain that communication and/or interaction are required between cells to coordinate their diverse activities (recommended).</p> <p><b>B2.r6b</b> -Explain that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activities, such as growth, and division. Note that cell behavior can also be affected by molecules from other parts of the organism, such as hormones (recommended).</p> <p><b>B2.4B</b> -Describe how various organisms have developed different specializations to accomplish a particular function. (excreting waste, obtaining oxygen)</p>	<p>*Given a visual: identify the cell type; identify and label the cell organelles; describe the function of the organelles.</p> <p>*List the levels of biological organization.</p> <p>*Explain the process that keeps the environment of the cell stable (homeostasis).</p>

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**Molecules to Organisms: Cells –Structures and Functions, Levels of Organization**  
**Semester One**

<b>Activities/Strategies for District Outcome</b>	<b>Text/Instructional Materials For District Outcome</b>	<b>Sample Assessment Items (Reference) for District Outcome</b>
<p><b>11.1</b> Explain the Principles of the Cell Theory.</p> <p><b>Video</b> <a href="#">Cell Theory</a> <a href="#">All Living Things Are Made of Cells</a> <a href="#">Conclusion</a> <a href="#">Even More Enlightenment Science: Leeuwenhoek, Hooke, Harvey, and Linnaeus</a> <a href="#">Robert Hooke</a> <a href="#">Antoni van Leeuwenhoek</a> <a href="#">Brief History of Cells</a></p> <p><b>Images</b> <a href="#">Anton van Leeuwenhoek (1632-1723)</a></p> <p><b>Article</b> <a href="#">Hooke, Robert</a> <a href="#">Leeuwenhoek, Antoni van</a> <a href="#">Schleiden, Matthias Jakob</a> <a href="#">Schwann, Theodor</a> <a href="#">Virchow, Rudolf</a></p> <p><b>11.2</b> Identify and describe structural organelles present in all cells (prokaryotic and eukaryotic).</p> <p><b>Video</b> <a href="#">Cell Membranes &amp; Cell Walls</a> <a href="#">The Organelles of the Cytoplasm</a></p> <p><b>Images</b> <a href="#">Cellular structures: nucleus, vacuole, cytoplasm, and cell</a></p>	<p><b>Biology: The Dynamics of Life,</b> <b>Chapter 14 Section 14.2 The Origin of Life, Read p.383 – 385.</b> <b>Chapter 7 A View of the Cell, p.170-193.</b> <b>Section 7.1, The Discovery of Cells, p.173-174.</b> <b>Section 7.3, Eukaryotic Cell Structure.</b> <b>MiniLab 7.1, Measuring Objects Under A Microscope, p.173.</b> <b>Problem-Solving Lab 7.1, Is the Plasma membrane a selective barrier, p.176.</b> <b>Problem-Solving Lab 7.2, What Organelle Directs Cell Activity? p.180.</b> <b>Investigate BioLab, Observing and Comparing Different Cell Types, p.188-189.</b> <b>Ancillary Materials</b> <b>Lab Manual</b> Exploration 7.1 <i>Use of the Compound Light Microscope</i>, p.35-38. Investigation 7.2, <i>How Can a Microscope Be Used in the Laboratory?</i> p.39-42. <b>BioChallenges and Enrichment Manual</b> Project 3: <i>The Life of a Cell</i>, p.9-12. <b>Section Focus Transparencies Manual</b> 16. Movement of Materials. 17. Plant and Animal Cells. 18. Water in the Cell. 19. Diffusion and Cell Size. <b>Chapter 18 Viruses and Bacteria, p.474-485</b> <b>MiniLab 18.1</b> Measuring in SI, p.476 <b>Problem-Solving Lab 18.1</b> Analyzing Information: What types of Viruses Cause Disease, p.480</p>	<p>Demonstrate use of the light microscope using a teacher made slide containing the letter ‘e’.</p> <p>Students must:</p> <ul style="list-style-type: none"> <li>• Locate the letter ‘e’ on the slide.</li> <li>• Focus the letter.</li> <li>• Turn the letter right side up.</li> <li>• Label parts of the microscope.</li> </ul> <p>Design and construct a chart comparing plant and animal cells.</p> <p><b>Biology: The Dynamics of Life</b> Chapter 7 Assessment, <i>Standardized Test Practice</i> p.193, items 21-29.</p>

[membrane](#)  
[Cell with cytoplasm highlighted](#)

**11.3** Demonstrate proper use and care of a compound light microscope.

**Video**

[Introduction](#)  
[Early History of the Microscope](#)  
[The Parts of the Compound Microscope](#)  
[Taking Care of the Microscope](#)  
[Requirements for Obtaining a Good Image](#)  
[Finding an Object under the Microscope](#)  
[Magnification & Illumination Adjustments](#)  
[Uses & Limitations of Compound & Electron Microscopes](#)

**Images**

[Illustration of Robert Hooke's Compound Microscope](#)  
[Microscope, compound](#)

**Audio**

[How to Use the Compound Microscope: Magnification](#)  
[How to Use the Compound Microscope: Uses & Limitations of Microscopes](#)  
[How to Use the Compound Microscope: Magnification & Illumination Adjustments](#)  
[How to Use the Compound Microscope: Early History of the Microscope](#)  
[How to Use the Compound Microscope: Getting a Good Image](#)  
[How to Use the Compound Microscope: Compound Microscopes of Today](#)  
[How to Use the Compound Microscope: Objective Lens Choice](#)

**11.4** Compare and contrast the structures of prokaryotic, eukaryotic

cells and viruses; including how a virus invades the living cell. i.e., AIDS

**Video**

[Two Types of Cells: Prokaryotic and Eukaryotic](#)

[Simple and Complex](#)

[Bacteria: A Single-Cell Organism](#)

[What Is a Virus?](#)

[Virus vs. Human](#)

[How Viruses Work](#)

[The Littlest Assassins: What Are Viruses?](#)

**Images**

[Chromosomes: prokaryotic vs. eukaryotic organization](#)

[Prokaryotic vs. eukaryotic cells: comparison](#)

[HIV Virus](#)

[AIDS virus](#)

**Reading Passage**

[Alexander Fleming: The Accidental 'Wonder Drug'](#)

**Article**

[Acquired Immune Deficiency Syndrome](#)

[Virus](#)

**11.5** Compare and contrast the components of the two types of eukaryotic cells (plant and animal).

**Video**

[Plant Cells](#)

[Plant Cells Versus Animal Cells](#)

[Types of Cells: Plant](#)

[Identifying Structures in Cells](#)

[Types of Cells: Amoeba and Animal](#)

**Images**

[Cell, animal](#)

[Plant cell structure](#)

[Cell, plant](#)

[Cell, plant](#)

[Cell, plant](#)

[Plant Cell](#)

**Audio**



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**Molecules to Organisms: Cells –Structures and Functions, Levels of Organization**  
**Semester One**

Activities/Strategies for District Outcome 11	Text/Instructional Materials for District Outcome 11	Sample Assessment Items for District Outcome 11
<p><b>11.6</b> Relate organelle structures to a task essential to the life of a cell. (Cell specialization)</p> <p><b>Video</b>  <a href="#">Cell Differentiation</a>  <a href="#">Organelles</a>  <a href="#">Organelles</a>  <a href="#">Cell Structure and Organelles</a>  <a href="#">Cytoplasmic Cell Structures</a></p> <p><b>Images</b>  <a href="#">Division of Labor in Cells - Mitochondria</a>  <a href="#">Cell Organelles</a></p> <p><b>Audio</b>  <a href="#">The Structure of the Cell: The Cell</a></p> <p><b>11.7</b> Compare and contrast unicellular and multi-cellular eukaryotes.</p> <p><b>Video</b>  <a href="#">Unicellular Organisms</a>  <a href="#">Unicellular Nutrition</a>  <a href="#">Bacteria: A Single-Cell Organism</a>  <a href="#">Kingdom Protista: Single Cell Algae</a>  <a href="#">Multicellular Nutrition</a>  <a href="#">Many-Celled Organisms</a></p>	<p><b>Biology: The Dynamics of Life, Ancillary Materials</b></p> <p><b>Reading Essentials for Biology Manual, Chapter 7 A View of the Cell, p.68-78.</b></p> <p><b>Reteaching Skills Transparencies Manual</b>  # 9, <i>The Optical Microscope</i>.  # 10, <i>Eukaryotic Cell Structures and Organelles</i>.</p> <p><b>Interactive Chalkboard CD</b>, Chapter 7, PowerPoint slide show.</p> <p><b>Virtual Labs CD</b>, Chapter 7, <i>Cellular Pursuit</i>.</p> <p><b>Unit 3 Resources Manual, Eukaryotic Cell Structure and Organelles</b>, p.67-68.</p> <p><b>Weblinks:</b>  <a href="http://www.glencoe.com/sec/science/biology/bio2004/weblinks/index.php?abbrev=ntl">http://www.glencoe.com/sec/science/biology/bio2004/weblinks/index.php?abbrev=ntl</a>  <a href="http://www.cell-biology.com">www.cell-biology.com</a> ;  <a href="http://www.howstuffworks.com">www.howstuffworks.com</a></p> <p><b>What is a Cell?</b>  <a href="http://www.cellsalive.com">www.cellsalive.com</a>  <a href="http://www.ncb.nlm.gov">www.ncb.nlm.gov</a>.</p> <p><b>Animal and Plant Cells</b> <a href="http://www.purchon.com/biology/cells/htm">www.purchon.com/biology/cells/htm</a>.</p>	<p><b>Biology: The Dynamics of Life</b>, Reinforcement and Study Guide, Chapter 7, <i>A View of the Cell</i>, p.29-32. Chapter 8, <i>Cellular Transport and Cell Cycle</i>, p.33-36.</p> <p><b>MindJogger VideoQuiz</b>, Chapter 7.</p> <p><b>Biology: The Dynamics of Life Unit 3 Resources Manual</b>, A View of the Cell, p.47-50.</p>

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Molecules to Organisms: Cells – Stable Internal Environment/Homeostasis**  
**Semester One**

Pacing	District Core Outcome	High School Content Expectation (HSCE)	Performance Indicators
<b>Week 5</b>	<b>12.</b> Explain how cells move essential materials into/out and maintain a stable internal environment.	<p><b>B2.6a</b> – Explain that the regulatory and behavioral responses of an organism to external stimuli occur in order to maintain both short and long-term equilibrium.</p> <p><b>B2.r6d</b> – Explain how higher levels of organization result from specific complex interactions of smaller units and that their maintenance requires a constant input of energy as well as new material. (recommended)</p> <p><b>B2.r6e</b> – Analyze the body’s response to medical interventions such as organ transplants, medicines, and inoculations. (recommended)</p> <p><b>B2.3B</b> – Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.</p> <p><b>B2.3A</b> – Describe how cells function in a narrow range of physical conditions, such as temperature and pH (acidity), to perform life functions.</p>	<p>Given cells of various measurements (i.e., 1cm x 1cm x 1cm and 0.1cm x 0.1cm x 0.1cm) explain and justify each cells chance for survival.</p> <p>Explain how nutrient and waste material concentrations are regulated by the cell.</p> <p>Compare and contrast the structures and functions of organs that perform the same function: gills vs. lungs vs. membranes.</p>
<b>Week 6</b>		<p><b>B2.3C</b> – Explain how stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents.</p> <p><b>B2.4C</b> - Explain how different organisms accomplish the same results using different structural specializations.</p> <p><b>B2.4f</b> - Recognize and describe that both living and nonliving things are composed of compounds, which are themselves made up of elements joined by energy containing bonds.</p> <p><b>B2.4g</b> - Explain that some structures in the modern eukaryotic cell developed from early prokaryotes, such as mitochondria and chloroplasts.</p>	<p><b>Focus Question</b> - How do systems of specialized cells within organisms help them perform the essential functions of life?</p> <p>*Identify micro-organisms in the field of a microscope.</p>



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**Semester One**

Activities and Strategies for District Outcome 12	Text/Instructional Materials for District Outcome 12	Sample Assessment Items (Reference) for District Outcome 12
<p><b>12.1</b> Explain why multi-cellular organisms are made of many small cells instead of one large cell. (Surface-Volume Ratio) <u><a href="#">Video</a></u> <u><a href="#">Cell Size</a></u></p> <p><b>12.2</b> Describe and identify the main functions of the cell membrane. <u><a href="#">Video</a></u> <u><a href="#">The Cell Membrane &amp; Cytosol</a></u> <u><a href="#">The Cell Membrane</a></u> <u><a href="#">Images</a></u> <u><a href="#">Cellular structures: nucleus, vacuole, cytoplasm, and cell membrane</a></u></p>	<p><b><u>Biology: The Dynamics of Life</u></b> <b>Chapter 8 Cellular Transport and the Cell Cycle, p.194-219.</b> <b>Section 8.1, Cellular Transport, p.195-200.</b> <b>Section 8.2, Cell Growth and Reproduction, p.201-203.</b> <b>Section 7.2, The Plasma Membrane, p.175-178.</b> <b>Problem-Solving Lab 8.1, What Happens to the Surface Area of a Cell As Its Volume Increases?, p.203.</b></p> <p><b><u>Biology: The Dynamics of Life Ancillary Materials</u></b> <b>Lab Manual SE, Exploration 8-1, Normal and Plasmolyzed Cells.</b> <b>Section Focus Transparencies Manual, #19, Diffusion and Cell Size.</b> <b>Reteaching Skills Transparencies Manual, # 11, Active Versus Passive Transport.</b></p> <p><b>Weblinks:</b> <b><a href="http://www.glencoe.com/sec/science/biology/bio2004/weblinks/index.php?abrev=ntl">http://www.glencoe.com/sec/science/biology/bio2004/weblinks/index.php?abrev=ntl</a>.</b> <b>Cellular Biology:</b> <b>What is a Cell? <a href="http://www.ncbi.nlm.nih.gov">www.ncbi.nlm.nih.gov</a>.</b> <b>Animal and Plant Cells: <a href="http://www.purchon.com/biology/cells.htm">www.purchon.com/biology/cells.htm</a>.</b></p>	<p>Predict the direction of a dissolved substance and water movement across a cell membrane. <b><u>Biology: The Dynamics of Life SE</u></b> Chapter 8 Assessment, <i>Standardized Test Practice</i>, p. 219, Items 19-28.</p>

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**Semester One**

Activities/Strategies For District Outcome 12	Text/Instructional Materials For District Outcome 12	Sample Assessment Items (Reference) For District Outcome 12
<p><b>12.3</b> Observe and describe the difference between osmosis (movement of water) and diffusion (active/passive transport). <b>Video</b> <a href="#">Cell Membrane: Diffusion</a> <b>Images</b> <a href="#">Osmosis experiment</a> <b>Article</b> <a href="#">Osmosis</a></p> <p><b>12.4</b> Observe, describe and explain how the processes of osmosis and diffusion occur and their importance in the maintenance of a stable internal environment within the cell (Relate osmosis, active/passive transport, hypo/hyper/isotonic solutions, nutrient intake, temperature, pH and waste removal). <b>Video</b> <a href="#">Active Transport</a> <a href="#">Passive and Active Transport</a> <a href="#">Cell Membrane: Active Transport</a> <a href="#">Passive Transport</a> <a href="#">Transpiration</a> <a href="#">Tonicity</a> <b>Images</b> <a href="#">Fresh Blood in Hypertonic Solution</a> <a href="#">Cell: active transport</a> <a href="#">Cell: active transport</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>Chapter 8 Cellular Transport and the Cell Cycle, p.194-219.</b> <b>Section 8.1, Cellular Transport, p.195-200.</b> <b>MiniLab 8.1 Cell Membrane Simulation, p.198.</b> <b>Biology: The Dynamics of Life. Ancillary Materials</b> <b>Unit Resources Manual, Real World Application, Osmosis and the Case of the Sad Salad, p.83-84.</b> <b>Diffusion and Osmosis:</b> <a href="http://www.mun.ca/biology/Osmosis_Diffusion/tutor2.html">http://www.mun.ca/biology/Osmosis_Diffusion/tutor2.html</a> <a href="http://biology.arizon.edu/sciconn/lessons/mccandiess/reading.html">http://biology.arizon.edu/sciconn/lessons/mccandiess/reading.html</a> <b>Facilitated Diffusion:</b> <a href="http://www.d.umu.edu/~sclowning/membranes/diffusionanimation.html">http://www.d.umu.edu/~sclowning/membranes/diffusionanimation.html</a> <b>Activity description of Diffusion and Osmosis (with analysis):</b> <a href="http://und.nodak.edu/dept/carmich/101lab/lab4/lab4.html">http://und.nodak.edu/dept/carmich/101lab/lab4/lab4.html</a>.</p>	<p><b>MindJogger Videoquizzes, Chapter 8.</b></p>

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**Semester One**

<b>Activities/Strategies for District Core Outcome 13</b>	<b>Text/Instructional Materials for District Core Outcome 13</b>	<b>Sample Assessment Items (Reference) for District Core Outcome 13</b>
<p><b>13.5</b> Construct a model of a typical plasma membrane.</p> <p><b>Video</b> <a href="#">Cell Walls and Cell Membranes</a> <a href="#">Functions of Cell Parts</a></p> <p><b>Images</b> <a href="#">Frog Development</a></p> <p><b>13.6</b> Explain how a water soluble substance can pass through a plasma membrane.</p> <p><b>Images</b> <a href="#">Osmosis experiment</a></p> <p><b>Article</b> <a href="#">Osmosis</a></p> <p><b>13.7</b> Conduct research on the internet to determine the ability of a plasma membrane to prevent disease agents from entering a cell.</p> <p><b>Video</b> <a href="#">Why Libraries Are Important for Research</a> <a href="#">Five Steps to Researching a Paper</a> <a href="#">Defining Your Topic</a> <a href="#">Determining Your Information Needs</a> <a href="#">Finding and Retrieving Information: From a Book</a> <a href="#">Finding and Retrieving Information: In the Computer Catalog</a></p>	<p><b>Biology: The Dynamics of Life</b></p> <p><b>Chapter 7: The Discovery of Cells</b> Section 7.2 The Plasma Membrane p.175-178</p> <p><b>Chapter 34: Protection, Support and Locomotion</b> Section 34.1 Skin: The Body's Protection p.893-898</p> <p><b>Chapter 35: The Digestive and Endocrine Systems</b> Section 35.3 The Endocrine System p.929-935</p> <p><b>Chapter 36: The Nervous System</b> Section 36.1 The Nervous System p.943-950 Section 36.2 The Senses p.951-955</p> <p><b>Chapter 37: Respiration, Circulation and Excretion</b> p.970-987 Section 37.1 The Respiratory System p.971-974 Section 37.2 The Circulatory System p.975-984 Section 37.3 The Urinary System p.985-987</p> <p><b>Hands on Activities</b> <a href="#">Problem-Solving Lab 7.1</a> p.176 Skin Structure &amp; Function FOLDABLE, p.893 <a href="#">Problem-Solving Lab 34.1</a>, p.896 Systems FOLDABLE, p.971</p> <p><b>MiniLab 37.1</b>, p.981 <b>MiniLab 37.2</b>, p.987</p> <p><b>INVESTIGATE BioLab:</b> Measuring Respiration p.988-989</p> <p><b>Technology</b> <b>Interactive Chalkboard</b> CD-ROM Power Point Chapters 7, 34, 36, 36 &amp; 37 <b>MindJogger Videoquiz</b> DVD <b>ExamView Pro Test Bank</b> <b>Glencoe Puzzle Maker</b></p>	<p>*Design and construct a foldable on how the plasma membrane controls the entry and exit of substances.</p> <p>*Describe the relationship of blood pH on preventing disease agents from infecting the body.</p> <p>*Design and Construct a model of a plasma membrane.</p> <p>*Describe how biofeedback mechanisms impact homeostasis in the human body.</p> <p>*Explain how the human body is able to maintain a constant internal temperature throughout all seasons.</p>

<p><a href="#">Finding and Retrieving Information: The Reference Section</a>  <a href="#">Finding and Retrieving Information: Periodicals</a>  <a href="#">Evaluating Your Information</a>  <a href="#">Organizing Your Information: Index Cards</a>  <a href="#">Plagiarism and Information Literacy</a></p> <p><b>13.8</b> Conduct research on how the skin is affected by serious burns and summarize your research in a short written paper or power point presentation.</p> <p><b>Video</b>  <a href="#">Why Libraries Are Important for Research</a>  <a href="#">Five Steps to Researching a Paper</a>  <a href="#">Defining Your Topic</a>  <a href="#">Determining Your Information Needs</a>  <a href="#">Finding and Retrieving Information: From a Book</a>  <a href="#">Finding and Retrieving Information: In the Computer Catalog</a>  <a href="#">Finding and Retrieving Information: The Reference Section</a>  <a href="#">Finding and Retrieving Information: Periodicals</a>  <a href="#">Evaluating Your Information</a>  <a href="#">Organizing Your Information: Index Cards</a>  <a href="#">Plagiarism and Information Literacy</a></p> <p><b>13.9</b> Identify the components of human systems that function in homeostasis.</p> <p><b>Video</b>  <a href="#">Metabolism and Homeostasis</a>  <a href="#">Cell Membrane: Homeostasis</a>  <a href="#">Homeostasis: Cell Characteristics</a>  <a href="#">Equilibrium</a>  <a href="#">Dynamic Equilibrium</a>  <a href="#">Human Body Systems: The Endocrine System</a>  <a href="#">The Peripheral Nervous System: Introduction</a>  <a href="#">Diagram of Central and Peripheral Nervous Systems</a></p>	<p>(Puzzlemaker program can be downloaded from Glencoe Website)</p>	
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[Structures and Functions of the Different Parts of the Peripheral Nervous System](#)  
[Function](#)  
[Introduction to the Nervous System](#)  
[Summary of the Nervous System](#)  
[Senses and the Nervous System Working Together](#)  
[Differences Between the Nervous System and Endocrine Systems](#)  
[Human Body Systems: The Reproductive System](#)  
[Introduction: The Human Male Reproductive System](#)  
[Functions of Male Reproductive System](#)  
[Structures of the Male Reproductive System](#)  
[Introduction: The Human Female Reproductive System](#)  
[Female Reproductive System Functions](#)  
[Review of All Structures in the Female Reproductive System](#)  
[The Musculoskeletal System](#)  
[Human Body Systems: The Circulatory System](#)  
[Human Body Systems: The Digestive System](#)  
[Nervous System Control Mechanism: Negative Feedback and its Role in Maintaining Homeostasis](#)  
**Images**  
[Endocrine system](#)  
[Nervous system](#)  
[Reproductive system](#)  
[Digestive system](#)  
[Circulatory system](#)  
**Article**  
[Homeostasis](#)

**13.10** Compare and contrast how a fish, a human, and a bacteria breaths.

**Video**  
[Breathing](#)

<a href="#">Breathing versus Respiration</a> <a href="#">Pathway of a Breath of Air</a> <a href="#">Breathing</a> <a href="#">Cell Membrane: Diffusion</a> <a href="#">How Do Fish Breathe Underwater?</a> <b><a href="#">Images</a></b> <a href="#">Diffusion</a> <b><a href="#">Exploration</a></b> <a href="#">Breathing Underwater</a>		
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**Biology - Grade 9**

**Molecules to Organisms: Cells – Micro-organisms and Health**  
**Semester One**

<b>Pacing</b>	<b>District Core Outcome</b>	<b>High School Content Expectation (HSCE)</b>	<b>Performance Indicators</b>
<b>Week 7</b>		<p><b>B2.4h</b> – Describe the structures of viruses and bacteria.</p> <p><b>B2.4i</b> – Recognize that while viruses lack cellular structure, they have the genetic material to invade living cells.</p>	<p>*Given pictures/diagrams of assorted bacteria, plant (prokaryotic) and animals (eukaryotic) cells students will:</p> <ul style="list-style-type: none"> <li>-Identify the cell type.</li> <li>-Identify/label the organelles.</li> <li>-Describe the function of identified organelles.</li> </ul>
<b>Week 8</b>	<p><b>8a.</b> Inform and educate students about AIDS, including infection, transmission and preventions of the disease.</p>		<ul style="list-style-type: none"> <li>*Describe how virus and bacteria invade cells in the body.</li> <li>*List and describe the body’s defense against viral and bacterial invasions.</li> <li>*Describe and explain the structure and function of viruses as related to HIV and AIDS.</li> <li>• <a href="http://nih.gov">http://nih.gov</a></li> </ul>

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**Molecules to Organisms: Structures and Function – Growth and Development of Organisms**  
**Semester One**

Pacing	District Core Outcomes	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 9</b>	<b>Molecules to Organisms: Growth and Development of Organisms</b> <b>15.</b> Describe what happens to the genetic material as cells reproduce sexually and asexually.	<b>B2.1d</b> – Describe how, through cell division, cells can become specialized for specific functions. <b>B4.3B</b> - Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring.	<b>Focus Question</b> - How do the structure and functioning of organisms change as they grow and develop?
<b>Week 10</b>		<b>B4.3d</b> - Explain that the sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations from the offspring of two parents <b>B4.3A</b> - Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations. <b>B4.3e</b> - Recognize that genetic variation can occur from such processes as crossing over, jumping genes and deletion and duplication of genes.	<b>Focus Question</b> - How is genetic information transmitted between parent and offspring after fertilization? *How do the structure and functioning of organisms change as they grow and develop?
<b>Week 11</b>		<b>B4.3f</b> - Predict how mutations may be transferred to progeny. <b>B4.3g</b> - Explain that cellular differentiation results from gene expression and/or environmental influence.	*Explain how characteristic structure and functioning of organisms change in predictable ways as they develop from birth to old age.



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**Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms**  
**Semester One**

Activities/Strategies For District Outcome 15	Text/Instructional Materials for District Outcome 15	Sample Assessment Items (Reference) For District Outcome 15
<p><b>15.1</b> Compare and contrast chromatin and the structure of a chromosome.</p> <p><b>Video</b> <a href="#">Chromatin, Chromosomes, and DNA Subunits</a> <a href="#">Chromosomes</a> <a href="#">Chromosomes, Proteins, and DNA</a></p> <p><b>Images</b> <a href="#">Chromosomes</a> <a href="#">Chromosomes</a></p> <p><b>Article</b> <a href="#">Chromosome</a></p> <p><b>15.2</b> Compare and contrast the number of chromosomes found in the body cells and several different organisms.</p> <p><b>Video</b> <a href="#">Chromosomes and DNA</a> <a href="#">Diploid Cells</a></p> <p><b>Images</b> <a href="#">Fruit fly chromosomes</a> <a href="#">Mouse chromosomes</a> <a href="#">Zebrafish chromosomes</a></p> <p><b>15.3</b> Explain the significance of sex chromosomes.</p> <p><b>Video</b> <a href="#">Sex Chromosomes</a></p> <p><b>Audio</b> <a href="#">Heredity: Problems Using Sex Chromosomes</a></p>	<p><b>Biology: The Dynamics of Life,</b> <b>Chapter 8 Cellular Transport and the Cell Cycle, p.194-219.</b> Section 8.2, <i>Cell Growth and Reproduction</i>, p.201-210. Section 8.3, <i>Control of the Cell Cycle</i>, p.211-216.</p> <p><b>Problem-solving Lab 8.1</b>, <i>What happens to the surface area of a cell as its volume increases?</i> p.203.</p> <p><b>Problem-Solving Lab 8.2</b>, <i>How Does the Length of the Cell Cycle Vary?</i> p.204.</p> <p><b>MiniLab 8.2</b>, <i>See Asters</i>, p.209.</p> <p><b>Problem-Solving Lab 8.3</b>, <i>How Does the Incidence of Cancer Vary?</i> p.212.</p> <p><b>Investigate BioLab</b>, <i>Where is Mitosis Most Common?</i> p.214-215.</p> <p><b>Ancillary Materials</b> <b>Laboratory Manual, SE</b> Investigation 8-2, <i>How Does the Environment Affect Mitosis?</i> p.45-48.</p> <p><b>Reinforcement and Study Guide</b> Chapter 8, <i>Cell Transport and the Cell Cycle</i>, p.33-36.</p> <p><b>Interactive Chalkboard CD</b> Chapter 8 Power Point presentation. (absent student tutor)</p>	<p><b>MindJogger Videoquizzes DVD Or VHS tape</b>, Chapter 8. Supply the missing information in a partially complete cell cycle (cell reproduction).</p>

[& Sex Linkage](#)

[Heredity: Sex Chromosomes](#)

**15.4** Compare cell reproduction in prokaryotes and eukaryotes.

**Video**

[Mitosis, Meiosis, & Binary Fission](#)

[Protists & Binary Fission](#)

[Bacteria & Binary Fission](#)

[Protist Reproduction: Binary Fission](#)

[Asexual Reproduction](#)

[Kingdom Protista](#)

[Mitosis](#)

[Mitosis](#)

[Mitosis](#)

[Meiosis](#)

[Meiosis](#)

**Images**

[Cell, animal; mitosis](#)

[Cell, animal; mitosis](#)

[Cells; daughter cells from simple cell](#)

**15.5** Outline and explain the main events of the cell cycle (cell reproduction).

**Video**

[Mitosis](#)

[Mitosis](#)

[Mitosis](#)

[Interphase, Mitosis, & Cytokinesis](#)

[The Four Phases of Mitosis](#)

**Images**

[Mitosis in Plant Cell \(5 of 6\)](#)

[Mitosis: Telophase](#)

[Cell, animal; mitosis](#)

[Cell, animal; mitosis](#)

[Cell, plant; mitosis](#)

[Cell, plant; mitosis](#)

[Cell, plant; mitosis](#)

**Audio**

[The Structure of the Cell: Reproduction & Movement](#)

**15.6** Explain mitosis and describe the phases and structures involved.

**Video**

<p><a href="#">Four Stages of Mitosis</a> <a href="#">The Cell Cycle and Mitosis</a> <a href="#">Mitosis video quiz</a> <a href="#">Mitosis Phases</a></p> <p><b>Images</b> <a href="#">Mitosis; each stage defined</a> <a href="#">Mitosis: Prometaphase</a> <a href="#">Growth by mitosis</a> <a href="#">Mitosis: Metaphase</a> <a href="#">Cell, animal; mitosis</a> <a href="#">Cell, animal; mitosis</a> <a href="#">Cell, animal; mitosis</a></p> <p><b>Audio</b> <a href="#">The Structure of the Cell: Reproductive Cell Structures</a></p>		
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**Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms**  
**Semester One**

Activities/Strategies For District Outcome 15	Text/Instructional Materials For District Outcome 15	Sample Assessment Items (Reference) For District Outcome 15
<p><b>15.7</b> Summarize the events that occur during meiosis I and meiosis II.</p> <p><b>Video</b>  <a href="#">Meiosis</a>  <a href="#">Significance of the Process of Meiosis in Organisms</a>  <a href="#">Closing Remarks: Meiosis and Gamete Formation</a>  <a href="#">Introduction to Meiosis</a>  <a href="#">The Importance of Meiosis</a></p> <p><b>Images</b>  <a href="#">Meiosis: summary</a>  <a href="#">Results of meiosis</a>  <a href="#">Meiosis I: independent assortment of chromosomes</a>  <a href="#">Meiosis I: stages</a>  <a href="#">Meiosis II: anaphase II</a>  <a href="#">Meiosis I: metaphase I</a></p> <p><b>Article</b>  <a href="#">cell</a></p> <p><b>15.8</b> Explain the process of crossing-over and how it affects evolution.</p> <p><b>Video</b>  <a href="#">Increasing the Genetic Variability in Species: Crossing Over in Meiosis</a>  <a href="#">Possible Combinations of Human Alleles</a>  <a href="#">Investigating Variation in Spore Color in Sordaria Fungus</a>  <a href="#">Morgan's Discoveries About Gene Linkages</a>  <a href="#">Calculating Cross Over Value for Spores</a>  <a href="#">Resulting From Mating Different Strains of</a></p>	<p><b>Biology: The Dynamics of Life,</b>  <b>Chapter 10 Mendel and Meiosis, p.252-279.</b>            Section 10.2, <i>Meiosis</i>, p.263-273.  <b>Problem-Solving Lab 10.2,</b> <i>Can you Identify Homologous Chromosomes?</i>  <b>MiniLab 10.2,</b> <i>Modeling Crossing Over</i>, p.268.  <b>Ancillary Materials</b>  <b>Basic Concepts Transparencies,</b>            # 15, Meiosis.  <b>Laboratory Manual SE,</b> Exploration 10-1, <i>Observation of Meiosis</i>, p.53-54.  <b>Reteaching Skills Transparencies,</b>            #17, <i>Mitosis Versus Meiosis</i>.  <b>Reinforcement and Study Guide,</b>            Chapter 10, <i>Mendel and Meiosis</i>, p.43-46.  <b>Interactive Chalkboard CD,</b> Chapter 10, PowerPoint slide presentation. (absent student tutor)  <b>Virtual Lab</b>            Chapter 8, <i>How Cancer Cells can be recognized</i>.  <b>Chapter 38 Reproduction and Development, p.1001 – 1007</b>  <b>MiniLab 38.1</b> <i>Examining Sperm, Egg, and Early Embryonic Development</i>, p.1006</p>	<p><b>MindJogger Videoquiz DVD or VHS tape.</b> Chapter 10            Explain how making two copies of a six page story is analogous to mitosis. Design a power point and/or construct a foldable with graphics comparing mitosis and meiosis.</p>

[Sordaria Fungus](#)

**Images**

[Linked genes and crossing over; resulting gametes](#)

**15.9** Compare and contrast mitosis and meiosis.

**Video**

[Meiosis versus Mitosis](#)

[Closing Remarks: Comparison of Mitosis and Meiosis](#)

[Relationship Between Mitosis and Meiosis in the Testis](#)

[Scientific Research into the Processes of Mitosis and Meiosis](#)

[Comparison Between the Processes of Mitosis and Meiosis](#)

[Introduction: Comparison of Mitosis and Meiosis](#)

[Comparing Mitosis and Meiosis](#)

[Definitions of Mitosis and Meiosis](#)

[Comparing the Actions of Chromosomes in Mitosis and Meiosis](#)

[Mitosis and Meiosis in Flowering Plants](#)

**Images**

[Comparison of mitosis and meiosis](#)

**15.10** Describe how cancer arises; include genetic and environmental influences.

**Video**

[Cancer](#)

[Cancer](#)

[Cancer on the Rise in Industry Towns](#)

[Basic Facts About Cancer](#)

[Skin Cancer](#)

[Cancer Cells](#)

[Cancer Cells](#)

[DNA and the Genetics of Cancer](#)

[A Family History of Breast Cancer](#)

[Defining Cancer](#)

[Genetic Research: Identifying Carcinogens in Environment That Cause Cancer](#)

**Images**

[Abnormal cancer cells](#)

[Cancer incidence; relationship to age of onset](#)

[Cancer predisposition; recessive gene.](#)

[dominant inheritance](#)  
[Cancer cells vs. normal; loss of growth control](#)

**Article**  
[Cancer](#)

**Body Atlas**

[Body Atlas: Uterine Cancer](#)

[Body Atlas: Colon Cancer](#)

[Body Atlas: Breast Cancer](#)

[Body Atlas: Lung Cancer](#)

[Body Atlas: Prostate Cancer](#)

**15.11** Explain the stage fertilized egg cells differentiate to become an embryo.

**Video**

[Becoming an Embryo](#)

[Vertebrate Embryos](#)

[The Blastula: Formation of the Major Body Systems](#)

**Images**

[Mouse vs. human embryos: differences at gastrulation](#)

[Human Embryo](#)

[Blastocyst](#)

**Article**

[Embryology](#)

DETROIT PUBLIC SCHOOLS  
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**Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms**  
**Semester One**

Pacing	District Core Outcomes	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 12</b>	<p><b>Molecules to Organisms: Growth and Development of Organisms</b></p> <p><b>16.</b> Discuss the mechanics of inheritance and predict the outcome of various genetic crosses.</p>	<p><b>B4.1A</b> – Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location.</p> <p><b>B4.1B</b> – Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules. These genes contain the information for the production of proteins.</p> <p><b>B4.1c</b> – Differentiate between dominant, recessive, co-dominant, polygenic, and sex-linked traits.</p> <p><b>-Marry this section with the HSCE from the previous section (Mitosis and Meiosis)-</b></p>	<p><b>Problem Solving:</b></p> <p>Imagine that you work for a company that specializes in growing ornamental flowers. One day you notice a beautiful lavender flower; a color you know will be in high demand. Knowing that the plants are self-pollinating you harvest and plant the seeds. Of the 106 test plants, 78 have white flowers and 28 have lavender flowers.</p> <p><b>Question:</b></p> <p>Is there a way to produce seed that are guaranteed to produce only lavender flowers?</p> <p>Prepare a step-by step procedures, show Punnett squares and list predicted F<sub>1</sub> and P<sub>1</sub> generations with plausible genotypes of parents. Present your procedures to the class as you would a business plan.</p>
<b>Week 13</b>		<p><b>B4.1d</b> – Explain the genetic basis for Mendel’s laws of segregation and independent assortment.</p> <p><b>B4.1e</b> – Determine the genotype and phenotype of monohybrid crosses using a Punnett Square.</p> <p><b>-Marry this section with the HSCE from the previous section (Mitosis and Meiosis)-</b></p>	<p>Given a pedigree write genotypes of each individual and explain why or why not certain members inherited the trait.</p>

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**Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms Semester One**

Activities/Strategies For District Outcome 16	Text/Instructional Materials For District Outcome 16	Sample Assessment Items (Reference) For District Outcome 16
<p><b>16.1</b> Discuss Mendel's work with the garden peas and analyze his experimental design.</p> <p><b>Video</b>  <a href="#">Gregor Mendel's Research on Pea Plants and His Development of Theories of Inheritance</a>  <a href="#">Mendel's Theories About Inherited Factors Using Terms In Modern Genetics To Review Mendel's Work</a>  <a href="#">Gregor Mendel's Research and Principles The Genetic Work of Gregor Mendel Mendel's Experiments</a></p> <p><b>Images</b>  <a href="#">Mendel's Hypotheses: Dominance</a>  <a href="#">Mendel's hypotheses</a>  <a href="#">Results of Mendel s monohybrid crosses</a>  <a href="#">Mendelian inheritance; reciprocal cross for pea shape</a>  <a href="#">Pea characteristics; plant height</a></p> <p><b>Article</b>  <a href="#">Mendel, Gregor Johann</a></p> <p><b>16.2</b> Compare and analyze Mendel's two Laws of Inheritance during meiosis. (Segregation and Independent assortment) to the behavior of chromosomes.</p> <p><b>Video</b>  <a href="#">Mendel's Research and Discoveries</a>  <a href="#">Investigating Mendel's Law of Segregation</a></p>	<p><b>Biology: The Dynamics of Life,</b>  <b>Chapter 10 Mendel and Meiosis, p.252-279.</b>            Section 10.1, <i>Mendel's Laws of Heredity</i>, p.253-262.  <b>Laws of Heredity FOLDABLE</b>, p.253.  <b>MiniLab 10.1</b>, <i>Looking at Pollen</i>, p.254.  <b>Internet BioLab</b>, <i>How Can Phenotypes and Genotypes of Plants Be Determined?</i> p.274-275.  <b>Problem-Solving Lab 10.1</b>, <i>Data Analysis</i>, p.262.  <b>Teacher Demo</b>, <i>Two-Minute Chapter Launcher</i>, p.252.  <b>Revealing Misconceptions</b>, p.256.  <b>Experimental Mustard Seed Crosses Project</b>, p.257.  <b>Quick Demo</b>, <i>Inherited Traits</i>, p.259.</p> <p><b>Ancillary Materials</b>  <b>Laboratory Manual SE</b>, <i>Investigation 10-2, What Phenotypic Ratio Is Seen in a Dihybrid Cross?</i> p.55-58.  <b>Reinforcement and Study Guide Manual</b>, Chapter 10, <i>Mendel and Meiosis</i>, p.43-46.            Section Focus Transparencies Manual, #24, <i>Predicting Combinations</i>.  <b>Interactive Chalkboard CD</b>, Chapter 10, PowerPoint Slide show. (absent student tutor)</p>	<p>Diagram a pedigree and provide the gene combinations for all individuals (e.g. aa, AA, Aa, A?) given a chart with phenotypes of several generations.</p> <p><b>BioChallenges and Enrichment Manual</b>, Project 4, <i>Genetics: The Secret of Life</i>, p.14-16.</p> <p><b>Biology: The Dynamics of Life</b>            Chapter 10 Assessment, <i>Standardized Test Practice</i>, p.279 items 20-30.</p>



[Principle of Independent Assortment](#)  
[Principle of Segregation](#)  
[The Law of Segregation](#)  
[The Law of Independent Assortment](#)

**Images**

[Segregation and independent assortment of genes in meiosis](#)

**Article**

[Mendel's Laws](#)

**16.3** Explain and illustrate the principle of dominance.

**Video**

[Principle of Dominance](#)

**Images**

[Mendel's Hypotheses: Dominance](#)

**16.4** Analyze the relationship between genotype and phenotype.

**Videos**

[Introduction: Chromosomal Basis of Inheritance](#)

[Mendel's Theories About Inherited Factors](#)

[Punnett's Contributions to Genetics:](#)

[Development of a Tool to Predict the](#)

[Outcomes of Matings](#)

[Diversity of Human Species](#)

[Morgan's Discoveries About Gene Linkages](#)

[Research on Gene Mapping](#)

[Introduction: Dihybrid Crosses](#)

[Basic Difference Between Mendelian Genetics and Population Genetics](#)

[Incomplete Dominance in Humans and Plants](#)

[Environmental Factors Which Influence the Expression of Traits](#)

**Images**

[Phenotype vs. genotype: definitions, pea illustration](#)

[Hypothetical population: phenotypes and genotypes](#)

[Phenotype and genotype](#)

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**Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms**  
**Semester One**

Activities/Strategies For District Outcome 16	Text/Instructional Materials For District Outcome 16	Sample Assessment Items (Reference) For District Outcome 16
<p><b>16.5</b> Construct Punnett squares to predict the outcome of monohybrid and dihybrid crosses.</p> <p><b>Video</b>  <a href="#">Closing Remarks: Classical Genetics and Monohybrid Crosses</a>  <a href="#">Introduction: Classical Genetics and Monohybrid Crosses</a>  <a href="#">Introduction: Dihybrid Crosses</a>  <a href="#">Simulating a Dihybrid Cross</a>  <a href="#">Punnett's Contributions to Genetics: Development of a Tool to Predict the Outcomes of Matings</a>  <a href="#">Punnett's Square</a></p> <p><b>Images</b>  <a href="#">Monohybrid cross: F- pea shape, height, color</a>  <a href="#">Monohybrid cross (F-) for flower color</a>  <a href="#">Results of Mendel s monohybrid crosses</a>  <a href="#">Dihybrid cross: Punnett square</a>  <a href="#">Collie/Newfoundland F2</a></p> <p><b>Audio</b>  <a href="#">Genetics: Dihybrid Crosses</a>  <a href="#">Genetics: Working With A Punnett Square</a></p> <p><b>16.6</b> Describe inheritance patterns that exist other than simple dominance. i.e., incomplete dominance, multiple alleles, co-dominance, continuous variation and environmental.</p> <p><b>Video</b>  <a href="#">Incomplete Dominance in Humans and Plants</a></p>	<p><b>Biology: The Dynamics of Life, SE</b>  <b>Chapter 12 Patterns of Heredity and Human Genetics, p.308-335.</b>            Section 12.2, <i>When Heredity Follows Different Rules</i>, p.315-322.            Section 12.3, <i>Complex Inheritance of Human Traits</i>, p.323-329.  <b>Problem-Solving Lab 12.2</b>, <i>How is Coat Color in Rabbits Inherited?</i> p.318.  <b>Problem-Solving Lab 12.3</b>, <i>How is Duchene's Muscular Dystrophy Inherited?</i> p.326.  <b>MiniLab 12.2</b>, <i>Detecting Colors and Patterns in Eyes</i>, p.27.  <b>Virtual Lab Chapter 12</b> How can Sex-Linked Traits be Identified?  <b>Ancillary Materials</b>  <b>Basic Concepts Transparencies Manual</b>, #14, <i>Monohybrid Cross</i>.  <b>Laboratory Manual SE</b>, Exploration 12-1, <i>Determination of Genotypes from Phenotypes in Humans</i>, p.67-70.            Investigation 12-2, <i>How Can Karyotype Analysis Detect Genetic Disorders?</i> p.71-74.  <b>Virtual Labs, CD</b>, Chapter 10, <i>Punnett Squares</i>.  <b>Reading Essentials for Biology Manual</b>, Chapter 12, Sections 12-2 and 12-3, p.128-134.  <b>Interactive Chalkboard CD</b>, Chapter 12, PowerPoint slide show. (absent student tutor)  <b>Chapter 12</b> Section 12.1, <i>Mendelian Inheritance of Human Traits</i>, p.309-314.  <b>MiniLab 12.1</b>, <i>Illustrating a Pedigree</i>, p.310.  <b>Problem-Solving Lab 12.1</b>, <i>What Are the Chances?</i> p.311.</p>	<p><b>Biology: The Dynamics of Life</b>            Chapter 12 Assessment, <i>Standardized Test Practice</i>, p.335, Items 20-27.            Design and construct a pedigree chart tracing the path of a sex linked trait in three generations of a family.</p>

[Incomplete Dominance in Snapdragons](#)  
[Multiple Alleles and Co-Dominance in Human Blood Types](#)  
[Reviewing Key Terms That Relate to Patterns of Inheritance](#)

**Images**

[Polygenic vs. multiple alleles \(F2 results\)](#)  
[Multiple alleles of one gene](#)  
[Polygenic inheritance problem: multiple genes or alleles?](#)

**16.7** Explain what gene (deletion, duplication, inversion and translocation) mutations are and how they can affect an organisms phenotype.

**Video**

[Mutation](#)  
[Damaged Fanconi Gene](#)

**Images**

[Gene to protein: understanding effects of mutations](#)  
[Translocation mutations](#)  
[Translocation Mutation](#)

**16.8** Given a karyotype predict the possible genetic disorder.

**Video**

[Using Karyotypes to Locate Genetic Alterations](#)  
[Karyotype: A Key to the Study of Sex-Linked Inheritance](#)  
[Identifying Genetic Abnormalities and Providing Genetic Counselling for Families](#)

**Images**

[Karyotype](#)  
[Preparing a Karyotype](#)  
[Preparing a karyotype](#)  
[Preparing a Karyotype](#)

**16.9** Construct and interpret pedigrees.

**Video**

[Organizing Information About Sex-Linked Inheritance in Pedigree Charts](#)

[Pedigree Chart and Family Group Sheet](#)

**Images**

[Colorblindness pedigrees; X-linked recessive trait](#)

[Autosomal dominant trait; pedigree](#)

[Pedigree analysis; explanation of symbols](#)

[Autosomal dominant trait; pedigrees](#)

[Anonymous pedigree](#)

[Pedigree of trait that skips generation](#)

[Pedigree: offspring](#)

[Pedigree: individuals](#)

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**Molecules to Organisms: Growth and Development-HereditY – Structure, Expression and Technology**  
**Semester One**

Pacing	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 14</b>	17. Explain how new traits may arise in individuals through changes in genetic material (DNA) and environmental factors	<p><b>B4.2A</b> – Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (non-inherited mutations).</p> <p><b>B4.2B</b> – Recognize that every species has its own characteristic DNA sequence.</p> <p><b>Include this section with the HSCE from the previous sections (Mitosis and Meiosis and HereditY – Fundamental Genetics)</b></p>	<p>Construct a DNA molecule model and use a multimedia presentation to explain its structure and function. Construct a model showing gene expression in eukaryotes and provide an explanation of the process. Research and debate the issue of genetic engineered crops and/or medicines and their risks/benefits to society.</p>
<b>Week 15</b>		<p><b>B4.2C</b> – Describe the structure and function of DNA.</p> <p><b>B4.2D</b> – Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other).</p> <p><b>B4.2E</b> – Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals.</p> <p><b>Include this section with the HSCE from the previous sections (Mitosis and Meiosis and HereditY – Fundamental Genetics)</b></p>	<p>Debate the issue on genetically modified (GM) foods and or genetically engineered medicines. Diagram how a clone or transgenic organism is produced. Create a model of a transgenic organism (bacteria, plant or animal) and describe what gene or genes were inserted. Also explain how the gene(s) affect the phenotype and how the new phenotype is beneficial.</p>

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**Molecules to Organisms: Growth and Development-Heredit - Structure, Expression and Technology**  
**Semester One**

<b>Week 16</b>	<b>Molecules to Organisms: Grow and Develop - Heredit - Structure, Expression and Technology</b> 17. Explain how new traits may arise in individuals through changes in genetic material (DNA) and environmental factors.	<b>B4.r5a</b> – Explain how recombinant DNA technology allows scientists to analyze the structure and function of genes. (recommended) <b>B4.r5b</b> – Evaluate the advantages and disadvantages of human manipulation of DNA. (recommended)	* List and describe the process of mitosis and apply the results to familiar living organisms *Explain how the process of mitosis occurs and how mitosis produces multi-cellular organisms.
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**Molecules to Organisms: Growth and Development-Hereditry – Structure, Expression and Technology**  
**Semester One**

<p style="text-align: center;"><b>Activities/Strategies For District Outcome 17</b></p>	<p style="text-align: center;"><b>Text/Instructional Materials For District Outcome 17</b></p>	<p style="text-align: center;"><b>Sample Assessment Items (Reference) For District Outcome 17</b></p>
<p><b>17.1</b> Create a timeline of the events that led to the identification of DNA.</p> <p><b>Video</b>  <a href="#">Rosalind Franklin and Maurice Wilkins: X-Ray Crystallography of DNA</a>  <a href="#">Main Points in the Discovery of DNA</a>  <a href="#">Friedrich Meischer: First to Isolate DNA</a>  <a href="#">Frederick Griffith: Discovery of the "Transforming Principle"</a>  <a href="#">Oswald Avery, Colin MacLeod and Maclyn McCarty: Confirming DNA is the Transforming Principle</a>  <a href="#">Alfred Hershey and Martha Chase: Acceptance Within Scientific Community of DNA as Genetic Material</a>  <a href="#">P.A. Levene: DNA Composition of 4 Nitrogen Bases and Deoxyribose Sugar</a>  <a href="#">Erwin Chargaff: DNA is Not Equal For All Species and Ratio of Bases Varies Among Species</a>  <a href="#">James Watson and Francis Crick: DNA Molecule Has the Form of a Double Helix</a></p> <p><b>17.2</b> Describe and construct a model of the DNA molecule.</p> <p><b>Video</b>  <a href="#">DNA</a>  <a href="#">The Riddle of Life: DNA</a>  <a href="#">What Is DNA?</a>  <a href="#">DNA Structure and Function</a>  <a href="#">Understanding DNA</a>  <a href="#">Determining DNA's Structure</a>  <a href="#">Recipes of Life: The Structure of DNA</a></p>	<p><b>Biology: The Dynamics of Life,</b>  <b>Chapter 11 DNA and Genes, p.280-307.</b> Section 11.1, <i>DNA: the Molecule of Heredity</i>, p.281-286.  <b>Problem-Solving Lab 11.1,</b> <i>What does chemical analysis reveal about DNA?</i> p.283.  <b>TE Additional Lab,</b> <i>Gene and Chromosome Size</i>, p.282-283.  <b>Using Models,</b> <i>DNA Sequence</i>, p.285.  <b>Quick Demo,</b> p.285.  <b>Project, Flip Books: Visual Spatial,</b> p.286.</p> <p><b>Ancillary Materials</b>  <b>Basic Concepts Transparencies,</b>  #16, DNA Replication.  <b>Bio-Challenge and Enrichment Manual,</b> <i>Genetics: The Secret of Life</i>, p.13-16.  <b>Forensics and Biotechnology Lab Manual,</b> Lab 2, <i>How can you extract DNA from Cells?</i> p.13-14.  <b>Reinforcement and Study Guide,</b> Chapter 11, <i>DNA and Genes</i>, p.47-50.</p>	<p>Design, create and present to the class, a PowerPoint presentation on the structure of the DNA molecule. Write a story about becoming a nitrogen base and being involved in DNA replication. Explain the events that happen from the beginning to the end. Must include knowledge of the DNA replication process and appropriate scientific vocabulary in the story.</p>

[Structure and Sequence of DNA Molecules](#)

The Double Helix

**Images**

[DNA Double Helix](#)

[DNA double helix](#)

[Molecular model](#)

**Article**

[DNA](#)

**17.3** Summarize the process of DNA replication.

**Video**

[DNA Replication](#)

[The Cell Cycle: Replication](#)

[Closing Remarks: DNA Replication](#)

[How a Specific Sequence in a DNA Molecule is Replicated to Create an Identical Copy of Itself](#)

[DNA Replication](#)

**Images**

[Initial stages of DNA replication: proteins involved](#)

[Nucleus function: DNA replication](#)

[DNA replication: separated strands as templates](#)

[Later stages of DNA replication: proteins involved](#)

[Lagging Strand Replication](#)

**Animation**

[DNA](#)



DETROIT PUBLIC SCHOOLS  
OFFICE OF SCIENTIFIC STUDIES  
**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Molecules to Organisms: Growth and Development-Heredity – Structure, Expression and Technology**  
**Semester One**

Activities/Strategies For District Outcome 17	Text/Instructional Materials For District Outcome 17	Sample Assessment Items (Reference) For District Outcome 17
<p><b>17.4</b> Analyze the importance of protein in the formation of the genetic code.</p> <p><b>Video</b> <a href="#">Proteins, Amino Acids, and Messenger RNA</a> <a href="#">The Role of Genetic Code in the Synthesis of Proteins and Effects of Mutations in the Genetic Code</a> <a href="#">Structures and Functions of Different Proteins in the Body</a> <a href="#">The Process of Protein Synthesis</a></p> <p><b>Images</b> <a href="#">Information flow: gene to protein</a> <a href="#">DNA to RNA to protein; 1D code to 3D structure</a> <a href="#">Gene structure; coding and regulatory regions</a></p> <p><b>17.5</b> Analyze the relationship between transcription and translation.</p> <p><b>Video</b> <a href="#">Exceptions to the Rules of Transcription</a> <a href="#">Simulating the Process of Transcription With Models</a> <a href="#">Introduction: Transcription of DNA to Messenger RNA</a> <a href="#">Closing Remarks: Transcription of DNA to Messenger RNA</a> <a href="#">Review of the Processes of Transcription and Translation of mRNA</a> <a href="#">Translation</a> <a href="#">Introduction: Translation and Protein Synthesis</a> <a href="#">RNA Polymerase and Transcription</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>Chapter 11 DNA and Genes, p.280-307.</b> Section 11.2, <i>From DNA to Protein</i>, pp. 288-295. <b>Problem-Solving Lab 11.2</b>, <i>How Many Nitrogenous Bases Determine An Amino Acid?</i> p.291. <b>MiniLab 11.1</b>, <i>Transcribe and Translate</i>, p.293. <b>Protein Synthesis FOLDABLE</b>, p. 288.</p> <p><b>Ancillary Materials</b> <b>Basic Concepts Transparencies</b>, #16, DNA Replication, #17, DNA Transcription, #18, RNA Translation. <b>Forensics and Biotechnology Lab Manual</b>, Lab 4, <i>How can you transcribe and translate a gene?</i> P.19-22. <b>Reading Essentials for Biology Manual</b>, Chapter 11, Section 11.2, <i>From DNA to Proteins</i>, p.118-123. <b>Interactive Chalkboard CD</b>, Chapter 12 PowerPoint presentation. (absent student tutor)</p>	<p><b>Biology: The Dynamics of Life SE</b> Chapter 11 Assessment, <i>Standardized Test Practice</i>, items # 20-25, p.307. Each student will pick from a pile of cards marked pro or con for genetically engineered medicine. Students will form groups that will prepare and debate the issue or write a position paper with factual information found in the research. <b>Topic:</b> Show how a beneficial trait can become part of the genetic material in members of a population.</p>

<p><b><u>Images</u></b> <a href="#">Direction of transcription</a> <a href="#">Regulation of transcription; regulatory protein binding</a> <a href="#">Transcription overview</a> <a href="#">Transcription: 5' to 3' direction of RNA formation</a> <a href="#">Nucleus: Transcription and Processing</a> <a href="#">Nucleus: Transcription and Processing</a></p> <p><b>17.6</b> Describe how RNA is made and the role it plays in gene expression (transcription).</p> <p><b><u>Video</u></b> <a href="#">RNA's Role in Creating Life</a> <a href="#">What Is RNA?</a> <a href="#">The Nucleus, DNA, &amp; RNA</a> <a href="#">What is the Difference Between the Sugars in DNA and RNA?</a> <a href="#">Comparing Characteristics of DNA and RNA (Sugar, Strands, Size, Site, Type, Base)</a> <a href="#">What is the Role of RNA?</a> <a href="#">How Does RNA Know Where to Start Coding From a DNA Molecule?</a> <a href="#">How is RNA Different From DNA?</a> <a href="#">Messenger RNA: Transcribing the Message</a></p> <p><b><u>Images</u></b> <a href="#">RNA</a> <a href="#">RNA</a> <a href="#">RNA</a> <a href="#">RNA</a> <a href="#">Cell with ribosomes and RNA highlighted</a> <a href="#">Removal of RNA Primers</a></p> <p><b><u>Article</u></b> <a href="#">RNA</a></p>		
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DETROIT PUBLIC SCHOOLS  
OFFICE OF SCIENTIFIC STUDIES  
**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Molecules to Organisms: Growth and Development-Hereditry – Structure, Expression and Technology**  
**Semester One**

Activities/Strategies For District Outcome 17	Text/Instructional Materials For District Outcome 17	Sample Assessment Items (Reference) For District Outcome 17
<p><b>17.7</b> Define and model steps in Genetic Engineering.</p> <p><b>Video</b>  <a href="#">Genetic engineering</a>  <a href="#">Genetic engineering</a>  <a href="#">Genetic engineering</a>  <a href="#">History of Genetic Engineering</a>  <a href="#">Genetic Engineering &amp; Research</a></p> <p><b>Article</b>  <a href="#">Genetic Engineering</a></p> <p><b>17.8</b> Explain the goals of the Genome Project.</p> <p><b>Video</b>  <a href="#">The Human Genome Project</a>  <a href="#">Mapping the Human Genome</a>  <a href="#">DNA and the Human Genome Project</a>  <a href="#">Completing the Human Genome Project</a>  <a href="#">Race to Finish the Human Genome Project</a>  <a href="#">Explaining the Human Genome Project</a>  <a href="#">The Human Genome Project</a>  <a href="#">Human Genome Project: What are the Objectives, Predicted Costs and Time Span of the Project?</a>  <a href="#">Human Genome Project: What Are the Implications of This Project on Society?</a>  <a href="#">Human Genome Project: How Does the Mapping Process Work?</a></p>	<p><b>Biology: The Dynamics of Life, Chapter 13 Genetic Technology, p.336-359.</b>            Section 13.2, p.341-348.            Section 13.3, <i>The Human Genome</i>, p.349-353.  <b>MiniLab 13.1</b>, <i>Matching Restriction Enzymes to Cleavage Sites</i>, p.343.  <b>Investigate BioLab</b>, <i>Modeling Recombinant DNA</i>, p.354-355.  <b>Problem-Solving Lab 13.2</b>, <i>How might gene transfer be verified?</i> p.347  <b>TE</b> Quick Demo, <i>Genetic Technology</i>, p.342.            Challenge Activity, <i>Knockout Mice</i>, p.344.            Using Models, <i>DNA Banding Patterns</i>, p.345.</p> <p><b>Ancillary Materials</b>  <b>Basic Concepts Transparencies</b>, #19, Recombinant DNA.  <b>Laboratory Manual SE</b>, Exploration 13-2, <i>DNA Sequencing</i> p.79-82.  <b>Reteaching Skills Transparencies</b>, #22, <i>Recombinant DNA Technique</i>.  <b>Section Focus Transparencies</b>, #34, <i>Mapping Human Genes</i>.  <b>Virtual Labs CD</b>, Chapter 13, <i>Biotechnology, Gene Splicing and Tracking Grissles</i>  <b>Interactive Chalkboard CD</b>, Chapter 13, PowerPoint Slide show. (absent student tutor)</p>	<p>Construct a flow chart showing the steps in genetic engineering.            Order the steps in producing recombinant DNA in a bacterial plasmid. (see p.348, Skill Review 6)</p> <p><b>Biology: The Dynamics of Life, Ancillary Materials</b>            Reinforcement and Study Guide, Chapter 13, <i>Genetic Technology</i>, p.55-58.  <b>MindJogger VideoQuiz DVD or VHS tapes</b>, <i>Chapter 13 Video quiz</i>            Reviewing Biology Manual, Chapter 13, p.26-28.  <b>Relate the cloning procedure to meiosis and fertilization.</b></p>

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Molecules to Organisms: Growth and Development-Hereditry – Structure, Expression and  
Technology Semester One**

<p style="text-align: center;"><b>Activities/Strategies For District Outcome 17</b></p>	<p style="text-align: center;"><b>Text/Instructional Materials For District Outcome 17</b></p>	<p style="text-align: center;"><b>Sample Assessment Items (Reference) For District Outcome 17</b></p>
<p><b>17.9</b> Describe how genetic engineering can benefit humans. <b>Video</b> <a href="#">Genetic Engineering and Wheat</a> <a href="#">Genetic Engineering and Agriculture</a> <a href="#">Genetically Engineered Food</a> <a href="#">Vascular Disease: Using Genes to Regenerate Tissue</a></p> <p><b>17.10</b> Debate the positive and negative effects of human manipulation in DNA. <b>Video</b> <a href="#">Genetic Engineering and Private Companies</a> <a href="#">Closing Remarks: Manipulating DNA</a> <a href="#">Transgenics: Manipulating Genetics</a> <a href="#">Understanding the Impact of Gene Alteration</a> <a href="#">Gene Therapy</a> <a href="#">Gene Therapy: Transforming the Human Body through Genetic Drugs</a> <a href="#">Studying Genes to Find a Cure for Cystic Fibrosis</a> <b>Images</b> <a href="#">Cystic fibrosis: potential body sites for gene therapy</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>MiniLab 13.2</b>, <i>Storing the Human Genome</i>, p.350. <b>Problem-Solving Lab 13.3</b>, <i>How is identification made from a DNA fingerprint?</i> p.353. <b>Forensics and Biotechnology Lab Manual SE</b>, Lab 3, <i>How can you transform cells with new DNA?</i> p.15-18. <b>Videodiscovery: Genetics</b></p>	<p>Research genetically engineered foods or/and medicines and debate the pros and cons. Research how genetic engineering techniques have been used to increase crop yield and improve livestock productivity. <b>Biology: The Dynamics of Life, SE</b> Unit 4 Review, <i>Standardized Test Practice, Constructed Response/Grid In</i>, p.364-365.</p>

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Cell: Structures and Function – Cell Energy and Dynamics - Photosynthesis and Respiration**  
**Semester One**

Pacing	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 17</b>	<b>Final Exams</b>	<b>Final Projects</b>	
<b>Week 18</b>	<p><b>14.</b> Describe how photosynthesis and respiration produce products used to synthesize macromolecules.</p>	<p><b>B2.2A</b> – Explain how carbon can join to other carbon atoms in chains and rings to form large and complex molecules.</p> <p><b>B2.2B</b> – Recognize the six most common elements in organic molecules (C,H,N,O,P,S).</p> <p><b>B2.2C</b> – Describe the composition of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).</p> <p><b>B2.2D</b> – Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.</p> <p><b>B2.2E</b> – Describe how dehydration and hydrolysis relate to organic molecules.</p> <p><b>B2.5e</b> – Explain the interrelated nature of photosynthesis and cellular respiration in terms of ATP synthesis and degradation.</p> <p><b>B2.5f</b> – Relate plant structures and functions to the process of photosynthesis and respiration.</p> <p><b>B2.5g</b> – Compare and contrast plant and animal cells.</p> <p><b>B2.5h</b> – Explain the role of cell membranes as highly selective barrier (diffusion, osmosis, and active transport).</p> <p><b>B2.5i</b> – Relate cell parts/organelles to their function.</p>	<p>Given a food chain, containing a producer and consumer, explain how energy is exchanged to produce building blocks for macromolecules.</p>

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Cell: Structures and Function–Energy Transformations**  
**Semester One**

<p style="text-align: center;"><b>Activities/Strategies For District Outcome 14</b></p>	<p style="text-align: center;"><b>Text/Instructional Materials For District Outcome 14</b></p>	<p style="text-align: center;"><b>Sample Assessment Items (Reference) For District Outcome 14</b></p>
<p><b>14.1</b> Explain how organisms containing chlorophyll capture sunlight, convert it to energy (ATP/NADPH) and then use it to synthesize organic molecules (carbon based compounds) – Photosynthesis.</p> <p><b>Video</b> <a href="#">Cellular Energy: Photosynthesis</a> <a href="#">The Photosynthesis Equation</a> <a href="#">Photosynthesis</a></p> <p><b>Images</b> <a href="#">Photosynthesis; role of ATP and ADP</a> <a href="#">Photosynthesis; role of ATP and ADP</a> <a href="#">Photosynthesis equation</a></p> <p><b>Article</b> <a href="#">Photosynthesis</a></p> <p><b>Audio</b></p> <p><b>14.2</b> Explain how the mitochondria use glucose to produce ATP when oxygen is present or lactic acid when oxygen is not present – Cellular Respiration.</p> <p><b>Video</b> <a href="#">Cellular Respiration</a> <a href="#">A Better Understanding of Respiration</a></p> <p><b>Images</b> <a href="#">Photosynthesis; compared with aerobic cellular respiration</a></p>	<p><b>Biology: The Dynamics of Life,</b> <b>Chapter 9 Energy in a Cell, p.220 – 243.</b> Section 9.2, <i>Photosynthesis: Trapping the Suns Energy</i>, p.225-230. Section 9.3, <i>Getting Energy to Make ATP</i>, p.231-237. <b>MiniLab 9.1,</b> <i>Separating Pigments</i>, p.226. <b>Internet BioLab,</b> <i>What Factors Influence Photosynthesis?</i> p.238-239. <b>MiniLab 9.2,</b> <i>Use Isotopes to Understand Photosynthesis</i>, p.228. <b>Problem-Solving Lab 9.2,</b> <i>Cellular Respiration or Fermentation</i>, p.235. <b>MiniLab 9.3,</b> <i>Determine if Apple Juice Ferments</i>, p.236.</p> <p><b>Ancillary Materials</b> <b>Basic Concepts Transparencies</b> #12, Photosynthesis #13, Respiration</p> <p><b>Reading Essentials for Biology Manual</b> 9.1 The Need for Energy, p.89-91. 9.2 Photosynthesis: Trapping the Suns Energy, p.92-95. 9.3 Getting Energy to Make ATP, p.96-99.</p> <p><b>Section Focus Transparencies</b> #22, Photosynthesis #23, Cellular Respiration</p>	<p>Construct concept diagrams for photosynthesis and cellular respiration. Design and construct a chart comparing the processes of photosynthesis and respiration.</p> <p><b>Biology: The Dynamics of Life</b> Chapter 9 Assessment, <i>Standardized Test Practice</i>, p.243 items 20-25. Unit 3 Review, <i>Standardized Test Practice</i>, p.248-249 items 1-21.</p>

**14.3** Compare and contrast photosynthesis and respiration and analyze their importance to the cells survival, (and ultimately the organisms' survival).

**Video**

Cellular Respiration

Glycolysis and Cellular Respiration

Photosynthesis

Seaweed and Photosynthesis

**Images**

[Photosynthesis and respiration, relationship between](#)

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Ecosystems – Photosynthesis and Respiration**  
**Semester Two**

Pacing	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 19</b>	<b>14.</b> Describe how photosynthesis and respiration produce products used to synthesize macromolecules. (Review)	<p><b>B2.2A</b> – Explain how carbon can join to other carbon atoms in chains and rings to form large and complex molecules.</p> <p><b>B2.2B</b> – Recognize the six most common elements in organic molecules (C,H,N,O,P,S).</p> <p><b>B2.2C</b> – Describe the composition of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).</p> <p><b>B2.2D</b> – Explain the general structure and primary functions of the major complex organic molecules that compose living organisms.</p> <p><b>B2.2E</b> – Describe how dehydration and hydrolysis relate to organic molecules.</p> <p><b>B2.5e</b> – Explain the interrelated nature of photosynthesis and cellular respiration in terms of ATP synthesis and degradation.</p> <p><b>B2.5f</b> – Relate plant structures and functions to the process of photosynthesis and respiration.</p> <p><b>B2.5g</b> – Compare and contrast plant and animal cells.</p> <p><b>B2.5h</b> – Explain the role of cell membranes as highly selective barrier (diffusion, osmosis, and active transport).</p> <p><b>B2.5i</b> – Relate cell parts/organelles to their function.</p>	Given a food chain, containing a producer and consumer, explain how energy is exchanged to produce building blocks for macromolecules.



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**Biology - Grade 9**

**Ecosystems – Photosynthesis and Respiration**  
**Semester Two**

Activities/Strategies For District Outcome 14	Text/Instructional Materials For District Outcome 14	Sample Assessment Items (Reference) For District Outcome 14
<p><b>14.1</b> Explain how organisms containing chlorophyll capture sunlight, convert it to energy (ATP/NADPH) and then use it to synthesize organic molecules (carbon based compounds) – Photosynthesis.</p> <p><b>Video</b> From Food to ATP <a href="#">Photosynthesis Reaction</a> <a href="#">Dark Reactions of Photosynthesis</a></p> <p><b>Images</b> <a href="#">Photosynthesis</a> <a href="#">Photosynthesis (2)</a></p> <p><b>14.2</b> Explain how the mitochondria use glucose to produce ATP when oxygen is present or lactic acid when oxygen is not present – Cellular Respiration.</p> <p><b>Video</b> Metabolic Pathways <a href="#">Aerobic Cellular Respiration</a></p> <p><b>Images</b> Photosynthesis; compared with aerobic cellular respiration</p> <p><b>14.3</b> Compare and contrast photosynthesis and respiration and analyze their importance to the cells survival, (and ultimately the organisms survival).</p> <p><b>Video</b> <a href="#">Plant Cells: Chloroplasts &amp; Photosynthesis</a> <a href="#">Anaerobic Respiration</a></p>	<p><b>Biology: The Dynamics of Life,</b> <b>Chapter 9 Energy in a Cell, pp. 220 – 243.</b> Section 9.2, <i>Photosynthesis: Trapping the Suns Energy</i>, pp. 225-230. Section 9.3, <i>Getting Energy to Make ATP</i>, pp. 231-237. <b>Create a Garden - <a href="http://4hgarden.msu.edu/">http://4hgarden.msu.edu/</a>; <a href="http://aggie-horticulture.tamu.edu/kinder/sgardens.html">http://aggie-horticulture.tamu.edu/kinder/sgardens.html</a></b></p> <p><b>MiniLab 9.1,</b> <i>Separating Pigments</i>, p. 226. <b>Internet BioLab,</b> <i>What Factors Influence Photosynthesis?</i>, pp. 238-239. <b>MiniLab 9.2,</b> <i>Use Isotopes to Understand Photosynthesis</i>, p. 228. <b>Problem-Solving Lab 9.2,</b> <i>Cellular Respiration or Fermentation</i>, p. 235. <b>MiniLab 9.3,</b> <i>Determine if Apple Juice Ferments</i>, p. 236.</p> <p><b>Ancillary Materials</b> <b>Basic Concepts Transparencies</b> #12, Photosynthesis #13, Respiration</p> <p><b>Reading Essentials for Biology Manual</b> 9.1 The Need for Energy, pp. 89-91. 9.2 Photosynthesis: Trapping the Suns Energy, pp. 92-95. 9.3 Getting Energy to Make ATP, pp. 96-99.</p> <p><b>Section Focus Transparencies</b> #22, Photosynthesis #23, Cellular Respiration</p>	<p>Construct concept diagrams for photosynthesis and cellular respiration. Design and construct a chart comparing the processes of photosynthesis and respiration.</p> <p><b>Biology: The Dynamics of Life</b> Chapter 9 Assessment, <i>Standardized Test Practice</i>, p. 243 items 20-25. Unit 3 Review, <i>Standardized Test Practice</i>, pp. 248-249 items 1-21.</p>

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Ecosystems – Energy Transformation and Flow of Energy**  
**Semester Two**

	<b>District Core Outcome</b>	<b>High School Content Expectations (HSCE)</b>	<b>Performance Indicators</b>
<b>Week 20</b>	1. Identify types of energy transformation in an ecosystem and predict the cause and effect relationships.	<p><b>B3.1C</b> – Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.</p> <p><b>B3.3A</b> – Use a food web to identify and distinguish producers, consumers, and decomposers and explain the transfer of energy through trophic levels.</p>	<p>*Explain how abiotic and biotic factors can be altered or adjusted to get the optimum energy necessary to promote life within the ecosystem.</p> <p>*Develop a scenario where a biome is threatened by a major environmental catastrophe and explain the flow of energy and the recycled nutrients in the biome.</p> <p>*Develop a method to quantitatively measure the lost of energy as it is transformed from one form to another.</p>
<b>Week 21</b>		<b>B3.3b</b> – Describe environmental processes (e.g., the carbon and nitrogen cycles) and their role in processing matter crucial for sustaining life.	*Describe each of the biocycles from organism to environment and back.
<b>Week 22</b>	2. Describe and explain for living organisms the energy transformations and changes in matter and energy involving heat, i.e., photosynthesis, respiration, fermentation, calories, kilocalories, temperatures.	<p><b>B3.2A</b> – Identify how energy is stored in an ecosystem.</p> <p><b>B3.2B</b> – Describe energy transfer through an ecosystem, accounting for energy lost to the environment as heat.</p>	

DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9 (Draft 9.2.10)**

**Ecosystems – Energy Transformation and Flow of Energy**  
**Semester Two**

<b>Week 23</b>		<p><b>B3.2C</b> – Draw the flow of energy through an ecosystem. Predict changes in the food web when one or more organisms are removed.</p> <p><b>B3.1A</b> – Describe how organisms acquire energy directly or indirectly from sunlight.</p>	
<b>Week 24</b>	<p><b>3.</b> Describe and draw the various types of food webs found in aquatic and terrestrial ecosystems and relate these to habitat and niche adaptation, showing the flow of energy. Predict changes when one or more organisms are removed.</p>	<p><b>B3.1B</b> – Illustrate and describe the energy conversions that occur during photosynthesis and respiration.</p> <p><b>B3.1D</b> – Explain how living organisms gain and use mass through the processes of photosynthesis and respiration.</p>	
<b>Week 25</b>		<p><b>B3.1E</b> – Write the chemical equation for photosynthesis and cellular respiration and explain in words what they mean.</p> <p><b>B3.1F</b> – Summarize the process of photosynthesis.</p>	

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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9 (Draft 9.2.10)**

**Ecosystems – Energy Transformation and Flow of Energy**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>Begin “Ecosystem in a jar” lab (Unit 2 Resources Manual)</b>, pp. 7-8 in order to facilitate future data collection.</p> <p><b>1.1</b> Identify and describe the types/forms of energy.</p> <p><b>Video</b>  <a href="#">Kinds and Forms of Energy</a>  <a href="#">Kinetic and Potential Energy</a>  <a href="#">Nuclear Energy</a>  <a href="#">Chemical Energy</a>  <a href="#">Sound Energy</a>  <a href="#">The Energy of Heat</a>  <a href="#">Energy Exchanges</a>  <a href="#">Energy Around Us</a>  <a href="#">Potential Energy</a>  <a href="#">Potential Energy and Kinetic Energy</a>  <a href="#">Kinetic and Potential Energy</a>  <a href="#">Potential and Kinetic Energy</a></p> <p><b>Images</b>  <a href="#">mechanical energy_S01852_SDD</a>  <a href="#">Nuclear Power Plant</a>  <a href="#">Geothermal Energy</a>  <a href="#">Wind Power Plants</a>  <a href="#">Wind Power Plants</a>  <a href="#">Geothermal Energy</a>  <a href="#">Nuclear</a>  <a href="#">Energy Gundremmigen nuclear power plant Germany_large</a>  <a href="#">Mechanical energy to electrical energy, conversion of</a>  <a href="#">Mechanical energy_S01852_SDD</a>  <a href="#">Energy exchange: potential, kinetic</a>  <a href="#">Energy: potential vs. kinetic</a>  <a href="#">Energy: potential vs. kinetic</a></p>	<p><b>Biology: The Dynamics of Life</b>  <b>Chapter 2 Principles of Ecology, pp. 32-36.</b>            Section 2.1, <i>Organisms and Their Environment</i>, pp. 35-45.            Section 2.2, <i>Nutrition and Energy Flow</i>, pp. 46-57.</p> <p><b>Science Inquiry Lab Manual</b>            Activity 1, What is Inquiry, pp. 7-10.  <b>Understanding the Photo</b>, p. 34.  <b>Finding the Main Idea</b>, p. 35.  <b>MiniLab 2.1</b>, <i>Salt Tolerance of Seeds</i>, p. 36.</p> <p><b>Cycles of Matter FOLDABLE</b>, p. 46.  <b>Problem-Solving Lab 2.2</b> <i>How Can You Organize Trophic Level Information</i>, p. 50.  <b>Mini-Lab 2.2</b>, <i>Detecting Carbon Dioxide</i>, p. 54.  <b>Design Your Own BioLab</b>, <i>How can one population affect another?</i> pp. 58-59.</p> <p><b>Ancillary Materials</b>  <b>Interactive Chalkboard CD</b> PowerPoint Slide Shows; Chapter 2. (Re-teaching Tool)  <b>Reading and Writing in the Science Classroom Manual</b>, <i>Reading Your Science Textbook</i>, pp. 19-28.  <b>Laboratory Manual SE</b></p>	<p>Construct ecological pyramids, which describe relationships between various ecosystems. Develop an energy map that indicates how energy is transformed by producers, consumers and decomposers.</p> <p>Create a biome museum, which describes the abiotic and biotic factors of all terrestrial and aquatic biomes. Include how organisms adapt based on the characteristics of the biomes in which they live.</p> <p>Create an energy transformation log from plant to fast food meal.</p> <p>Use a calorimeter to determine the energy content of food samples.</p> <p>What kinds of energy transformations does it take for you to listen to your CD player?</p> <p><b>MindJogger Video</b> DVD disk or VHS tape, Chapter 2.</p>

<p><a href="#">Energy: potential vs. kinetic</a></p> <p><b>Exploration</b>  <a href="#">Moving On</a></p> <p><b>Article</b>  <a href="#">Energy</a></p> <p><b>1.2</b> Compare and contrast the differences between energy transformations in an electrical system to energy transformation in a living system.</p> <p><b>Video</b>  <a href="#">Physical Energy Transformations</a>  <a href="#">Human Energy Transformations</a>  <a href="#">Glowworms</a>  <a href="#">Chemical Potential Energy</a>  <a href="#">Friction and Energy Transformation</a></p> <p><b>Images</b>  <a href="#">Battery, dry cell; diagram of basic components</a>  <a href="#">Battery, rechargeable</a></p> <p><b>1.3</b> Distinguish between abiotic and biotic forms of energy.</p> <p><b>Video</b>  <a href="#">Common Abiotic Factors</a>  <a href="#">Living Resources</a>  <a href="#">Fossils and Fossil Fuels</a>  <a href="#">Fossil Fuels and Energy Conservation</a>  <a href="#">Fuel from Human Waste</a>  <a href="#">Energy From the Earth</a></p> <p><b>Images</b>  <a href="#">Abiotic factors, definition</a>  <a href="#">Oil drilling rig</a>  <a href="#">Coal loaded on rail cars</a></p> <p><b>1.4</b> Describe the abiotic and biotic factors that influence the flow of energy in an ecosystem. (Use information obtained in the “Ecosystem in a Jar” lab.)</p> <p><b>Video</b>  <a href="#">The Energy Flow</a></p>	<p>2.1 Physical Factors of Soil, pp. 9-10.</p>	
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<p><a href="#">Food Chains and Webs</a> <a href="#">Trophic Levels in a Food Chain</a> <a href="#">Pyramids of Energy and Numbers: Consumer Levels</a> <a href="#">THE CARBON CYCLE</a> Energy Absorption and Conversion <b>Images</b> <a href="#">Food web: example</a> <a href="#">Lake food web</a> <b>Exploration</b> <a href="#">What's Eating You?</a> <a href="#">Who's for Dinner?</a> <b>Article</b> <a href="#">Food Web</a> <a href="#">Carbon Cycle</a></p>		
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DETROIT PUBLIC SCHOOLS  
OFFICE OF SCIENTIFIC STUDIES  
**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Ecosystems – Energy Transformation and Flow of Energy**  
**Semester Two**

Activities/Strategies For District Core Outcome	Text/Instructional Materials For District Core Outcome	Sample Assessment Items (Reference) For District Core Outcome
<p><b>2.1</b> Identify and explain the carbon, water, nitrogen and phosphorus cycles in the “Succession in a Jar.” Analyze the influence(s) these cycles have on climate and how they are related to the energy flow within the ecosystem.</p> <p><b>Videos:</b>  <a href="#">The Water Cycle</a>  <a href="#">The Carbon-Oxygen Cycle</a>  <a href="#">Nutrients and Soil</a>  <a href="#">A Natural Cycle</a>  <a href="#">The Nitrogen Cycle</a>  <a href="#">Changes in the Ozone Layer</a>  <a href="#">The Nitrogen Cycle</a>  <a href="#">The Water Cycle</a>  <a href="#">Continental Glaciers and the Water Cycle</a>  <a href="#">Freshwater’s Journey</a>  <a href="#">The Water Cycle</a>  <a href="#">The Phosphorus Cycle</a></p> <p><b>Images:</b>  <a href="#">Water cycle</a>  <a href="#">Oxygen/carbon exchange</a>  <a href="#">Carbon cycle</a>  <a href="#">Phosphorus cycle</a>  <a href="#">Water cycle Water cycle large</a>  <a href="#">Nitrogen Cycle</a></p>	<p><b>Biology: The Dynamics of Life</b>  <b>Chapter 3 Communities and Biomes, pp. 64-89.</b>            Section 3.1, <i>Communities</i>, pp 64-69.            Section 3.2, <i>Life in a Community</i>, pp. 65-69.  <b>Chapter 2; Principles of Ecology, pp. 32-36.</b>  <b>Biology and Society, The Everglades-Restoring an Ecosystem</b>, p. 60.  <b>Chapter 3; Communities and Biomes pp. 64-89</b>  <b>MiniLab 3.1</b> <i>Looking at Lichens</i>, p. 67.  <b>Problem-Solving Lab 3.1</b>, <i>How do You Distinguish Between Primary and Secondary Succession?</i> p. 68.  <b>Biomes FOLDABLE</b>, p. 70.  <b>Problem-Solving Lab 3.2</b>, <i>How does oxygen vary in a tide pool?</i> p. 72.  <b>Investigate BioLab</b>, <i>Succession in a Jar</i>, pp. 84-85.  <b>Ancillary Materials</b>  <b>Laboratory Manual SE</b>,            3.1 <i>What Organisms Make Up a Microcommunity?</i> pp. 11-14.  <b>Reteaching Skills Transparencies</b></p> <ol style="list-style-type: none"> <li>1. The Carbon Cycle</li> <li>2. The Nitrogen Cycle</li> <li>3. Trophic Levels</li> </ol>	<p><b>Mindjogger Videoquiz</b>, Chapter 2  <b>Reinforcement and Study Guide</b>,  <i>Principles of Ecology</i>, pp. 7-10.  <i>Communities and Biomes</i>, pp. 11-14.  <i>Population Biology</i>, pp. 12-18.            Remove an organism from a single food web and illustrate all the changes that result from the removal of this organism. Include the organism’s ability to adapt to the change.  <b>Biology: The Dynamics of Life SE</b>  <b>Chapter Assessment</b>,  <i>Standardized Test Practice</i> Items: p. 63, 17-24; p. 89, 15-22; p. 109, 16-23; p. 131,17-22.            Develop a compost bin that will utilize waste and decomposers to reduce the amount of waste produced by the class.</p>

<p><a href="#">Hydrologic Cycle of the Earth</a>  <a href="#">Hydrologic Cycle</a>  <b>Articles:</b>  <a href="#">water</a>  <a href="#">nitrogen cycle</a>  <a href="#">carbon cycle</a>  <b>Skill Builders:</b>  <a href="#">The Water Cycle</a>  <a href="#">Nitrogen Cycle</a>  <a href="#">Carbon cycle</a></p> <p><b>2.2</b> Analyze the interdependence of cycles and species (plants, animals, and microorganisms) that contribute to the deposit exchange and use of nutrients in the soil.</p> <p><b>Video</b>  <a href="#">The Flow of Energy through Ecosystems</a>  <a href="#">Energy Transfer: Producers and Consumers</a>  <a href="#">Energy Transfer: Decomposers and Detritus Feeders</a>  <a href="#">Ecosystems: Balance Within Food Chains and Energy Pyramids</a>  <a href="#">The Food Web</a>  <a href="#">The Food Chain: Predators and Prey</a>  <a href="#">Chemical Cycles</a>  <a href="#">The Carbon Cycle: Recycling Matter</a>  <a href="#">Carbon, Nitrogen, and Phosphorus: Nutrients Cycle</a>  <a href="#">Through Ecosystems to Sustain Life</a></p> <p><b>Images</b>  <a href="#">Carbon cycle</a>  <a href="#">Photosynthesis/respiration cycle</a>  <a href="#">Nitrogen Cycle</a>  <a href="#">Water Cycle</a></p>		
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**Biology - Grade 9**

**Ecosystems – Energy Transformation and Flow of Energy**  
**Semester Two**

Activities/Strategies For District Core Outcome	Text/Instructional Materials For District Core Outcome	Sample Assessment Items (Reference) For District Core Outcome
<p><b>3.1</b> Describe the interactive relationships (parasitism, commensalism, mutualism) of organisms in various ecosystems.</p> <p><b>Video</b>  <a href="#">Clownfish and Sea Anemone: Symbiotic Relationship</a>  <a href="#">Relationships Between Populations: Symbiotic Relationships in the Reef</a>  <a href="#">Hippos and Barbels: A Day at the Spa</a>  <a href="#">Symbiosis</a></p> <p><b>Images</b>  <a href="#">Clown Fish in anemone</a>  <a href="#">Sea anemone with Clown Fish</a>  <a href="#">Symbiosis, definition</a>  <a href="#">Buffalo, Cape: with birds</a>  <a href="#">Parasitism; brood-cowbird &amp; dickcissel</a></p> <p><b>Article</b>  <a href="#">Symbiosis</a></p> <p><b>3.2</b> Discuss the methods that organisms use to adapt to their environment.</p> <p><b>Video</b>  <a href="#">Extreme Plant Adaptations: Conifers and Cacti</a>  <a href="#">Plant Adaptations to Desert Conditions</a>  <a href="#">Adaptation of Plants to the Arctic Biome</a>  <a href="#">Adaptation and climate</a>  <a href="#">How Plants Adapt</a>  <a href="#">Introduction to Plant Adaptation</a>  <a href="#">Adaptation</a>  <a href="#">Prey Animals: Their Adaptations for Survival</a>  <a href="#">Beneficial Adaptations of Species of the Galapagos</a></p>	<p><b>Biology: The Dynamics of Life, Ancillary Materials</b>  <b>BioChallenges and Enrichment Manual</b> Project 2; <i>Habitat Improvement</i>, pp. 5-8.  <b>Laboratory Manual</b>            5-1 <i>How Does Detergent Affect Seed Germination?</i> pp. 23-26.  <b>Probeware Lab Manual,</b>            Lab 2: <i>An Environmental Limiting Factor</i>, pp. 5-8.            Lab 3: <i>Testing Water Quality</i>, pp. 9-12.  <b>Unit 2 Resources Manual</b>, Chapters 2 and 3 review worksheets and masters.  <b>Basic Concepts Transparencies Manual, 1-3:</b>            1. A Food Web.            2. Ecological Pyramids.            3. Primary Succession.</p>	

<p><a href="#">Adaptations in Desert Biomes</a> <a href="#">Animal Adaptations to Desert Conditions</a> <a href="#">Fish Adaptations</a> <b>Images</b> <a href="#">Plant adaptations</a> <a href="#">Adaptations, animal and plant</a> <a href="#">Protective coloration, definition of</a> <a href="#">Camouflage, definition</a> <a href="#">Desert adaptation: dromedary camels</a> <a href="#">Tropical rainforest adaptation: shallow roots</a></p> <p><b>3.3</b> Explain how a food pyramid can be used to represent energy flow in a food web.</p> <p><b>Video</b> <a href="#">Biomass</a> <a href="#">The Energy Flow</a> <a href="#">Energy Pyramids</a> <a href="#">Food Pyramid Under the Sea</a></p>		
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DETROIT PUBLIC SCHOOLS  
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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Ecosystems –Biogeochemical Cycles and Succession**  
**Semester Two**

Pace	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 26</b>	<p><b>4.</b> Describe soil nutrients essential for ecosystem maintenance and explain the distinction among critical biochemical cycles, i.e., nitrogen, phosphorous, carbon and chemical reactions of these cycles and microorganisms that control these pathways.</p> <p><b>5.</b> Describe how climates and other physical factors affect biomes and the distributions of life forms.</p> <p><b>6.</b> Describe and discuss aspects of succession, looking at primary and secondary succession models. Understand the recovered ecosystem will be similar to the original one.</p>	<p><b>B3.4A</b> – Describe ecosystem stability. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages of succession that eventually result in a system similar to the original one.</p> <p><b>B3.4B</b> – Recognize and describe that a great diversity of species increases the chance that at least some living organisms will survive in the face of cataclysmic changes in the environment.</p> <p><b>B3.4C</b> – Examine the negative impact of human activities.</p>	<p>Research the succession of a forest that has undergone a major forest fire. Produce a species map for a forest that is undergoing succession. Indicate the current phase of succession the forest is experiencing.</p>

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**Ecosystems –Biogeochemical Cycles and Succession**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>4.1</b> Explain the relationships between the carbon, nitrogen, phosphorus and water cycles.</p> <p><b>Video</b>  <a href="#">The Water Cycle</a>  <a href="#">The Carbon-Oxygen Cycle</a>  <a href="#">Nutrients and Soil</a>  <a href="#">A Natural Cycle</a>  <a href="#">The Nitrogen Cycle</a>  <a href="#">Changes in the Ozone Layer</a>  <a href="#">The Nitrogen Cycle</a>  <a href="#">The Water Cycle</a>  <a href="#">Continental Glaciers and the Water Cycle</a>  <a href="#">Freshwater's Journey</a>  <a href="#">The Water Cycle</a>  <a href="#">The Phosphorus Cycle</a></p> <p><b>Images</b>  <a href="#">Water cycle</a>  <a href="#">Oxygen/carbon exchange</a>  <a href="#">Carbon cycle</a>  <a href="#">Phosphorus cycle</a>  <a href="#">Water cycle Water cycle large</a>  <a href="#">Nitrogen Cycle</a>  <a href="#">Hydrologic Cycle of the Earth</a>  <a href="#">Hydrologic Cycle</a></p> <p><b>5.1</b> Explore the effects of seasonal changes on food webs and living systems (Ecosystems/Biomes).</p>	<p><b>Biology: The Dynamics of Life</b>  <b>Chapter 5 Biological Diversity and Conservation, pp. 110-131.</b>            Section 5.1 <i>Biological Diversity, Conservation</i>, pp. 111-119.  <b>Re-teaching Skills Transparencies;</b>            Terrestrial Biomes</p> <p><b>Ancillary Materials</b>  <b>Science Inquiry Lab Manual</b>            Activity 8: <i>Measuring Biodiversity</i>, pp. 35-38.  <b>Biology: A Community Context</b>  <b>Instructional Resources,</b>            Inquiry 2.2, <i>What Will This Area Look Like?</i> pp. 26-27.            Inquiry 2.3, <i>The Success of Succession</i>, pp. 27-29.            www. Biologycorner.com</p>	<p>Create a pictorial illustration of how the chemicals in the carbon, nitrogen and phosphorus cycles participate in the flow of energy throughout the ecosystem.</p>

**Video**

[Seasonal Change in Temperate Deciduous Forests](#)  
[Followers of Food: The Migration Patterns of Caribou and Birds](#)  
[Physical and Behavioral Adaptations Enable Animals to Survive](#)  
[Reindeer: A Deer for All Seasons](#)  
[Autumn in the Northern Woods, Preparation for Winter and the Mating Season for Many Animals](#)  
[Freshwater Habitats: Summer into Winter](#)  
[Late Spring in Northeast Asia: Life in the Temperate Forest](#)

**Images**

[California coastal range: seasonal change](#)  
[California coastal range: seasonal change](#)

**5.2** Predict how changes in the environment affect an organism.

**Video**

[Animals, Environment, and Adaptation](#)  
[Changes in Communities](#)  
[Living Things Can Undergo Change over Time](#)  
[How Changes, Disturbances and Diversity are Interconnected](#)

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**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Ecosystems –Biogeochemical Cycles and Succession**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>6.1</b> Abandoned field exploration: Mark off a one-meter by one-meter grid with string to:</p> <ul style="list-style-type: none"> <li>• Observe the succession of species in an urban area.</li> <li>• Collect, record and identify the type of species (plant, animal) that inhabit an area (abandoned field) over a two-week period in a journal.</li> </ul> <p><b>Video</b>  <a href="#">Communities and Biomes</a>  <a href="#">Stages of Succession</a>  <a href="#">Building a Model of Succession Based on the Study of Succession Within the Limestone Quarry Site</a>  <a href="#">Factors That Influence Succession</a>  <a href="#">Introduction: Succession and Climax Communities</a>  <a href="#">How Quickly Changes in Succession Take Place</a>  <a href="#">Ecological Succession</a></p> <p><b>Images</b>  <a href="#">Stream to forest succession</a></p> <p><b>6.2</b> Identify and analyze the role succession plays in the distribution and interrelationships between species (parasitism, mutualism, commensalism, etc.).</p> <p><b>Video</b>  <a href="#">Succession</a>  <a href="#">Closing Remarks: Succession and Climax Communities</a>  <a href="#">How Quickly Changes in Succession Take Place</a>  <a href="#">Introduction: Succession and Climax Communities</a>  <a href="#">What Determines the Course of Succession Over Time?</a>  <a href="#">Historical Changes in the Study of Succession</a>  <a href="#">Factors That Influence Succession</a>  <a href="#">Description of the Area Where the Study of Succession is Taking Place</a>  <a href="#">Plant Adaptation: Succession in the Forest System</a></p>	<p><b>Biology: The Dynamics of Life, Chapter 5 Biological Diversity and Conservation, pp. 110-131.</b> Section 5.1 <i>Biological Diversity, Conservation</i>, pp. 111-119.</p> <p><b>Ancillary Materials</b>  <b>Reading Essentials for Biology Manual:</b>  2.1 <i>Organisms and Their Environment</i>, pp. 10-16.  2.2 <i>Nutrition and Energy Flow</i>, pp. 17-23.  3.1 <i>Communities</i>, pp. 24-27.  3.2 <i>Biomes</i>, pp. 28-33.  4.1 <i>Population Dynamics</i>, pp. 34-39.  4.2 <i>Human Population</i>, pp. 40-43.  5.1 <i>Vanishing Species</i>, pp. 44-49.  5.2 <i>Conservation of Biodiversity</i>, pp. 50-52.</p> <p><b>Virtual Labs CD</b>  Chapter 4: <i>Population Biology</i>.  Chapter 5: <i>Assessing Water Quality</i>.</p> <p><b>DVD <i>Inconvenient Truth, Presentation by Al Gore</i></b>  <b>Probeware Lab Manual, Lab 1: <i>Is Oxygen Cycled in the Environment?</i></b>  pp. 1-4.</p> <p><b>Reteaching Skills Transparencies;</b>  Secondary Succession</p>	<p>Describe the interactions between plants and animals in the absence of man.  Debate the effect of Global Warming on the earth and what future laws could be implemented to improve the possible outcomes.  Create a timeline of the flora and fauna in an abandoned urban field. Relate how environmental changes affect succession.</p>

[Succession and Soil Formation](#)  
[Changes in Communities](#)  
[Vegetation Patterns on River Islands](#)

**6.3** Investigate and examine an ecosystem before and following a natural disaster. Compare and contrast biodiversity and survival rate of the ecosystem.

**Video**

[Fire in the Forest: Its Role in the Ecosystem](#)

[Threats to Coral Reefs](#)

[Changes in Ecosystems](#)

[Lightning Fires](#)

[How Changes, Disturbances and Diversity are Interconnected](#)

DETROIT PUBLIC SCHOOLS  
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**Ecosystems – Population and Human Impact**  
**Semester Two**

<b>Pace</b>	<b>District Core Outcome</b>	<b>High School Content Expectation (HSCE)</b>	<b>Performance Indicators</b>
<b>Week 27</b>	<p><b>7.</b> Discuss the effect of human population on natural resources.</p> <p><b>8.</b> Describe some implications of human activity and technology on the balance of ecosystems and related issues in bio-ethics</p> <p><b>9.</b> Investigate and analyze the role of agriculture, manufacturing and human activities as they relate to atmospheric conditions in ecosystems.</p> <p><b>10.</b> Make information judgments related to global environmental issues, based on critical analysis of available information.</p>	<p><b>B3.4d</b> – Describe the greenhouse effect and list possible causes.</p> <p><b>B3.4e</b> – List the possible causes and consequences of global warming.</p> <p><b>B3.5e</b> – Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of population dynamics within ecosystems.</p> <p><b>B3.5f</b> – Graph an example of exponential growth. Then show the population leveling off at the carrying capacity of the environment.</p> <p><b>B3.5g</b> – Diagram and describe the stages of the life cycle for a human disease-causing organism. (recommended)</p>	<p>Develop a multimedia presentation that shows how man maintains a suitable environment in spite of acid rain, depletion of the ozone and other adverse environmental implications. Students will make informed decisions regarding the dangers associated with HIV/AIDS.</p> <p>Through the perspective of a government agency develop plausible solutions to environmental problems (Bioethics).</p>



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**Ecosystems – Population and Human Impact**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>7.1</b> Create a model of a food web that illustrates the effect species experience if there is an increase in population or the elimination of a population.</p> <p><b>Video</b>  <a href="#">Marine Harvests and the Endangerment and Extinction of Ocean Species</a>  <a href="#">Protecting Native Species</a>  <a href="#">The Threat to Biodiversity</a>  <a href="#">Change and Biodiversity</a>  <a href="#">Interdependence, Recycling, and Adaptation</a></p> <p><b>Images</b>  <a href="#">Food web</a>  <a href="#">Stream food web</a>  <a href="#">Rocky bottom food web</a>  <a href="#">Sandy shore food web</a>  <a href="#">Polar food web (Antarctic)</a></p> <p><b>8.1</b> Identify several ways that man impacts the environment.</p> <p><b>Videos:</b>  <a href="#">Human Impact on Rainforests</a>  <a href="#">Human Impact on Catchments</a>  <a href="#">Human Impact on the Carbon Cycle</a>  <a href="#">Human Impact</a>  <a href="#">Scientists Study the Impact of the Oil Spill on Sea Otter Populations</a>  <a href="#">March 24, 1989, A Look at the Exxon Valdez Oil Spill in Alaska's Prince William Sound</a>  <a href="#">Environments Under Stress</a>  <a href="#">Studying the Effects of Humans on Their Environment</a></p>	<p><b>Biology: The Dynamics of Life Ancillary Materials</b>            Activity 9 Effects of Water Quality            Changes on Protists, pp. 39-42.</p> <p><b>Virtual Labs CD</b>            Chapter 5: Assessing Water Quality.</p> <p><b>Performance Assessment in the Science Classroom Manual</b>, The Environmental Choice-Paper or Foam, p. 43.            4.1 <i>How Does the Environment Affect an Eagle Population?</i> pp. 15-18.  <a href="http://www.ecofootprint">http://www.ecofootprint</a></p> <p><b>Reteaching Skills Transparencies;</b>            Linear Versus Exponential Growth</p>	<p>As a member of Greenpeace write an article that indicates the pros and cons for offshore drilling of oil.            Trace Non-Point Source Pollution (Fertilizer from corn farm) to the possible sources and develop a plan to eliminate the problem.            Debate the scientific evidence to support or refute global warming.            Write a new government regulation on the legal steps necessary for a state to sell water to other states or countries.</p>

[Climate Change, Species Loss, & Resource Renewal](#)  
[Chemicals in the Environment](#)  
[Contaminants in the Great Lakes](#)  
[Human Impact](#)

[Human Impact on the Geology of Earth](#)

[Human Impact on Animal Habitat](#)

[Human Impact on the Carbon Cycle](#)

[Human Impact on Catchments](#)

[Human Impact on Rainforests](#)

[March 24, 1989, A Look at the Exxon Valdez Oil Spill in Alaska's Prince William Sound](#)

**Images:**

[Fish kill caused by acid rain pollution](#)

[Pollution, smog as a cause of](#)

[Primary pollutants; United States](#)

[Water pollution](#)

**8.2** Describe the cause and effect of acid rain.

**Video**

[Acid Rain & Snow](#)

[Neutralization and Acid Rain](#)

[The Worldwide Problem of Acid Deposition](#)

[The pH in the Chemistry of Nature](#)

[Air Pollution](#)

**Images**

[An acid rain damaged stream \(1\)](#)

[pH meter used to study acid rain](#)

[Acid rain, acids found in \(2\)](#)

[Acid rain, causes of](#)

[Acid rain, change in plant mineral uptake due to](#)

[Acid rain, oxygen depletion caused by](#)

[Acid rain; map showing how power plant emissions travel from Ohio Valley to Massachusetts](#)

[Acid rain; diagram showing pH of Whetstone Brook in](#)

[Massachusetts](#)

[Tall smokestack \(2\)](#)

**Article**

[Acid rain](#)

**Audio**

[Earth's Natural Resources: The Greenhouse Effect & the Ozone Layer](#)

**Skill Builder**

[Nitrogen Cycle](#)

**8.3** Explain how the burning of fossil fuels has changed the atmosphere, and

evaluate the controversy over global warming and the greenhouse effect

**Video**

[Fossil Fuels](#)

[Fossil Fuels](#)

[Fossils and Fossil Fuels](#)

[Fossil Fuelled](#)

[Testing the Greenhouse Effect](#)

[Understanding the Greenhouse Effect](#)

[The Greenhouse Effect Is Like Cooking a Turkey](#)

[The Greenhouse Effect](#)

[The Greenhouse Effect](#)

[The Investigation](#)

[The Evidence](#)

[Global Warming](#)

[Polar Bears and Global Warming](#)

[Fossil Fuels and Global Warming](#)

[Greenhouse Gases](#)

[Civilization & the Greenhouse Effect](#)

[Choices & Consequences for the Future](#)

[Cows and the Greenhouse Effect](#)

[CFCs and the Ozone](#)

[Changes in the Ozone Layer](#)

[Global Warming: Taking Action](#)

[Long Range Predictions about Global Warming](#)

[Global Warming: Action and Reaction](#)

[Tuvalu: A Victim of Global Warming](#)

[The Growing Threat of Global Warming](#)

**Images**

[Greenhouse effect](#)

[Greenhouse effect](#)

[Greenhouse effect](#)

[Ozone layer: CFCs Rising](#)

[Projected Global Warming](#)

[Greenhouse effect](#)

[Greenhouse effect](#)

[Ozone layer, location in atmosphere of](#)

[Projected global warming](#)

**Skill Builder**

[Greenhouse Effect](#)

**8.4** Investigate population growth. Graph a growth curve, identifying where the carrying capacity would be on the curve.

**Video**

[Resource Depletion versus Sustainability: Striking a Balance](#)

<p> <a href="#">Human Population Growth</a>  <a href="#">Using and Conserving Our Land: A Look at Sheep Farming</a>  <a href="#">Ecosystems Field Study Simulations for the Classroom</a>  <a href="#">Wildlife Biologists</a>  <a href="#">Human Population and Strained Resources</a>  <a href="#">Population</a>  <a href="#">Introduction to Population Problem</a>  <a href="#">Calculating Population Growth Rates</a>  <a href="#">Human Population Growth</a>  <a href="#">Representing r-Selected and K-Selected Populations on Survivorship Curves</a>  <a href="#">Representing Populations on Growth Curves</a>  <a href="#">Earth's Carrying Capacity</a>  <b>Images</b>  <a href="#">Chart, population of California from 1850 to 2000.</a> </p> <p> <b>8.5</b> Analyze what factors in the environment (physical and chemical) would be considered limiting factors that would influence birth rates and death rates. </p> <p> <b>Video</b>  <a href="#">Introduction: Gene Frequencies, Natural Selection and Speciation</a>  <a href="#">Darwin, the Beagle, and Finches: Darwin Discovers Evidence of Natural Selection</a>  <a href="#">Natural Selection</a>  <a href="#">Natural Selection: Examples from the Galapagos</a>  <a href="#">Species on the Island of Java: A Leopard's Feast</a>  <a href="#">Darwin Studies Two Types of Evolution: Economic and Natural Selection</a>  <a href="#">Darwin Develops a Non-Random Theory of Evolution: Natural Selection and Adaptation</a>  <a href="#">Earth's Carrying Capacity</a>  <a href="#">Using and Conserving Our Land: A Look at Sheep Farming</a>  <a href="#">Overpopulation: The Case of the White-Tailed Deer</a>  <a href="#">Characteristics of Deserts and Animal Adaptations</a>  <a href="#">Representing Populations on Growth Curves</a>  <a href="#">Changes in Population Size</a>  <a href="#">Population</a>  <a href="#">Population Growth</a>  <a href="#">Now and Then: Population Growth</a>  <a href="#">Using and Conserving Our Land: A Look at Sheep Farming</a>  <a href="#">Earth's Carrying Capacity</a>  <a href="#">Exponential Growth</a>  <a href="#">Closing Remarks: Patterns of Population Growth and</a> </p>		
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<a href="#">Management</a> <a href="#">Family Planning in Latin America</a> <a href="#">Human Population and Strained Resources</a> <a href="#">Types of Interactions Within Ecosystems</a> <a href="#">Interacting Organisms</a> <a href="#">Deforestation</a> <a href="#">Tracking Human Impact on the Environment</a> <a href="#">Human Impact on Biomes</a> <a href="#">Invasive Species</a> <a href="#">Zebra Mussels and Other Invasive Species in the Great Lakes Basin</a> <a href="#">Controlling Invasive Species: Helpful Tips for What You Can Do</a> <a href="#">Agriculture and the Environment</a> <a href="#">Change and Biodiversity</a> <a href="#">The Scientific Study of Biodiversity</a> <a href="#">Renewable Resources</a> <a href="#">Irreplaceable: Using of Non-renewable Resources</a>		
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**Ecosystems – Population and Human Impact**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>9.1</b> Research how agriculturalists maintain a sustainable environment for crops and animals.</p> <p><b>Video</b>  <a href="#">Soil Health and Sustainability</a>            Sustainable Agriculture  <a href="#">Why Libraries Are Important for Research</a>  <a href="#">Five Steps to Researching a Paper</a>  <a href="#">Defining Your Topic</a>  <a href="#">Determining Your Information Needs</a>  <a href="#">Finding and Retrieving Information: From a Book</a>  <a href="#">Finding and Retrieving Information: In the Computer Catalog</a>  <a href="#">Finding and Retrieving Information: The Reference Section</a>  <a href="#">Finding and Retrieving Information: Periodicals</a>  <a href="#">Evaluating Your Information</a>  <a href="#">Organizing Your Information: Index Cards</a>  <a href="#">Plagiarism and Information Literacy</a>            Environmental Management for the Dairy Industry  <a href="#">Waste and Insect Management in the Everglades</a>  <a href="#">Waste Management in Citrus Processing</a></p> <p><b>9.2</b> Research manufacturing practices and their affect on the surrounding atmosphere and ecosystems.</p> <p><b>Video</b>  <a href="#">Sustainability</a>  <a href="#">Promoting Sustainability</a>  <a href="#">BMW and Eco-friendly Design</a>  <a href="#">Why Libraries Are Important for Research</a>  <a href="#">Five Steps to Researching a Paper</a>  <a href="#">Defining Your Topic</a>  <a href="#">Determining Your Information Needs</a>  <a href="#">Finding and Retrieving Information: From a Book</a>  <a href="#">Finding and Retrieving Information: In the Computer Catalog</a></p>	<p><b>Biology: The Dynamics of Life</b>  <b>Chapter 4 Population Biology, pp. 90-109.</b>            Section 4.1 <i>Population Dynamics</i>, pp. 91-99.            Section 4.2 <i>Human Populations</i>, pp. 100-103.  <b>Chapter 5 Biological Diversity and Conservation, pp. 110-131.</b>            Section 5.1 <i>Vanishing Species</i>, pp. 111-120.            Section 5.2 <i>Conservation of Biodiversity</i> pp. 121-125.  <b>Ancillary Materials</b>  <b>Interactive Chalkboard CD</b>            Chapters 4 and 5 slideshows.  <b>Reteaching Skills Transparencies</b>            7a, 7b &amp; 7c. Acid precipitation  <b>Virtual Labs CD</b>            Chapter 4: Population Biology.</p>	<p><b>Biology: The Dynamics of Life SE</b>  <b>Unit 2 Review</b>, Standardized Test Practice Items 1-15, pp. 136-137.</p>

<p> <a href="#">Finding and Retrieving Information: The Reference Section</a>  <a href="#">Finding and Retrieving Information: Periodicals</a>  <a href="#">Evaluating Your Information</a>  <a href="#">Organizing Your Information: Index Cards</a>  <a href="#">Plagiarism and Information Literacy</a>  <a href="#">Consequences of Unchecked Industrial Growth</a>  <a href="#">Economic Development and the Environment</a>  <a href="#">Ways to Avoid Pollution</a>  <a href="#">Industrial Chicken Farms Major Contributor to Water Pollution</a>  <a href="#">Industrial Pollution</a> </p> <p> <b>10.1</b> Analyze how human behaviors contribute to the depletion of the ozone layer.         </p> <p> <b>Video</b>  <a href="#">Changes in the Ozone Layer</a>  <a href="#">CFCs and the Ozone</a> </p> <p> <b>Images</b>  <a href="#">Ozone layer, location in atmosphere of</a>  <a href="#">Greenhouse effect</a>  <a href="#">Ozone layer blocks ultraviolet rays</a>  <a href="#">CFC and ozone molecules</a>  <a href="#">Ozone molecule, extent of destruction by chlorine atom</a> </p> <p> <b>Article</b>  <a href="#">Ozone layer</a> </p>		
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**Biological Evolution – Unity and Diversity**  
**Semester Two**

Pacing	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 28</b>	<b>13 a.</b> Classify living organisms based on structural, embryological and biochemical similarities.	<b>B2.4A</b> Explain that living things can be classified based on structural, embryological, and molecular (relatedness of DNA sequence) evidence.	Design and construct a foldable summarizing the features of a six-kingdom system of classification.
<b>Week 29</b>	<b>13 b.</b> Compare and contrast living organisms based on structural, embryological similarities	<b>B2.4d</b> Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes. Design and construct a foldable, chart or power point slide show that shows how living things are classified according to structural similarities.	Use a cladogram to identify phylogenetic relationships among a group of closely related organisms.



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<b>Activities/Strategies For District Core Outcome</b>	<b>Text/Instructional Materials For District Core Outcome</b>	<b>Sample Assessment Items (Reference) For District Core Outcome</b>
<p><b>13.1</b> Classify living organisms using a 6-kingdom system of classification.</p> <p><b>Video</b> Classification System Classification of Organisms The Five Kingdoms of Living Things Comparing Prokaryotes and Eukaryotes Protists Kingdom Fungi Kingdom Animalia: The Characteristics of Animals Animal Classification The Kingdom Plantae: Characteristics of Plants Classification of Plants</p> <p><b>Images</b> Phylogeny of mammals Kingdom, definition Fungi, definition</p> <p><b>Reading Passage</b> <a href="#">Classification of Living Things</a> <a href="#">A New Way of Classifying Life?</a> <a href="#">Plant Planet</a> <a href="#">Bacteria</a></p> <p><b>Exploration</b> What's in a Name? Cat Classification</p> <p><b>Interactive Science Simulation</b></p> <p><b>Article</b> Protista Fungi Plant</p>	<p><b>Biology: The Dynamics of Life</b> <b>Chapter 17 Organizing Life's Diversity, pp 442-463.</b> Section 17.1, Classification, pp 443-449 Section 17.2, The Six Kingdoms, pp 450-459</p> <p><b>Hands on Activities</b> <b>BDOL textbook* TE, SE</b> Classification systems foldable, pg 443 MiniLab 17.1, pg 446 Problem-solving Lab 17.1, pg 447 MiniLab 17.2, pg 453 Problem Solving Lab 17.2, pg 456 Investigate BioLab pp 460-61 *Printable copies of lab activities are available for download from the Teacher Works CD.</p> <p><b>Laboratory Manual SE</b> How Can a Key Be Used to Identify Organisms? 17.1 pp. 101-104 Comparing Characteristics of Organisms 17.2 pp. 105-109</p> <p><b>Technology</b> <b>Interactive chalkboard</b> CD-ROM Power Point Chapter 17 <b>Virtual Labs</b> CD-ROM Classifying Using Biotechnology <b>MindJogger Videoquizzes</b> DVD <b>ExamView Pro Test Bank</b> <b>Glencoe Puzzle Maker</b> (Puzzlemaker program can be downloaded from Glencoe Website) <b>Weblinks</b> <a href="http://ology.amnh.org/biodiversity/treeoflife/pages/cladogram.html">http://ology.amnh.org/biodiversity/treeoflife/pages/cladogram.html</a> <a href="http://en.wikipedia.org/wiki/Scientific_classification">http://en.wikipedia.org/wiki/Scientific_classification</a> <a href="http://www.bdol.glencoe.com">http://www.bdol.glencoe.com</a></p>	<p>*Design and construct a dichotomous key to identify different species of a family of living organisms. *Use ExamView Pro to construct an exam to determine if students have mastered objectives B2.4A and B2.4d *Use the MindJogger Videoquiz DVD disc for chapter 17 to help prepare students for the assessment constructed above. *Design and construct a simple cladogram that compares and contrasts members of the Primate family, including humans.</p>

Animal

**Audio**

How Plants Are Classified: The Classification System

**13.2** Compare/contrast living organisms based on structural, biochemical and embryological characteristics.

**Video**

[Sexual Reproduction in Other Vertebrates](#)

[Vertebrate Embryos](#)

[Animal Systems for Transport](#)

[Marine Invertebrates](#)

[Aurelia Jellyfish: Ocean Drifters](#)

[Red Starfish, Sea Urchins, and](#)

[Nemertine Worms in Antarctica: Defying the Cold](#)

[Mammals](#)

[The World of Mammals](#)

[Terrestrial Mammals](#)

[Sea Mammals](#)

[The World of Reptiles and Amphibians](#)

[Birds](#)

**Images**

[Vertebrate, definition](#)

[Evolutionary tree, vertebrates](#)

[Birds, definition](#)

[Mammal, definition](#)

[Amphibians, definition](#)

[Invertebrate, definition](#)

**Article**

[vertebrate](#)

[mammal](#)

**13.3** Use a dichotomous key to identify different species of a family of living organisms.

**Video**

**Images**

**Reading Passage**

**Exploration**

**Interactive Science Simulation**

**Article**

**Audio**

**13.4** Describe how cladograms are constructed and used to identify relationships that exist among groups of living organisms.

**Images**

[Evolutionary tree](#)

[Great apes: evolutionary tree with divergence times](#)

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**Biological Evolution – Organization of Living Things**  
**Semester Two**

Pacing	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 30</b>	<b>18.</b> Describe evidence of evolutionary relationships among living organisms.	<p><b>B5.2a</b> – Describe species as reproductively distinct groups of organisms that can be classified based on morphological, behavioral, and molecular similarities.</p> <p><b>B5.2b</b> – Explain that the degree of kinship between organisms or species can be estimated from the similarity of their DNA and protein.</p> <p><b>B5.2c</b> – Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of subpopulations.</p> <p><b>B5.r2d</b> – Interpret a cladogram of phylogenetic tree showing evolutionary relationships among organisms. (recommended)</p>	<p>Research the evolutionary history of the modern horse (<i>Equus</i>) from its ancestor (<i>Eohippus</i>); include plausible explanations for the changes in their features.</p> <p>Prepare a research paper comparing and contrasting the Theories of Evolution and Abiogenesis.</p> <p>Construct a concept map illustrating the evolutionary events leading to the development of eukaryotic cells.</p>

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<p><b>Week 31</b></p>	<p><b>18.</b> Describe evidence of evolutionary relationships among living organisms.</p>	<p><b>B5.1A</b> – Summarize the major concepts of natural selection (differential survival and reproduction of chance inherited variants, depending on environmental conditions).  <b>B5.1B</b> – Describe how natural selection provides a mechanism for evolution.  <b>B5.1c</b> – Summarize the relationships between present-day organisms and those that inhabited the Earth in the past (e.g., use fossil record, embryonic stages, homologous structures, chemical basis).  <b>B5.1d</b> – Explain how a new species or variety originates through the evolutionary process of natural selection.  <b>B5.1e</b> – Explain how natural selection leads to organisms that are well suited for the environment (differential survival and reproduction of chance inherited variants, depending upon environmental conditions).  <b>B5.1f</b> – Explain, using examples, how the fossil record, comparative anatomy, and other evidence supports the theory of evolution.  <b>B5.1g</b> – Illustrate how genetic variation is preserved or eliminated from a population through natural selection (evolution) resulting in biodiversity.</p>	<p>Research the evolutionary history of the modern horse (<i>Equus</i>) from its ancestor (<i>Eohippus</i>): include plausible explanations for the changes in their features.          Prepare a research paper comparing and contrasting the Theories of Evolution and Abiogenesis.          Construct a concept map illustrating the evolutionary events leading to the development of eukaryotic cells.</p>
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Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>18.1</b> Compare and contrast the characteristic features of a given species (i.e. Finches, horses, or elephants). <b>Video</b> <a href="#">Evolution Islands</a> <a href="#">Darwin, the Beagle, and Finches: Darwin Discovers Evidence of Natural Selection</a> <a href="#">The World of Birds</a> <b>Images</b> <a href="#">Darwin's finches: importance of heritability</a></p> <p><b>18.2</b> Compare and contrast Darwin's initial view of evolution with the observations that led him to the theory of evolution by natural selection. <b>Video</b> <a href="#">Introduction to Charles Darwin's Theory of Evolution</a> <a href="#">Islands of Theory: Charles Darwin and Why Evolution Occurs</a> <a href="#">Darwin's Discoveries</a> <a href="#">Darwin's Theory of Evolution</a> <a href="#">Darwin Develops a Non-Random Theory of Evolution: Natural Selection and Adaptation</a> <a href="#">Scientific Writing: Darwin's The Origin of Species</a> <b>Images</b> <a href="#">The English naturalist Charles Darwin.</a> <b>Article</b> <a href="#">Darwin, Charles Robert</a></p> <p><b>18.3</b> Interpret a graphical presentation of</p>	<p><b>Biology: The Dynamics of Life</b> <b>Chapter 15 The Theory of Evolution, pp. 392-419.</b> Section 15.1, <i>Natural Selection and Evidence for Evolution</i> pp. 393-403; Evolution FOLDABLE, p. 393. <b>Problem-Solving Lab 15.1, How can natural selection be observed?,</b> p. 397. <b>MiniLab 15.1, Camouflage Provides and Adaptive Advantage,</b> p. 398. <b>Ancillary Materials</b> <b>Laboratory Manual SE, How is Camouflage an Adaptive Advantage?,</b> pp. 89-92. <b>Virtual Labs CD,</b> Chapter 15, <i>Natural Selection.</i> <b>Interactive Chalkboard CD,</b> Chapter 15, PowerPoint slide show. (absent student tutor) <b>Voyage of the Beagle:</b> <a href="http://www.pubs.nsta.org/Galapogos/resource/page1.html">http://www.pubs.nsta.org/Galapogos/resource/page1.html</a> <b>Evolution Processes, Evolution Patterns:</b> <a href="http://www.indiana.edu/~ensiweb/home.html">www.indiana.edu/~ensiweb/home.html</a> <b>Teaching Biology:</b> <a href="http://highschool!hub.org/hub/biology.cfm">http://highschool!hub.org/hub/biology.cfm</a> <b>Teaching About Evolution and Natural Selection:</b> <a href="http://biology.about.com/cs/lessonplan912/">http://biology.about.com/cs/lessonplan912/</a></p>	<p>Research the evolutionary history of the modern horse (Equus) from its ancestor (Eohippus): include plausible explanations for the changes in their features. (Other species may be used) <b>Biology: The Dynamics of Life, Ancillary Materials</b> Unit 5 Resources Manual, Chapter 15, The Theory of Evolution, pp. 55-60. Write a paragraph explaining Darwin's observations.</p>

<p>the correlation between food supply, population and natural selection.</p> <p><b>Video</b>  Natural Selection: Survival of the Fittest  Natural Selection, Competition, and Adaptations  <a href="#">Adaptation and Natural Selection</a>  <a href="#">Speciation</a>  <a href="#">What Are Populations and Gene Pools?</a>  <a href="#">Five Conditions of the Hardy-Weinberg Principle</a>  <a href="#">Basic Difference Between Mendelian Genetics and Population Genetics</a>  <a href="#">Genetic Drift</a>  <a href="#">Mutation</a>  <a href="#">Selection</a>  <a href="#">Genetic Mutations: Good &amp; Bad</a>  <a href="#">The DNA Molecule &amp; DNA Mutations</a>  <a href="#">Darwin, the Beagle, and Finches: Darwin Discovers Evidence of Natural Selection</a>  <a href="#">Selection</a>  <a href="#">Dressing for Desire: Manifestations of Sexual Selection</a></p> <p><b>Images</b>  <a href="#">Evolution by natural selection; requirements</a></p> <p><b>Article</b>  <a href="#">Natural selection</a>  <a href="#">Darwin, Charles Robert</a>  <a href="#">Galapagos Islands or Colon Archipelago</a>  <a href="#">Wallace, Alfred Russel</a>  <a href="#">Fisher, Sir Ronald</a></p> <p><b>Audio</b>  <a href="#">Evolution: Natural Selection: Fitness</a>  <a href="#">Evolution: Natural Selection: Environmental Effects on Natural Selection</a>  <a href="#">Evolution: Natural Selection: A Summary</a>  <a href="#">Evolution: Natural Selection: The Hardy-Weinburg Law</a>  <a href="#">Evolution: Natural Selection: Genes &amp; Natural Selection</a>  <a href="#">Evolution: Natural Selection: Five Patterns of Natural Selection</a></p>		
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[Evolution: Natural Selection: An Example of How Natural Selection Changes Gene Frequencies in a Population](#)

**18.4** Predict a plausible explanation of why if given two species, species “a” would survive better in a particular environment versus species “b”.

**Video**

[Video Quiz: Biomes: The Adaptations of Organisms Characteristics of Deserts and Animal Adaptations](#)

[Mutations, Conquest, and Adaptations](#)

[Adaptation and Natural Selection](#)

[Why Don't Horses Have Wheels?: The Development of Complex Changes in a Species](#)

[Cave Specialists](#)

**Images**

[Adaptations, animal and plant](#)

[Desert adaptation: dromedary camels](#)

[Fish; adaptations for hunting](#)

[Camouflage, definition](#)

**Article**

Adaptation



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Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>18.5</b> Identify and describe the three possible theories for the origin of life on Earth. <b>Video</b> <a href="#">Could the "Spark of Life" Reoccur?</a> <a href="#">The History of Life On Earth</a> <a href="#">How Life Formed on Earth</a></p> <p><b>18.6</b> Research and diagram a comparison of the modern Earth's atmosphere with the models proposed by Miller and Lermann. <b>Video</b> <a href="#">The Atmosphere</a> <a href="#">The Atmosphere</a> <a href="#">Earth's Atmosphere: The Properties of the Atmosphere</a> <a href="#">Chemical Origins of Life</a> <b>Images</b> <a href="#">Atmosphere, layers of</a> <a href="#">Atmosphere, composition of; pie chart</a></p> <p><b>18.7</b> Describe the sources of energy present on the early Earth and infer how this energy affected the inorganic molecules found in RNA, amino acids, and proteins. <b>Video</b> <a href="#">Where Did Life on Earth Originate?</a> <a href="#">Water and the Origin of Life</a> <a href="#">RNA's Role in Creating Life</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>Chapter 14 The History of Life, pp. 368-391.</b> Section 14.2, <i>The Origin of Life</i>, pp. 380-385. <b>Problem-solving Lab 14.2, Can a clock model Earth's history?</b> p. 384. <b>Evolution:</b> <a href="http://www.pbs.org/evolution">www.pbs.org/evolution</a>. <b>The Talk Origins Archive; Evolution:</b> <a href="http://www.talkorigins.org/faqs/evolution-definitin.html">www.talkorigins.org/faqs/evolution-definitin.html</a>. <b>Evolution Update:</b> <a href="http://mcb.harvard.edu/Biolinks?Evolution.html">http://mcb.harvard.edu/Biolinks?Evolution.html</a>.</p>	<p>Have students research a creation story from another country or culture and have the students explain why their stories can or cannot be duplicated in experiments. If the story can be duplicated design an experiment to test the story.</p> <p><b>Biology: The Dynamics of Life, Ancillary Materials</b> Unit 5 Resources Manual, Chapter 14, <i>The History of Life</i>, pp. 7-10. Design an experiment to test whether organic matter could form from inorganic matter. Name the variables of the experiment and designate the type of control used for the experiment.</p>

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Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>18.8</b> Infer evolutionary relationships among species by biochemical comparison of amino acid sequences in different organisms.</p> <p><b>Video</b> <a href="#">In the Beginning There Was Soup: Examining Animals With Common Origins</a></p> <p><b>18.9</b> Research several radioisotopes and demonstrate how they are used in dating the age of rocks and fossils.</p> <p><b>Video</b> <a href="#">Radiocarbon Dating</a> <a href="#">Interpreting the Fossil Record</a> <a href="#">Changing Theories on Evolution</a> <a href="#">Finding the Age of Fossils</a> <a href="#">Fossil Formation</a> <a href="#">Relative Dating</a> <a href="#">Radioactive Dating</a> <a href="#">Looking at Changes in Allele Frequencies in Shale Strata from Different Ages</a> <a href="#">What is the Relationship Between the Burgess Shale Prehistoric Populations and Populations of Today?</a> <a href="#">Radiocarbon Dating</a></p>	<p><b>Biology: The Dynamics of Life, Chapter 15 The Theory of Evolution, pp. 392-419.</b> Section 15.1, <i>Natural Selection and the Evidence for Evolution</i>, pp. 393-403.</p> <p><b>Ancillary Materials</b> <b>Interactive Chalkboard CD</b>, Chapter 15, PowerPoint slide show. (absent student tutor)</p> <p><b>Sources on Fossils and Phylogenetics:</b> <a href="http://www.ucmp.berkeley.edu/help/topic.html">www.ucmp.berkeley.edu/help/topic.html</a>.</p> <p><b>The Tree of Life:</b> <a href="http://meb.harvard.edu/Biolinks/Evolution.html">http://meb.harvard.edu/Biolinks/Evolution.html</a>.</p> <p><b>Radioactive Dating:</b> <a href="http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/raddat.html">http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/raddat.html</a>.</p> <p><b>Radiometric Dating and the Geological Time Scale:</b> <a href="http://www.talk.orginis.org/faqs/evolution-definition.html">www.talk.orginis.org/faqs/evolution-definition.html</a>.</p>	<p>Working in pairs the students will write an essay explaining how they might compare amino acid sequences and describe possible evolutionary relationships between the most closely related animals. (See Instructional example MICLiMB SCI III.4.h.1)</p> <p><b>Biology: The Dynamics of Life, Ancillary Materials</b> Reinforcement and Study Guide Manual, Chapter 15, Section 15.1, <i>Natural Selection and the Evidence for Evolution</i> pp. 65-66.</p>

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**Biological Evolution – Organization of Living Things**  
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<p><b>18.10</b> Construct a geological timetable of sedimentary rock that illustrates the approximate age of fossils present in the rocks.</p> <p><b>Video</b>  <a href="#">Geological Time Scale</a>  <a href="#">Adaptation and Natural Selection</a>  <a href="#">Fossils in Undersea Caves</a>  <a href="#">Fossils, Zoology, and Comparative Anatomy</a>  <a href="#">Other Important Discoveries</a>  <a href="#">Visiting the Burgess Shale</a>  <a href="#">Looking at Changes in Allele Frequencies in Shale Strata from Different Ages</a>  <a href="#">The Theory of Uniformitarianism</a>  <a href="#">More Fundamental Principles of Layer Formation</a>  <a href="#">Superposition</a>  <a href="#">What is the Geologic Time Scale?</a>  <a href="#">Geological Time Scale</a>  <a href="#">What is the Precambrian?</a>  <a href="#">What is the Paleozoic Era?</a>  <a href="#">What Happened During the Cambrian Period?</a>  <a href="#">What Happened During the Ordovician Period?</a>  <a href="#">What Happened During the Silurian Period?</a>  <a href="#">What Happened During the Devonian Period?</a>  <a href="#">What Happened During the Carboniferous Period?</a>  <a href="#">What Happened During the Permian Period?</a>  <a href="#">What is the Mesozoic Era?</a>  <a href="#">What Happened During the Triassic Period?</a>  <a href="#">What Happened During the Jurassic Period?</a>  <a href="#">What Happened During the Cretaceous Period?</a>  <a href="#">What is the Cenozoic Era?</a></p> <p><b>Images</b>  <a href="#">Geologic time line; Earth's history</a>  <a href="#">Geologic time; orders of magnitude</a>  <a href="#">Geologic time line; Earth's history</a></p>	<p><b>Biology: The Dynamics of Life,</b>  <b>Chapter 14 The History of Life, pp. 368-391.</b>          Section 14.1, <i>The Record of Life</i>, pp. 369-379.  <b>Problem-Solving Lab 14.1</b>, <i>Could ferns have lived in Antarctica?</i> p. 372.  <b>Investigate BioLab</b>, <i>Determining a Rocks Age</i>, pp. 386-387.  <b>MiniLab 14.2</b>, <i>A Time Line</i>, p. 376.  <b>Ancillary Materials</b>  <b>Laboratory Manual SE</b>, Exploration 14-1, <i>Analyzing Fossil Molds</i>, pp. 83-84.  <b>Interactive Chalkboard CD</b>, Chapter 14, PowerPoint presentation.  <b>Reading Essentials for Biology Manual</b>, Section 14.1, <i>The Record of Life</i>, pp. 151-156.  <b>Geological Time Scale:</b> <a href="http://www.geology.er.usg.gov/paleo/geotime.shtml">www.geology.er.usg.gov/paleo/geotime.shtml</a>  <b>Prehistoric Animals:</b>  <a href="http://www.anglia.co.uk/angmulti/learning/science/prehistoric">www.anglia.co.uk/angmulti/learning/science/prehistoric</a>  <b>Time Machine:</b>  <a href="http://www.indiana.edu/~ensiweb/lessons/time.mac.html">http://www.indiana.edu/~ensiweb/lessons/time.mac.html</a>  <b>The Fossil Record:</b>  <a href="http://school.discovery.com/lessonplans/programs/ancient">http://school.discovery.com/lessonplans/programs/ancient</a>  <b>Biology: The Dynamics of Life,</b>  <b>Chapter 17 Organizing Life Diversity, pp. 442-471.</b>          Section 17.1, <i>Classification</i>, pp. 443-449.</p>	<p><b>Biology: The Dynamics of Life, SE</b>  <i>Section Assessment, Skill Review</i>, p. 379, item 6.</p>
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[Geologic time line; Earth's history](#)  
[Geologic time line; Earth's history](#)  
[Geologic time line; Earth's history](#)  
[Geologic time line; Earth's history](#)

**18.11** Organize a table to compare and contrast the features of the organisms that inhabited the ancient ocean with the first organisms to live on land.

**Video**

[Ichthyosaurs](#)

**18.12** Organize a phylogenic tree that classifies several organisms according to structural similarities, cell types, and evolutionary relationships.

**Video**

**Images**

**Reading Passage**

**Exploration**

**Interactive Science Simulation**

**Article**

**Audio**

**18.13** Describe how classification reflects evolutionary history.

**Video**

[The Human Family Tree](#)

[Identifying New Creatures](#)

[Classifying Plants](#)

[Classifying Animals](#)

[Taxonomy](#)

[Five Kingdoms](#)

[Classifying Plants and Animals: Challenges](#)

[Classification System](#)

[Phylum Echinodermata: Spiny-Skinned Animals,](#)

[The Echinoderms](#)

[Phylum Chordata: The Chordates](#)

[Introduction to classification](#)

<a href="#">The Five Kingdoms of Life</a> <a href="#">Classification Into Smaller Sub-Groups</a> <a href="#">Video Quiz: How Living Things are Classified</a>		
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DETROIT PUBLIC SCHOOLS  
OFFICE OF SCIENTIFIC STUDIES  
**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**

**Biological Evolution – Natural and Artificial Selection**  
**Semester Two**

<b>Pacing</b>	<b>District Core Outcome</b>	<b>High School Content Expectations (HSCE)</b>	<b>Performance Indicators</b>
<b>Week 32</b>	<b>19.</b> Explain the processes of natural and artificial selection and relate these to the process by which new traits arise and become established in a population.	<p><b>B5.3A</b> – Explain how natural selection acts on individuals, but it is populations that evolve. Relate genetic mutations and genetic variety produced by sexual reproduction to diversity within population.</p> <p><b>B5.3B</b> – Describe the role of geographic isolation in speciation.</p> <p><b>B5.3C</b> – Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.</p> <p><b>B5.3d</b> – Explain how evolution through natural selection can result in changes in biodiversity.</p> <p><b>B5.3e</b> – Explain how changes at the gene level are the foundation for changes in populations and eventually the formation of new species.</p> <p><b>B5.3f</b> – Demonstrate and explain how biotechnology can improve a population and species.</p>	<p>Prepare a report on the results of selective breeding in various plants and/or animals.</p> <p>Develop a concept map demonstrating the relationship between microevolution and macroevolution. Use the terms from chapter 12.</p> <p>Apply the theory of evolution by natural selection to provide a detailed explanation of why houseflies are resistant to certain pesticides and why some bacterial strains are penicillin resistant.</p>

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**Biology - Grade 9**

**Biological Evolution – Natural and Artificial Selection**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>19.1</b> Analyze and explain Lamarcks law of “Use and Disuse”.</p> <p><u>Article</u> <a href="#">Lamarck, Jean Baptiste Pierre Antoine de Monet, Chevalier de</a></p> <p><b>19.2</b> Identify the five main elements that affect the process of natural selection.</p> <p><u>Audio</u> <a href="#">Evolution: Natural Selection: Five Patterns of Natural Selection</a></p>	<p><b>Biology: The Dynamics of Life,</b> <b>Chapter 15 The Theory of Evolution,</b> <b>pp. 392-419.</b> Section 15.1, <i>Natural Selection and the Evidence for Evolution</i>, pp. 393-403.</p> <p><b>Problem-Solving Lab 15.1,</b> <i>How can natural selection be observed?</i>, p. 397.</p> <p><b>Internet BioLab,</b> <i>Natural Selection and Allelic Frequency</i>, pp. 414-415.</p> <p><b>Ancillary Materials</b> <b>Reading Essentials for Biology Manual,</b> <i>Natural Selection and the Evidence for Evolution</i>, pp.163-168.</p> <p><b>Interactive Chalkboard CD,</b> Chapter 15, PowerPoint slide show. (absent student tutor)</p> <p><b>Evolution website:</b> <a href="http://www.bbc.co.uk/education">www.bbc.co.uk/education</a></p> <p><b>Evolution Teaching Activities: Activity 3 Investigating Natural Science:</b> <a href="http://www.nap.edu/readingroom/books/Evolution98/evol6.html">http://www.nap.edu/readingroom/books/Evolution98/evol6.html</a></p> <p><b>Scopes Monkey Trial:</b> <a href="http://www.thirteen.org/wnetschool/origlessons/evolution">http://www.thirteen.org/wnetschool/origlessons/evolution</a></p>	<p>Apply Lamarcks law of “Use and Disuse” to the evolution of whale appendages.</p> <p>Describe the elements that must be present in any population before artificial or natural selection can bring about changes within the population.</p> <p>Write a paragraph explaining natural selection and demonstrate its relationship to adaptation and speciation.</p>

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**Biological Evolution – Natural and Artificial Selection**  
**Semester Two**

<b>Activities/Strategies</b>	<b>Text/Instructional Materials</b>	<b>Sample Assessment Items (Reference)</b>
<p><b>19.3</b> Compare and contrast natural selection and artificial selection.</p> <p><b>Video</b> <a href="#">Selection</a> Natural Selection, Competition, and Adaptations <a href="#">Adaptation and Natural Selection</a></p> <p><b>19.4</b> Demonstrate how fossils reveal changes within a species, extinction and relationships between other species.</p> <p><b>Video</b> <a href="#">Interpreting the Fossil Record</a> <a href="#">Evolution</a> <a href="#">Evolution and Variation</a></p>	<p><b>Biology: The Dynamics of Life, Ancillary Materials Virtual Labs CD, Natural Selection.</b></p> <p><b>1995 Access Excellence Collections: Not Just a Bag of Beans:</b> <a href="http://www.accessexcellence.org/AE">http://www.accessexcellence.org/AE</a>.</p> <p><b>Learning from Fossil Records:</b> <a href="http://ucmp.Berkeley.edu/fosrec/">http://ucmp.Berkeley.edu/fosrec/</a>.</p> <p><b>Fossils:</b> <a href="http://school.discovery.com/lessonplans/programs/an">http://school.discovery.com/lessonplans/programs/an</a>.</p> <p><b>1996 Access Excellence Collection Fossil Hunt:</b> <a href="http://www.accessexcellence.org/AE/">http://www.accessexcellence.org/AE/</a>.</p>	<p>Cite examples of natural and artificial selection that are observed in everyday life. Explain any affects artificial selection has on the agricultural and dairy community.</p> <p>Trace the major feature changes in organisms, using the geologic time scale. Select one particular organism to illustrate the evolutionary changes.</p>



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**Biological Evolution – Natural and Artificial Selection**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>19.5</b> Describe and cite examples of how fossil records support evolution. <b>Video</b> <a href="#">Changing Theories on Evolution</a> <a href="#">Support for the Theory of Evolution</a></p> <p><b>19.6</b> Demonstrate how fossils, homologous structures and similarities among embryos are evidence of evolution. <b>Video</b> <a href="#">Looking at Changes in Allele Frequencies in Shale Strata from Different Ages</a> <a href="#">Finding the Age of Fossils</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>Chapter 15 The Theory of Evolution, pp. 392-419.</b> Section 15.1, <i>Natural Selection and the Evidence for Evolution</i>, pp. 393-403. Section 15.2, <i>Mechanisms of Evolution</i>, pp. 404-413. <b>A Whale of a Change:</b> <a href="http://www.indiana.edu/~ensiweb/lessons/whale.ev.html">http://www.indiana.edu/~ensiweb/lessons/whale.ev.html</a>. <b>1995 Access Excellence Collection: Evolutionstechnik:</b> <a href="http://www.accessexcellence.org/AE/">http://www.accessexcellence.org/AE/</a>. <b>Macroevolution: Patterns, Trends and Rates of Change:</b> <a href="http://www.indiana.edu/~ensiweb/lessons/macroev.html">http://www.indiana.edu/~ensiweb/lessons/macroev.html</a>.</p>	<p>Explain why the absence of transitional fossils does not mean that evolution did not occur.</p>
<p><b>19.7</b> Describe how natural selection has affected the European peppered moth. <b>Video</b> <a href="#">Relationships Between Populations: Predator-Prey</a> <b>Images</b> <a href="#">Protective coloration, definition of Camouflage, definition</a></p> <p><b>19.8</b> Describe the factors involved in species formation <b>Video</b> <a href="#">The Proliferation of Species</a> <a href="#">Introduction: Gene Frequencies, Natural Selection and Speciation</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>Problem-Solving Lab 15.1, <i>How can natural selection be observed?</i></b> p. 397. <b>Island Biogeography and Evolution: Solving a Phylogenetic Puzzle Using Molecular Genetics:</b> <a href="http://www.ucmp.Berkeley.edu/fosrec/filson.html">http://www.ucmp.Berkeley.edu/fosrec/filson.html</a>.</p>	<p>Research the Peppered Moth and construct an evolutionary tree that depicts the changes that have occurred within the species.</p>

[5 Factors That Contribute to Gene Pool Changes Over Time](#)

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**Biological Evolution – Fossils Evidence and Modern Humans**  
**Semester Two**

	District Core Outcome	High School Content Expectations (HSCE)	Performance Indicators
<b>Week 33</b>	<b>20.</b> Use fossil evidence to trace the origin of modern humans to Africa.	<p><b>B5.2a</b> – Describe species as reproductively distinct groups of organisms that can be classified based on morphological, behavioral, and molecular similarities.</p> <p><b>B5.2b</b> – Explain that the degree of kinship between organisms or species can be estimated from the similarity of their DNA and protein.</p> <p><b>B5.2c</b> – Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of subpopulations.</p> <p><b>B5.r2d</b> – Interpret a cladogram of phylogenetic tree showing evolutionary relationships among organisms. (recommended)</p>	<p>Construct an evolutionary tree that traces from the first hominid to modern man.</p> <p>Research a hominid and include the following:</p> <ul style="list-style-type: none"> <li>• Sketch of its origin on a map.</li> <li>• Details: who, when and where.</li> <li>• Detailed description and/or illustrations of the fossilized remains.</li> </ul>
<b>Week 34</b>	Final Exams		

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**Biological Evolution – Fossils Evidence and Modern Humans**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>20.1</b> Describe characteristic features of humans that separate them from other animals. <b>Video</b> <a href="#">How Humans Are Unique</a></p> <p><b>20.2</b> State the genus and place or origin of the first hominids. <b>Video</b> <a href="#">Our Ancestors</a> <a href="#">The First Species of the Genus Homo Appears</a> <b>Images</b> <a href="#">A trail of prehistoric footprints.</a> <a href="#">Footprints 3.5 million years old.</a></p> <p><b>20.3</b> Create a chronology of the evolution of modern humans from the ancestral hominids. <b>Video</b> <a href="#">The Human Family Tree</a> <a href="#">A New Hominid Genus</a> <a href="#">New Chapter in Hominid Evolution</a> <a href="#">Ardi's Hands and Feet</a> <a href="#">Lucy's Discovery: Australopithecus afarensis</a> <a href="#">The Mystery of the First Americans</a> <a href="#">Before We Ruled the Earth</a> <a href="#">The Development of the Genus Homo</a></p>	<p><b>Biology: The Dynamics of Life, SE</b> <b>Chapter 16 Primate Evolution, pp. 420-441.</b> Section 16.2, <i>Human Ancestry</i>, pp. 428-435. <b>MiniLab 16.2, Compare Human Proteins with Those of Other Primates</b>, p. 429. <b>Investigate BioLab, Comparing Skulls of Three Primates</b>, pp. 436-437. <b>Biology: The Dynamics of Life, TE</b> <b>Cultural Diversity, The Hominid Gang</b>, p. 429. <b>Revealing Misconceptions</b>, p. 431. <b>Additional Lab, Measuring Human Variation</b>, pp. 432-433. <b>Ancillary Materials</b> <b>Basic Concepts Transparencies, #23, Possible Phylogeny of Humans.</b> <b>Lab Manual SE, Exploration 16-1, Primate Characteristics</b>, pp. 93-96. <b>Reading Essentials for Biology Manual, Chapter 16, Primate Evolution</b>, pp. 175-183. <b>Re-teaching Skills Transparencies Manual, #25, Human Versus Primate Traits.</b> <b>Section Focus Transparency Manual, #40, Skeletal Clues.</b> <b>Interactive Chalkboard CD, Chapter 16, PowerPoint slide show. (absent student tutor)</b> <b>The Human Lineage:</b> <a href="http://biology.about.com/cs/evolution/">http://biology.about.com/cs/evolution/.</a> <b>Axing the Family Tree:</b> <a href="http://biology.about.com/cs/evolution1/">http://biology.about.com/cs/evolution1/.</a></p>	<p>Written activity: Compare and contrast the characteristics of humans with other animal groups. Justify your answer. Written activity: Describe, explain and justify the relationship between humans and primates. <b>Biology: The Dynamics of Life, Ancillary Materials</b> <b>MindJogger Videoquiz, Chapter 16, Reinforcement and Study Guide Manual, Chapter 16, Primate Evolution</b>, pp. 69-72 Create a timeline illustrating the evolution of modern man.</p>

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**Biological Evolution – Fossils Evidence and Modern Humans**  
**Semester Two**

Activities/Strategies	Text/Instructional Materials	Sample Assessment Items (Reference)
<p><b>20.4</b> Describe the anatomical and biochemical evidence that reveals an evolutionary relationship between humans and primates. <b>Video</b> <a href="#">Are Humans Related to Chimpanzees? Berkley Studies Human Lineage</a> <a href="#">World Population</a> <a href="#">How We Define a Human Species</a> <a href="#">Chimpanzees: Community Living</a></p> <p><b>20.5</b> Describe the evidence that indicates human ancestors walked upright before their brains enlarged. <b>Video</b> Evolutionary Advantages of Walking Upright <a href="#">Walking Upright as a Great Achievement</a> <a href="#">Origins of Bipedalism</a> <b>Images</b> <a href="#">Human characteristics: upright posture</a></p> <p><b>20.6</b> Contrast the two theories of the origin of Homo sapiens. <b>Video</b> <a href="#">The Cradle of Humankind</a> <a href="#">The Birthplace of Humanity</a></p>	<p><b>Biology: The Dynamics of Life, SE Chapter 16 Primate Evolution, pp. 420-441.</b> <b>MiniLab 16.2</b>, <i>Compare Human Proteins with Those of Other Primates</i>, p. 429. Figure 16.15, p. 435. Section 16.2, <i>Human Ancestry</i>, pp. 428-435. <b>Problem-Solving Lab</b>, <i>How similar are Neanderthals and humans?</i> p. 433. <u>Holt Biology Videodisc:</u> 77Disc 2 Side A #19821-26705. <u>Holt Biology Videodisc:</u> 80 Disc 2 Side A #23983-26104.</p>	<p>Draw a simplified phylogenetic tree that shows the evolution of primates: include the following primate groups or species, first primates, prosimians, monkeys, gorillas, chimpanzees, australopithecine, Homohabilis, Homo erectus and Homo sapiens. <b>Biology: The Dynamics of Life, SE Chapter 16 Assessment</b>, <i>Standardized Test Practice</i>, p. 441 Items 19-23.</p>