# 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

<table>
<thead>
<tr>
<th>Pacing</th>
<th>District Core Outcomes</th>
<th>High School Content Expectations (HSCE)</th>
<th>Performance Indicators</th>
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<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td>Review and Procedural Lessons</td>
<td>Review Prerequisite Objectives and Practice Standardized High School Classroom Procedures.</td>
<td></td>
</tr>
<tr>
<td><strong>Week 2</strong></td>
<td>Review and Procedural Lessons</td>
<td>Review Prerequisite Objectives and Practice Standardized High School Classroom Procedures.</td>
<td></td>
</tr>
</tbody>
</table>
| **Week 3** | 11. Compare and contrast ways in which selected cells are specialized to carry out life functions. | **L2.p1** – 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)  
**B2.3A** – Describe and explain how cells, using chemical reactions, function in a narrow range of conditions, such as temperature and pH, to perform life functions.  
**B2.3B** - Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.  
**B2.3C** - Explain how stability is aided or challenged by changing chemical, physical and environmental conditions. | **Focus Question** – What is a cell and why is it important in living organisms?  
**Focus Question** - How do the structures of organisms help them to perform life’s functions?  
*Explain how the structures of organisms help to perform life's functions.  
*Describe cell processes that are important to maintain life.  
*Given a visual: identify the cell type; identify and label the cell organelles; describe the function of the organelles.  
*List the levels of biological organization.  
*Explain the process that keeps the environment of the cell stable (homeostasis). |
| **Week 4** | **B2.r6c** - Recognize and explain that communication and/or interaction are required between cells to coordinate their diverse activities (recommended.  
**B2.r6b** - 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).  
**B2.4B** - Describe how various organisms have developed different specializations to accomplish a particular function. (excreting waste, obtaining oxygen) | | |
## Molecules to Organisms: Cells – Structures and Functions, Levels of Organization

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<th>Sample Assessment Items (Reference) for District Outcome</th>
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<tr>
<td>11.1 Explain the Principles of the Cell Theory.</td>
<td><strong>Biology: The Dynamics of Life</strong>, Chapter 14 Section 14.2 The Origin of Life, Read p.383 – 385.</td>
<td>Demonstrate use of the light microscope using a teacher made slide containing the letter ‘e’.  Students must:  • Locate the letter ‘e’ on the slide.  • Focus the letter.  • Turn the letter right side up.  • Label parts of the microscope.</td>
</tr>
<tr>
<td>Video</td>
<td><strong>Chapter 7 A View of the Cell, p.170-193.</strong></td>
<td><strong>Problem-Solving Lab 7.1, Is the Plasma membrane a selective barrier, p.176.</strong></td>
</tr>
<tr>
<td><strong>Cell Theory</strong></td>
<td><strong>Section 7.1, The Discovery of Cells, p.173-174.</strong></td>
<td><strong>Problem-Solving Lab 7.2, What Organelle Directs Cell Activity? p.180.</strong></td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td><strong>Section 7.3, Eukaryotic Cell Structure.</strong></td>
<td><strong>Investigate BioLab, Observing and Comparing Different Cell Types, p.188-189.</strong></td>
</tr>
<tr>
<td><strong>Even More Enlightenment Science:</strong> Leeuwenhoek, Hooke, Harvey, and Linnaeus</td>
<td><strong>MiniLab 7.1, Measuring Objects Under A Microscope, p.173.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Robert Hooke</strong></td>
<td><strong>Problem-Solving Lab 7.1, Is the Plasma membrane a selective barrier, p.176.</strong></td>
<td><strong>Ancillary Materials</strong></td>
</tr>
<tr>
<td><strong>Antoni van Leeuwenhoek</strong></td>
<td><strong>Problem-Solving Lab 7.2, What Organelle Directs Cell Activity? p.180.</strong></td>
<td><strong>Lab Manual Exploration 7.1 Use of the Compound Light Microscope, p.35-38.</strong></td>
</tr>
<tr>
<td><strong>Brief History of Cells</strong></td>
<td><strong>Investigate BioLab, Observing and Comparing Different Cell Types, p.188-189.</strong></td>
<td><strong>Investigation 7.2, How Can a Microscope Be Used in the Laboratory? p.39-42.</strong></td>
</tr>
<tr>
<td><strong>Images</strong></td>
<td><strong>Ancillary Materials</strong></td>
<td><strong>BioChallenges and Enrichment Manual</strong></td>
</tr>
<tr>
<td>Anton van Leeuwenhoek (1632-1723).</td>
<td><strong>Project 3: The Life of a Cell, p.9-12.</strong></td>
<td><strong>Chapter 18 Viruses and Bacteria, p.474-485</strong></td>
</tr>
<tr>
<td><strong>Article</strong></td>
<td><strong>Section Focus Transparencies Manual</strong></td>
<td><strong>MiniLab 18.1 Measuring in SI, p.476</strong></td>
</tr>
<tr>
<td>Leeuwenhoek, Antoni van Schleiden, Matthias Jakob Schwann, Theodor Virchow, Rudolf</td>
<td>17. Plant and Animal Cells.</td>
<td></td>
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<tr>
<td>11.2 Identify and describe structural organelles present in all cells (prokaryotic and eukaryotic).</td>
<td>18. Water in the Cell.</td>
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</tr>
<tr>
<td><strong>Cell Membranes &amp; Cell Walls</strong></td>
<td><strong>Chapter 18 Viruses and Bacteria, p.474-485</strong></td>
<td></td>
</tr>
<tr>
<td><strong>The Organelles of the Cytoplasm</strong></td>
<td><strong>MiniLab 18.1 Measuring in SI, p.476</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Images</strong></td>
<td><strong>Problem-Solving Lab 18.1 Analyzing Information: What types of Viruses Cause Disease, p.480</strong></td>
<td></td>
</tr>
</tbody>
</table>
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
- Plant Cell

**Audio**
# Molecules to Organisms: Cells –Structures and Functions, Levels of Organization

## Semester One

<table>
<thead>
<tr>
<th>Activities/Strategies for District Outcome 11</th>
<th>Text/Instructional Materials for District Outcome 11</th>
<th>Sample Assessment Items for District Outcome 11</th>
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</thead>
<tbody>
<tr>
<td><strong>11.7</strong> Compare and contrast unicellular and multi-cellular eukaryotes. Video <strong>Unicellular Organisms</strong> <strong>Unicellular Nutrition</strong> <strong>Bacteria: A Single-Cell Organism</strong> <strong>Kingdom Protista: Single Cell Algae</strong> <strong>Multicellular Nutrition</strong> <strong>Many-Celled Organisms</strong></td>
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</tbody>
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**Note:** The activities, strategies, and materials are designed to support the development of District Outcome 11, focusing on the understanding of cellular structures and their functions within the context of Molecules to Organisms.
# Molecules to Organisms: Cells – Stable Internal Environment/Homeostasis

## Semester One

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<th>Performance Indicators</th>
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</table>
| **Week 5** | 12. Explain how cells move essential materials into/out and maintain a stable internal environment. | **B2.6a** – Explain that the regulatory and behavioral responses of an organism to external stimuli occur in order to maintain both short and long-term equilibrium.  
**B2.r6d** – 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)  
**B2.r6e** – Analyze the body’s response to medical interventions such as organ transplants, medicines, and inoculations. (recommended)  
**B2.3B** – Describe how the maintenance of a relatively stable internal environment is required for the continuation of life.  
**B2.3A** – Describe how cells function in a narrow range of physical conditions, such as temperature and pH (acidity), to perform life functions.  
**Focus Question** - How do systems of specialized cells within organisms help them perform the essential functions of life?  
*Identify micro-organisms in the field of a microscope. | 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.  
Explain how nutrient and waste material concentrations are regulated by the cell.  
Compare and contrast the structures and functions of organs that perform the same function: gills vs. lungs vs. membranes. |
| **Week 6** |  | **B2.3C** – Explain how stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents.  
**B2.4C** - Explain how different organisms accomplish the same results using different structural specializations.  
**B2.4f** - 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.  
**B2.4g** - Explain that some structures in the modern eukaryotic cell developed from early prokaryotes, such as mitochondria and chloroplasts. |  |
# Molecules to Organisms: Cells – Stable Internal Environment/Homeostasis
## Semester One

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<tr>
<th>Activities and Strategies for District Outcome 12</th>
<th>Text/Instructional Materials for District Outcome 12</th>
<th>Sample Assessment Items (Reference) for District Outcome 12</th>
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# Molecules to Organisms: Cells – Stable Internal Environment/Homeostasis

## Semester One

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<thead>
<tr>
<th>Activities/Strategies For District Outcome 12</th>
<th>Text/Instructional Materials For District Outcome 12</th>
<th>Sample Assessment Items (Reference) For District Outcome 12</th>
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<tbody>
<tr>
<td><strong>12.4</strong> 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). Video <strong>Active Transport</strong> Passive and Active Transport <strong>Cell Membrane: Active Transport</strong> Passive Transport Transpiration Tonicity Images <strong>Fresh Blood in Hypertonic Solution</strong> Cell; active transport Cell; active transport</td>
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</tbody>
</table>
## Molecules to Organisms: Cells – Stable Internal Environment/Homeostasis
### Semester One

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<tr>
<th>Activities/Strategies for District Core Outcome 13</th>
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</table>
| **13.5** Construct a model of a typical plasma membrane. **Video** Cell Walls and Cell Membranes Functions of Cell Parts **Images** Frog Development | **Biology: The Dynamics of Life**  
**Chapter 7: The Discovery of Cells**  
Section 7.2 The Plasma Membrane p.175-178  
**Chapter 34: Protection, Support and Locomotion**  
Section 34.1 Skin: The Body’s Protection p.893-898  
**Chapter 35: The Digestive and Endocrine Systems**  
Section 35.3 The Endocrine System p.929-935  
**Chapter 36: The Nervous System**  
Section 36.1 The Nervous System p.943-950  
Section 36.2 The Senses p.951-955  
**Chapter 37: Respiration, Circulation and Excretion** 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  
**Hands on Activities**  
Problem-Solving Lab 7.1 p.176  
Skin Structure & Function FOLDABLE, p.893  
Problem-Solving Lab 34.1, p.896  
Systems FOLDABLE, p.971  
MiniLab 37.1, p.981  
MiniLab 37.2, p.987  
**INVESTIGATE BioLab:** Measuring Respiration p.988-989  
**Technology**  
Interactive Chalkboard CD-ROM  
Power Point Chapters 7, 34, 36, 36 & 37  
MindJogger Videoquiz DVD  
ExamView Pro Test Bank  
Glencoe Puzzle Maker | *Design and construct a foldable on how the plasma membrane controls the entry and exit of substances.*  
*Describe the relationship of blood pH on preventing disease agents from infecting the body.*  
*Design and Construct a model of a plasma membrane.*  
*Describe how biofeedback mechanisms impact homeostasis in the human body.*  
*Explain how the human body is able to maintain a constant internal temperature throughout all seasons.* |
13.8 Conduct research on how the skin is affected by serious burns and summarize your research in a short written paper or power point presentation.

Video
Why Libraries Are Important for Research
Five Steps to Researching a Paper
Defining Your Topic
Determining Your Information Needs
Finding and Retrieving Information: From a Book
Finding and Retrieving Information: In the Computer Catalog
Finding and Retrieving Information: The Reference Section
Finding and Retrieving Information: Periodicals
Evaluating Your Information
Organizing Your Information: Index Cards
Plagiarism and Information Literacy

13.9 Identify the components of human systems that function in homeostasis.

Video
Metabolism and Homeostasis
Cell Membrane: Homeostasis
Homeostasis: Cell Characteristics
Equilibrium
Dynamic Equilibrium
Human Body Systems: The Endocrine System
The Peripheral Nervous System: Introduction
Diagram of Central and Peripheral Nervous Systems

(Puzzlemaker program can be downloaded from Glencoe Website)
13.10 Compare and contrast how a fish, a human, and a bacteria breath.
<table>
<thead>
<tr>
<th>Breath versus Respiration</th>
<th>Pathway of a Breath of Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing</td>
<td>Pathway of a Breath of Air</td>
</tr>
<tr>
<td>Cell Membrane: Diffusion</td>
<td>Breathing</td>
</tr>
<tr>
<td>How Do Fish Breathe Underwater?</td>
<td>Cell Membrane: Diffusion</td>
</tr>
<tr>
<td>Images</td>
<td>Diffusion</td>
</tr>
<tr>
<td>Exploration</td>
<td>Breathing Underwater</td>
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<tr>
<td>Pacing</td>
<td>District Core Outcome</td>
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<tr>
<td><strong>Week 7</strong></td>
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<td><strong>B2.4h</strong> – Describe the structures of viruses and bacteria. <strong>B2.4i</strong> – Recognize that while viruses lack cellular structure, they have the genetic material to invade living cells.</td>
</tr>
</tbody>
</table>
| **Week 8** | **8a. Inform and educate students about AIDS, including infection, transmission and preventions of the disease.** | | *Describe how virus and bacteria invade cells in the body. *List and describe the body’s defense against viral and bacterial invasions. *Describe and explain the structure and function of viruses as related to HIV and AIDS.  
• [http://nih.gov](http://nih.gov)* |
Molecules to Organisms: Structures and Function – Growth and Development of Organisms

Semester One

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<tr>
<td>Week 9</td>
<td>Molecules to Organisms: Growth and Development of Organisms 15. Describe what happens to the genetic material as cells reproduce sexually and asexually.</td>
<td><strong>B2.1d</strong> – Describe how, through cell division, cells can become specialized for specific functions.  <strong>B4.3B</strong> - Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring.</td>
<td><strong>Focus Question</strong> - How do the structure and functioning of organisms change as they grow and develop?</td>
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<tr>
<td>Week 10</td>
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<td><strong>B4.3d</strong> - 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.  <strong>B4.3A</strong> - 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.  <strong>B4.3e</strong> - Recognize that genetic variation can occur from such processes as crossing over, jumping genes and deletion and duplication of genes.</td>
<td><strong>Focus Question</strong> - 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?</td>
</tr>
<tr>
<td>Week 11</td>
<td></td>
<td><strong>B4.3f</strong> - Predict how mutations may be transferred to progeny.  <strong>B4.3g</strong> - Explain that cellular differentiation results from gene expression and/or environmental influence.</td>
<td>*Explain how characteristic structure and functioning of organisms change in predictable ways as they develop from birth to old age.</td>
</tr>
</tbody>
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Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms
Semester One

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<tr>
<td>15.2 Compare and contrast the number of chromosomes found in the body cells and several different organisms.</td>
<td><strong>Video</strong> Chromatin, Chromosomes, and DNA Subunits Chromosomes Chromosomes, Proteins, and DNA <strong>Images</strong> Chromosomes Chromosomes Article Chromosome</td>
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<tr>
<td>15.3 Explain the significance of sex chromosomes.</td>
<td><strong>Video</strong> Sex Chromosomes <strong>Audio</strong> Heredity: Problems Using Sex Chromosomes</td>
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<tr>
<td>Chapter 15</td>
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<tr>
<td><strong>15.4</strong> Compare cell reproduction in prokaryotes and eukaryotes.</td>
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<tr>
<td><strong>Video</strong></td>
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<tr>
<td>Mitosis, Meiosis, &amp; Binary Fission</td>
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<tr>
<td>Protists &amp; Binary Fission</td>
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<td>Bacteria &amp; Binary Fission</td>
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<td>Protist Reproduction: Binary Fission</td>
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<td>Asexual Reproduction</td>
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<td>Kingdom Protista</td>
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<td>Mitosis</td>
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<td>Meiosis</td>
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<td>Meiosis</td>
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<tr>
<td><strong>Images</strong></td>
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<tr>
<td>Cell, animal; mitosis</td>
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<tr>
<td>Cell, animal; mitosis</td>
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<tr>
<td>Cells; daughter cells from simple cell</td>
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| **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** |
## Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms
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</table>
| **15.7 Summarize the events that occur during meiosis I and meiosis II.**  
**Video**  
Meiosis  
Significance of the Process of Meiosis in Organisms  
Closing Remarks: Meiosis and Gamete Formation  
The Importance of Meiosis  
**Images**  
Meiosis, summary  
Results of meiosis  
Meiosis I: independent assortment of chromosomes  
Meiosis I: stages  
Meiosis II: anaphase II  
Meiosis I: metaphase I  
**Article**  
cell | **Biology: The Dynamics of Life,**  
Chapter 10 Mendel and Meiosis, p.252-279.  
Section 10.2, Meiosis, p.263-273.  
**Problem-Solving Lab 10.2, Can you Identify Homologous Chromosomes?**  
**MiniLab 10.2, Modeling Crossing Over,** p.268.  
**Ancillary Materials**  
Basic Concepts Transparencies,  
# 15, Meiosis.  
**Laboratory Manual SE,** Exploration 10-1, *Observation of Meiosis,*  
p.53-54.  
**Reteaching Skills Transparencies,**  
#17, *Mitosis Versus Meiosis.*  
**Reinforcement and Study Guide,**  
Chapter 10, *Mendel and Meiosis,*  
p.43-46.  
**Interactive Chalkboard CD,** Chapter 10, PowerPoint slide presentation. (absent student tutor)  
**Virtual Lab**  
Chapter 8, *How Cancer Cells can be recognized.*  
**Chapter 38 Reproduction and Development,** p.1001 – 1007  
**MiniLab 38.1 Examining Sperm, Egg, and Early Embryonic Development,** p.1006 | **MindJogger Videoquiz DVD or VHS tape.** 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. |
| **15.8 Explain the process of crossing-over and how it affects evolution.**  
**Video**  
Increasing the Genetic Variability in Species:  
Crossing Over in Meiosis  
Possible Combinations of Human Alleles  
Investigating Variation in Spore Color in Sordaria Fungus  
Morgan's Discoveries About Gene Linkages  
Calculating Cross Over Value for Spores Resulting From Mating Different Strains of | | |
### 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 on the Rise in Industry Towns
- Basic Facts About Cancer
- Skin Cancer
- 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
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
## OFFICE OF SCIENTIFIC STUDIES
## Curriculum Instructional Sequence and Pacing Chart
### Biology - Grade 9

## Molecules to Organisms: Cells – Structures and Function – Growth and Development of Organisms

### Semester One

<table>
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<th>Pacing</th>
<th>District Core Outcomes</th>
<th>High School Content Expectations (HSCE)</th>
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</table>
| **Week 12** | **Molecules to Organisms: Growth and Development of Organisms** 16. Discuss the mechanics of inheritance and predict the outcome of various genetic crosses. | **B4.1A** – Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location.  
**B4.1B** – 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.  
**B4.1c** – Differentiate between dominant, recessive, co-dominant, polygenic, and sex-linked traits.  
-MARRY this section with the HSCE from the previous section (Mitosis and Meiosis)- | **Problem Solving:**  
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.  
**Question:**  
Is there a way to produce seed that are guaranteed to produce only lavender flowers?  
Prepare a step-by-step procedures, show Punnett squares and list predicted F₁ and P₁ generations with plausible genotypes of parents. Present your procedures to the class as you would a business plan. |
| **Week 13** | | **B4.1d** – Explain the genetic basis for Mendel’s laws of segregation and independent assortment.  
**B4.1e** – Determine the genotype and phenotype of monohybrid crosses using a Punnett Square.  
-MARRY this section with the HSCE from the previous section (Mitosis and Meiosis)- | | Given a pedigree write genotypes of each individual and explain why or why not certain members inherited the trait. |
<table>
<thead>
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<th>Sample Assessment Items (Reference) For District Outcome 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.2 Compare and analyze Mendel’s two Laws of Inheritance during meiosis. (Segregation and Independent assortment) to the behavior of chromosomes.</td>
<td><strong>Video</strong> <strong>Gregor Mendel's Research on Pea Plants and His Development of Theories of Inheritance</strong> <strong>Mendel’s Theories About Inherited Factors Using Terms In Modern Genetics To Review</strong> <strong>Mendel’s Work</strong> <strong>Gregor Mendel’s Research and Principles</strong> <strong>The Genetic Work of Gregor Mendel</strong> <strong>Mendel’s Experiments</strong> <strong>Images</strong> <strong>Mendel's Hypotheses: Dominance</strong> <strong>Mendel's hypotheses</strong> <strong>Results of Mendel’s monohybrid crosses</strong> <strong>Mendelian inheritance: reciprocal cross for pea shape</strong> <strong>Pea characteristics: plant height</strong> <strong>Article</strong> <strong>Mendel, Gregor Johann</strong></td>
<td></td>
</tr>
</tbody>
</table>
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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</table>
| **16.5** Construct Punnett squares to predict the outcome of monohybrid and dihybrid crosses.  
**Video**  
Closing Remarks: Classical Genetics and Monohybrid Crosses  
Introduction: Classical Genetics and Monohybrid Crosses  
Introduction: Dihybrid Crosses  
Simulating a Dihybrid Cross  
Punnett’s Contributions to Genetics: Development of a Tool to Predict the Outcomes of Matings  
Punnett’s Square  
Images  
Monohybrid cross; F- pea shape, height, color  
Monohybrid cross (F-) for flower color  
Results of Mendel’s monohybrid crosses  
Dihybrid cross; Punnett square  
Collie/Newfoundland F2  
**Audio**  
Genetics: Dihybrid Crosses  
Genetics: Working With A Punnett Square | **Biology: The Dynamics of Life, SE**  
Chapter 12 Patterns of Heredity and Human Genetics, p.308-335.  
Section 12.2, When Heredity Follows Different Rules, p.315-322.  
**Problem-Solving Lab 12.2,** How is Coat Color in Rabbits Inherited? p.318.  
**Problem-Solving Lab 12.3,** How is Duchene’s Muscular Dystrophy Inherited? p.326.  
**MiniLab 12.2,** Detecting Colors and Patterns in Eyes, p.27.  
**Virtual Lab Chapter 12** How can Sex-Linked Traits be Identified?  
**Ancillary Materials**  
Basic Concepts Transparencies Manual, #14, Monohybrid Cross.  
Laboratory Manual SE, Exploration 12-1, Determination of Genotypes from Phenotypes in Humans, p.67-70.  
**Virtual Labs, CD,** Chapter 10, Punnett Squares.  
**Reading Essentials for Biology Manual,** Chapter 12, Sections 12-2 and 12-3, p.128-134.  
**Interactive Chalkboard CD,** Chapter 12, PowerPoint slide show. (absent student tutor)  
**Chapter 12** Section 12.1, Mendelian Inheritance of Human Traits, p.309-314.  
**MiniLab 12.1,** Illustrating a Pedigree, p.310.  
**Problem-Solving Lab 12.1,** What Are the Chances? p.311. | **Biology: The Dynamics of Life**  
Chapter 12 Assessment, Standardized Test Practice, 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. |

**16.6** Describe inheritance patterns that exist other than simple dominance. i.e., incomplete dominance, multiple alleles, codominance, continuous variation and environmental.  
**Video**  
Incomplete Dominance in Humans and Plants
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>16.7</strong></td>
<td>Explain what gene (deletion, duplication, inversion and translocation) mutations are and how they can affect an organism's phenotype.</td>
</tr>
<tr>
<td><strong>16.8</strong></td>
<td>Given a karyotype, predict the possible genetic disorder.</td>
</tr>
<tr>
<td><strong>16.9</strong></td>
<td>Construct and interpret pedigrees.</td>
</tr>
<tr>
<td>Images</td>
<td></td>
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<tr>
<td>--------------------------------------------</td>
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</tr>
<tr>
<td>Colorblindness pedigrees: X-linked recessive trait</td>
<td></td>
</tr>
<tr>
<td>Autosomal dominant trait; pedigree</td>
<td></td>
</tr>
<tr>
<td>Pedigree analysis; explanation of symbols</td>
<td></td>
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<tr>
<td>Autosomal dominant trait; pedigrees</td>
<td></td>
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<tr>
<td>Anonymous pedigree</td>
<td></td>
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<tr>
<td>Pedigree of trait that skips generation</td>
<td></td>
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<tr>
<td>Pedigree: offspring</td>
<td></td>
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<tr>
<td>Pedigree: individuals</td>
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</tbody>
</table>
### Molecules to Organisms: Growth and Development-Heredity – Structure, Expression and Technology

#### Semester One

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</table>
| **Week 14** | 17. Explain how new traits may arise in individuals through changes in genetic material (DNA) and environmental factors | **B4.2A** – 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).  
**B4.2B** – Recognize that every species has its own characteristic DNA sequence. | 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. |
| **Week 15** | **B4.2C** – Describe the structure and function of DNA.  
**B4.2D** – Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other).  
**B4.2E** – Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals. | **Include this section with the HSCE from the previous sections (Mitosis and Meiosis and Heredity – Fundamental Genetics)** | 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. |
### Molecules to Organisms: Growth and Development - Heredity – Structure, Expression and Technology

#### Semester One

<table>
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<th>Week 16</th>
<th>Molecules to Organisms: Growth and Develop - Heredity – Structure, Expression and Technology</th>
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<td></td>
<td>17. Explain how new traits may arise in individuals through changes in genetic material (DNA) and environmental factors.</td>
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<tr>
<td></td>
<td><strong>B4.r5a</strong> – Explain how recombinant DNA technology allows scientists to analyze the structure and function of genes. (recommended)</td>
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<tr>
<td></td>
<td><strong>B4.r5b</strong> – Evaluate the advantages and disadvantages of human manipulation of DNA. (recommended)</td>
</tr>
</tbody>
</table>

* 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.
## Molecules to Organisms: Growth and Development-Heredity – Structure, Expression and Technology

### Semester One

#### Activities/Strategies

- **For District Outcome 17**

17.1 Create a timeline of the events that led to the identification of DNA.

- **Video**
  - Rosalind Franklin and Maurice Wilkins: X-Ray Crystallography of DNA
  - Friedrich Miescher: First to Isolate DNA
  - Frederick Griffith: Discovery of the "Transforming Principle"
  - Oswald Avery, Colin MacLeod and Maclyn McCarty: Confirming DNA is the Transforming Principle
  - Alfred Hershey and Martha Chase: Acceptance Within Scientific Community of DNA as Genetic Material
  - P.A. Levene: DNA Composition of 4 Nitrogen Bases and Deoxyribose Sugar
  - Erwin Chargaff: DNA is Not Equal For All Species and Ratio of Bases Varies Among Species
  - James Watson and Francis Crick: DNA Molecule Has the Form of a Double Helix

17.2 Describe and construct a model of the DNA molecule.

- **Video**
  - DNA
  - The Riddle of Life: DNA
  - What Is DNA?
  - DNA Structure and Function
  - Understanding DNA
  - Determining DNA's Structure
  - Recipes of Life: The Structure of DNA

#### Text/Instructional Materials

- **For District Outcome 17**

**Biology: The Dynamics of Life,**

**Problem-Solving Lab 11.1,** What does chemical analysis reveal about DNA? p.283.

**TE Additional Lab,** Gene and Chromosome Size, p.282-283.


**Quick Demo,** p.285.


#### Ancillary Materials

- **Basic Concepts Transparencies,** #16, DNA Replication.
- **Forensics and Biotechnology Lab Manual,** Lab 2, How can you extract DNA from Cells? p.13-14.

#### Sample Assessment Items

- **For District Outcome 17**

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.
17.3 Summarize the process of DNA replication.
### Molecules to Organisms: Growth and Development - Heredity – Structure, Expression and Technology

**Semester One**

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</table>
| **17.4** Analyze the importance of protein in the formation of the genetic code.  
**Video**  
Proteins, Amino Acids, and Messenger RNA  
The Role of Genetic Code in the Synthesis of Proteins and Effects of Mutations in the Genetic Code  
Structures and Functions of Different Proteins in the Body  
The Process of Protein Synthesis  
**Images**  
Information flow: gene to protein  
DNA to RNA to protein: 1D code to 3D structure  
Gene structure; coding and regulatory regions | **Biology: The Dynamics of Life, SE**  
Chapter 11 DNA and Genes, p.280-307.  
Section 11.2, From DNA to Protein, pp. 288-295.  
**MiniLab 11.1**, Transcribe and Translate, p.293.  
**Ancillary Materials**  
Basic Concepts Transparencies, #16, DNA Replication, #17, DNA Transcription, #18, RNA Translation.  
**Reading Essentials for Biology Manual**, Chapter 11, Section 11.2, From DNA to Proteins, p.118-123.  
**Interactive Chalkboard CD**, Chapter 12 PowerPoint presentation. (absent student tutor) | **Biology: The Dynamics of Life SE**  
Chapter 11 Assessment, Standardized Test Practice, 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.  
**Topic**: Show how a beneficial trait can become part of the genetic material in members of a population. |
| **17.5** Analyze the relationship between transcription and translation.  
**Video**  
Exceptions to the Rules of Transcription  
Simulating the Process of Transcription With Models  
Introduction: Transcription of DNA to Messenger RNA  
Closing Remarks: Transcription of DNA to Messenger RNA  
Review of the Processes of Transcription and Translation of mRNA  
Translation  
Introduction: Translation and Protein Synthesis  
RNA Polymerase and Transcription | | |

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**DETROIT PUBLIC SCHOOLS**  
**OFFICE OF SCIENTIFIC STUDIES**  
**Curriculum Instructional Sequence and Pacing Chart**  
**Biology - Grade 9**
### Images
- Direction of transcription
- Regulation of transcription; regulatory protein binding
- Transcription overview
- Transcription; 5' to 3' direction of RNA formation
- Nucleus: Transcription and Processing
- Nucleus: Transcription and Processing

### Video
- RNA's Role in Creating Life
- What Is RNA?
- The Nucleus, DNA, & RNA
- What is the Difference Between the Sugars in DNA and RNA?
- Comparing Characteristics of DNA and RNA (Sugar, Strands, Size, Site, Type, Base)
- What is the Role of RNA?
- How Does RNA Know Where to Start Coding From a DNA Molecule?
- How is RNA Different From DNA?
- Messenger RNA: Transcribing the Message

### Article
- RNA

### 17.6 Describe how RNA is made and the role it plays in gene expression (transcription).

### Images
- RNA
- RNA
- RNA
- RNA
- Cell with ribosomes and RNA highlighted

### Removal of RNA Primers
**Activities/Strategies For District Outcome 17** | **Text/Instructional Materials For District Outcome 17** | **Sample Assessment Items (Reference) For District Outcome 17**
---|---|---
17.7 Define and model steps in Genetic Engineering.  
Video  
Genetic engineering  
Genetic engineering  
History of Genetic Engineering  
Genetic Engineering & Research  
Article  
Genetic Engineering  

**17.8** Explain the goals of the Genome Project.  
Video  
The Human Genome Project  
Mapping the Human Genome  
DNA and the Human Genome Project  
Race to Finish the Human Genome Project  
Explaining the Human Genome Project  
The Human Genome Project  
Human Genome Project: What are the Objectives, Predicted Costs and Time Span of the Project?  
Human Genome Project: What Are the Implications of This Project on Society?  
Human Genome Project: How Does the Mapping Process Work?  

**Biology: The Dynamics of Life, Chapter 13 Genetic Technology, p.336-359.**  
**MiniLab 13.1, Matching Restriction Enzymes to Cleavage Sites, p.343.**  
**Investigate BioLab, Modeling Recombinant DNA, p.354-355.**  
**Problem-Solving Lab 13.2, How might gene transfer be verified? p.347**  
Challenge Activity, *Knockout Mice*, p.344.  

**Ancillary Materials**  
Basic Concepts Transparencies, #19, Recombinant DNA.  
Reteaching Skills Transparencies, #22, Recombinant DNA Technique.  
Section Focus Transparencies, #34, *Mapping Human Genes*.  
Virtual Labs CD, Chapter 13, *Biotechnology, Gene Splicing and Tracking Grissles*  
Interactive Chalkboard CD, Chapter 13, PowerPoint Slide show.  
(absent student tutor)  

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)  
**Biology: The Dynamics of Life, Ancillary Materials**  
MindJogger VideoQuiz DVD or VHS tapes, *Chapter 13 Video quiz*  
Relate the cloning procedure to meiosis and fertilization.
### Molecules to Organisms: Growth and Development-Heredity – Structure, Expression and Technology Semester One

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</table>
| **17.9 Describe how genetic engineering can benefit humans.** Video  
Genetic Engineering and Wheat  
Genetic Engineering and Agriculture  
Genetically Engineered Food  
Vascular Disease: Using Genes to Regenerate Tissue | **Biology: The Dynamics of Life, SE**  
**Problem-Solving Lab 13.3**, *How is identification made from a DNA fingerprint?* p.353.  
**Videodiscovery: Genetics** | 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.  
| **17.10 Debate the positive and negative effects of human manipulation in DNA.** Video  
Genetic Engineering and Private Companies  
Closing Remarks: Manipulating DNA  
Transgenics: Manipulating Genetics  
Understanding the Impact of Gene Alteration  
Gene Therapy  
Gene Therapy: Transforming the Human Body through Genetic Drugs  
Studying Genes to Find a Cure for Cystic Fibrosis  
Images  
Cystic fibrosis: potential body sites for gene therapy | | |
### Cell: Structures and Function – Cell Energy and Dynamics - Photosynthesis and Respiration

**Semester One**

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

**For District Outcome 14**

14.1 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.

- **Video**
  - Cellular Energy: Photosynthesis
  - The Photosynthesis Equation
- **Images**
  - Photosynthesis: role of ATP and ADP
  - Photosynthesis equation
- **Article**
  - Photosynthesis
- **Audio**
  - A Better Understanding of Respiration

14.2 Explain how the mitochondria use glucose to produce ATP when oxygen is present or lactic acid when oxygen is not present – Cellular Respiration.

- **Video**
  - Cellular Respiration
- **Images**
  - Photosynthesis: compared with aerobic cellular respiration

### Text/Instructional Materials

**For District Outcome 14**

- **Biology: The Dynamics of Life,**
  - MiniLab 9.2, Use Isotopes to Understand Photosynthesis, p.228.
  - Problem-Solving Lab 9.2, Cellular Respiration or Fermentation, p.235.

- **Ancillary Materials**
  - Basic Concepts Transparencies
    #12, Photosynthesis
    #13, Respiration
  - Reading Essentials for Biology Manual
    9.1 The Need for Energy, p.89-91.

### Sample Assessment Items

**Reference**

- Construct concept diagrams for photosynthesis and cellular respiration.
  - Design and construct a chart comparing the processes of photosynthesis and respiration.

- **Biology: The Dynamics of Life**
  - Chapter 9 Assessment, Standardized Test Practice, p.243 items 20-25.
  - Unit 3 Review, Standardized Test Practice, p.248-249 items 1-21.
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
## Ecosystems – Photosynthesis and Respiration
### Semester Two

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

### Semester Two

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</table>
| **14.1** 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.  
**Video**  
From Food to ATP  
Photosynthesis Reaction  
Dark Reactions of Photosynthesis  
**Images**  
Photosynthesis  
Photosynthesis (2) | **Biology: The Dynamics of Life,**  
**Create a Garden -** [http://4hgarden.msu.edu/](http://4hgarden.msu.edu/);  
[http://aggie-horticulture.tamu.edu/kinder/sgardens.html](http://aggie-horticulture.tamu.edu/kinder/sgardens.html)  
**MiniLab 9.1,** Separating Pigments, p. 226.  
**MiniLab 9.2,** Use Isotopes to Understand Photosynthesis, p. 228.  
**Problem-Solving Lab 9.2,** Cellular Respiration or Fermentation, p. 235.  
**MiniLab 9.3,** Determine if Apple Juice Ferments, p. 236.  
**Ancillary Materials**  
Basic Concepts Transparencies  
#12, Photosynthesis  
#13, Respiration  
**Reading Essentials for Biology Manual**  
9.1 The Need for Energy, pp. 89-91.  
**Section Focus Transparencies**  
#22, Photosynthesis  
#23, Cellular Respiration | **Construct concept diagrams for photosynthesis and cellular respiration.**  
**Design and construct a chart comparing the processes of photosynthesis and respiration.**  
**Biology: The Dynamics of Life**  
Chapter 9 Assessment, **Standardized Test Practice,** p. 243 items 20-25.  
Unit 3 Review, **Standardized Test Practice,** pp. 248-249 items 1-21. |
| **14.2** Explain how the mitochondria use glucose to produce ATP when oxygen is present or lactic acid when oxygen is not present – Cellular Respiration.  
**Video**  
Metabolic Pathways  
Aerobic Cellular Respiration  
**Images**  
Photosynthesis; compared with aerobic cellular respiration | | |
| **14.3** Compare and contrast photosynthesis and respiration and analyze their importance to the cells survival, (and ultimately the organisms survival).  
**Video**  
Plant Cells: Chloroplasts & Photosynthesis  
Anaerobic Respiration | | |
### Ecosystems – Energy Transformation and Flow of Energy
#### Semester Two

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<tr>
<td>Week 20</td>
<td><strong>1.</strong> Identify types of energy transformation in an ecosystem and predict the cause and effect relationships.</td>
<td><strong>B3.1C</strong> – Recognize the equations for photosynthesis and respiration and identify the reactants and products for both. <strong>B3.3A</strong> – Use a food web to identify and distinguish producers, consumers, and decomposers and explain the transfer of energy through trophic levels.</td>
<td>*Explain how abiotic and biotic factors can be altered or adjusted to get the optimum energy necessary to promote life within the ecosystem. *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. *Develop a method to quantitatively measure the lost of energy as it is transformed from one form to another.</td>
</tr>
<tr>
<td>Week 21</td>
<td></td>
<td><strong>B3.3b</strong> – Describe environmental processes (e.g., the carbon and nitrogen cycles) and their role in processing matter crucial for sustaining life.</td>
<td>*Describe each of the biocycles from organism to environment and back.</td>
</tr>
<tr>
<td>Week 22</td>
<td><strong>2.</strong> 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.</td>
<td><strong>B3.2A</strong> – Identify how energy is stored in an ecosystem. <strong>B3.2B</strong> – Describe energy transfer through an ecosystem, accounting for energy lost to the environment as heat.</td>
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</tr>
</tbody>
</table>
## Ecosystems – Energy Transformation and Flow of Energy

### Semester Two

<table>
<thead>
<tr>
<th>Week 23</th>
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</table>
|         | **B3.2C** – Draw the flow of energy through an ecosystem. Predict changes in the food web when one or more organisms are removed.  
**B3.1A** – Describe how organisms acquire energy directly or indirectly from sunlight. |

<table>
<thead>
<tr>
<th>Week 24</th>
<th>3. 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.</th>
</tr>
</thead>
</table>
|         | **B3.1B** – Illustrate and describe the energy conversions that occur during photosynthesis and respiration.  
**B3.1D** – Explain how living organisms gain and use mass through the processes of photosynthesis and respiration. |

<table>
<thead>
<tr>
<th>Week 25</th>
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</table>
|         | **B3.1E** – Write the chemical equation for photosynthesis and cellular respiration and explain in words what they mean.  
**B3.1F** – Summarize the process of photosynthesis. |
## Ecosystems – Energy Transformation and Flow of Energy
### Semester Two

<table>
<thead>
<tr>
<th>Activities/Strategies</th>
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</table>
| **Begin “Ecosystem in a jar” lab** (Unit 2 Resources Manual), pp. 7-8 in order to facilitate future data collection. | **Biology: The Dynamics of Life**  
Section 2.1, Organisms and Their Environment, pp. 35-45.  
Section 2.2, Nutrition and Energy Flow, pp 46-57. | Construct ecological pyramids, which describe relationships between various ecosystems. Develop an energy map that indicates how energy is transformed by producers, consumers and decomposers. 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. Create an energy transformation log from plant to fast food meal. Use a calorimeter to determine the energy content of food samples. What kinds of energy transformations does it take for you to listen to your CD player? *MindJogger Video* DVD disk or VHS tape, Chapter 2. |
| **Identify and describe the types/forms of energy.**                                  |                                               |                                                                                                    |
| **Video**                                                                            | **Science Inquiry Lab Manual**                                                              |                                                                                                    |
| Kinds and Forms of Energy                                                            | Activity 1, What is Inquiry, pp. 7-10.                                                     |                                                                                                    |
| Kinetic and Potential Energy                                                          | **Understanding the Photo**, p. 34.                                                         |                                                                                                    |
| Nuclear Energy                                                                       | **Finding the Main Idea**, p. 35.                                                           |                                                                                                    |
| Chemical Energy                                                                      | **MiniLab 2.1, Salt Tolerance of Seeds**, p. 36.                                           |                                                                                                    |
| Sound Energy                                                                         | **Cycles of Matter** FOLDABLE, p. 46.                                                      |                                                                                                    |
| The Energy of Heat                                                                   | **Problem-Solving Lab 2.2 How Can You Organize Trophic Level Information**, p. 50.         |                                                                                                    |
| Energy Exchanges                                                                     | **Mini-Lab 2.2**, Detecting Carbon Dioxide, p. 54.                                         |                                                                                                    |
| Energy Around Us                                                                     | **Design Your Own BioLab, How can one population affect another?** pp. 58-59.             |                                                                                                    |
| Potential Energy                                                                     | **Ancillary Materials**                                                                    |                                                                                                    |
| Potential Energy and Kinetic Energy                                                  | **Interactive Chalkboard CD** PowerPoint Slide Shows; Chapter 2. (Re-teaching Tool)        |                                                                                                    |
| Potential and Kinetic Energy                                                         | **Laboratory Manual SE**                                                                   |                                                                                                    |
| **Images**                                                                           |                                               |                                                                                                    |
| mechanical energy_S01852_SDD                                                         |                                               |                                                                                                    |
| Nuclear Power Plant                                                                  |                                               |                                                                                                    |
| Geothermal Energy                                                                    |                                               |                                                                                                    |
| Wind Power Plants                                                                    |                                               |                                                                                                    |
| Energy_Gundremmingen_nuclear_power_plant_Germany_large                                 |                                               |                                                                                                    |
| Mechanical energy to electrical energy, conversion of                                |                                               |                                                                                                    |
| Mechanical energy_S01852_SDD                                                         |                                               |                                                                                                    |
| Energy exchange; potential, kinetic                                                 |                                               |                                                                                                    |
| Energy; potential vs. kinetic                                                        |                                               |                                                                                                    |
| Energy; potential vs. kinetic                                                        |                                               |                                                                                                    |
1.2 Compare and contrast the differences between energy transformations in an electrical system to energy transformation in a living system.

1.3 Distinguish between abiotic and biotic forms of energy.

1.4 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.)
### Ecosystems – Energy Transformation and Flow of Energy
#### Semester Two

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</table>
| **2.1** 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. | **Biology: The Dynamics of Life**  
Chapter 3 Communities and Biomes, pp. 64-89.  
Section 3.1, Communities, pp 64-69.  
Section 3.2, Life in a Community, pp. 65-69.  
**Chapter 2; Principles of Ecology, pp. 32-36.**  
**Biology and Society,** The Everglades-Restoring an Ecosystem, p. 60.  
**Chapter 3; Communities and Biomes pp. 64-89**  
**MiniLab 3.1 Looking at Lichens,** p. 67.  
**Problem-Solving Lab 3.1, How do You Distinguish Between Primary and Secondary Succession?** p. 68.  
**Biomes FOLDABLE,** p. 70.  
**Problem-Solving Lab 3.2, How does oxygen vary in a tide pool?** p. 72.  
**Investigate BioLab,** Succession in a Jar, pp. 84-85.  
**Ancillary Materials**  
**Laboratory Manual SE,**  
3.1 **What Organisms Make Up a Microcommunity?** pp. 11-14.  
**Reteaching Skills Transparencies**  
1. The Carbon Cycle  
2. The Nitrogen Cycle  
3. Trophic Levels  
**Mindjogger Videoquiz,** Chapter 2  
**Reinforcement and Study Guide,**  
Principles of Ecology, pp. 7-10.  
Communities and Biomes, pp. 11-14.  
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.  
**Biology: The Dynamics of Life SE**  
**Chapter Assessment,**  
**Standardized Test Practice** 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. |

**Videos:**  
The Water Cycle  
The Carbon-Oxygen Cycle  
Nutrients and Soil  
A Natural Cycle  
The Nitrogen Cycle  
Changes in the Ozone Layer  
The Nitrogen Cycle  
The Water Cycle  
Continental Glaciers and the Water Cycle  
Freshwater’s Journey  
The Water Cycle  
The Phosphorus Cycle  
**Images:**  
Water cycle  
Oxygen/carbon exchange  
Carbon cycle  
Phosphorus cycle  
Water cycle_Water_cycle_large  
Nitrogen Cycle
<table>
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<th>Skill Builders:</th>
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<tr>
<td>water</td>
<td>The Water Cycle</td>
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<tr>
<td>nitrogen cycle</td>
<td>Nitrogen Cycle</td>
</tr>
<tr>
<td>carbon cycle</td>
<td>Carbon cycle</td>
</tr>
</tbody>
</table>

2.2 Analyze the interdependence of cycles and species (plants, animals, and microorganisms) that contribute to the deposit exchange and use of nutrients in the soil.

**Video**
- The Flow of Energy through Ecosystems
- Energy Transfer: Producers and Consumers
- Energy Transfer: Decomposers and Detritus Feeders
- Ecosystems: Balance Within Food Chains and Energy Pyramids
- The Food Web
- The Food Chain: Predators and Prey

**Images**
- Carbon cycle
- Photosynthesis/respiration cycle
- Nitrogen Cycle
- Water Cycle
## Ecosystems – Energy Transformation and Flow of Energy
### Semester Two

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</table>
| **3.1 Describe the interactive relationships (parasitism, commensalism, mutualism) of organisms in various ecosystems.** | **Biology: The Dynamics of Life, Ancillary Materials**  
**BioChallenges and Enrichment Manual** Project 2; *Habitat Improvement*, pp. 5-8.  
**Laboratory Manual**  
**Probeware Lab Manual,**  
Lab 2: *An Environmental Limiting Factor*, pp. 5-8.  
**Unit 2 Resources Manual,** Chapters 2 and 3 review worksheets and masters.  
**Basic Concepts Transparencies Manual, 1-3:**  
1. A Food Web.  
2. Ecological Pyramids.  
3. Primary Succession. | |
| Video  
**Clownfish and Sea Anemone: Symbiotic Relationship**  
**Relationships Between Populations: Symbiotic Relationships in the Reef**  
**Hippos and Barbels: A Day at the Spa**  
**Symbiosis**  
**Images**  
**Clown Fish in anemone**  
**Sea anemone with Clown Fish**  
**Symbiosis, definition**  
**Buffalo, Cape; with birds**  
**Parasitism; brood-cowbird & dickcissel**  
**Article**  
**Symbiosis** | |
| **3.2 Discuss the methods that organisms use to adapt to their environment.** | | |
| Video  
**Extreme Plant Adaptations: Conifers and Cacti**  
**Plant Adaptations to Desert Conditions**  
**Adaptation of Plants to the Arctic Biome**  
**Adaptation and climate**  
**How Plants Adapt**  
**Introduction to Plant Adaptation**  
**Adaptation**  
**Prey Animals: Their Adaptations for Survival**  
**Beneficial Adaptations of Species of the Galapagos** | | |
### Adaptations in Desert Biomes

**Animal Adaptations to Desert Conditions**

**Fish Adaptations**

### Images

**Plant adaptations**

**Adaptations, animal and plant**

**Protective coloration, definition of**

**Camouflage, definition**

**Desert adaptation: dromedary camels**

**Tropical rainforest adaptation: shallow roots**

### 3.3 Explain how a food pyramid can be used to represent energy flow in a food web.

### Video

**Biomass**

**The Energy Flow**

**Energy Pyramids**

**Food Pyramid Under the Sea**
<table>
<thead>
<tr>
<th>Pace</th>
<th>District Core Outcome</th>
<th>High School Content Expectations (HSCE)</th>
<th>Performance Indicators</th>
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</thead>
</table>
| **Week 26** | 4. 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.  
5. Describe how climates and other physical factors affect biomes and the distributions of life forms.  
6. Describe and discuss aspects of succession, looking at primary and secondary succession models. Understand the recovered ecosystem will be similar to the original one. | **B3.4A** – 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.  
**B3.4B** – 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.  
**B3.4C** – Examine the negative impact of human activities. | 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. |
<table>
<thead>
<tr>
<th>Activities/Strategies</th>
<th>Text/Instructional Materials</th>
<th>Sample Assessment Items (Reference)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.1</strong> Explore the effects of seasonal changes on food webs and living systems (Ecosystems/Biomes). <strong>Text/Instructional Materials</strong></td>
<td></td>
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</tr>
</tbody>
</table>
5.2 Predict how changes in the environment affect an organism.

<table>
<thead>
<tr>
<th>Video</th>
<th>Seasonal Change in Temperate Deciduous Forests</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Followers of Food: The Migration Patterns of Caribou and Birds</td>
</tr>
<tr>
<td></td>
<td>Physical and Behavioral Adaptations Enable Animals to Survive</td>
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<td></td>
<td>Reindeer: A Deer for All Seasons</td>
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<td></td>
<td>Autumn in the Northern Woods, Preparation for Winter and the Mating Season for Many Animals</td>
</tr>
<tr>
<td></td>
<td>Freshwater Habitats: Summer into Winter</td>
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<td>Late Spring in Northeast Asia: Life in the Temperate Forest</td>
</tr>
<tr>
<td>Images</td>
<td>California coastal range; seasonal change</td>
</tr>
<tr>
<td></td>
<td>California coastal range; seasonal change</td>
</tr>
</tbody>
</table>
# Ecosystems – Biogeochemical Cycles and Succession
## Semester Two

<table>
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<tr>
<th>Activities/Strategies</th>
<th>Text/Instructional Materials</th>
<th>Sample Assessment Items (Reference)</th>
</tr>
</thead>
</table>
| **6.1 Abandoned field exploration:** Mark off a one-meter by one-meter grid with string to:  
  • Observe the succession of species in an urban area.  
  • Collect, record and identify the type of species (plant, animal) that inhabit an area (abandoned field) over a two-week period in a journal.  
  **Video**  
  *Communities and Biomes*  
  *Stages of Succession*  
  *Building a Model of Succession Based on the Study of Succession Within the Limestone Quarry Site*  
  *Factors That Influence Succession*  
  *Introduction: Succession and Climax Communities*  
  *How Quickly Changes in Succession Take Place*  
  *Ecological Succession*  
  **Images**  
  *Stream to forest succession*  
| **Biology: The Dynamics of Life,** Chapter 5 Biological Diversity and Conservation, pp. 110-131.  
  Section 5.1 Biological Diversity, Conservation, pp. 111-119.  
  **Ancillary Materials**  
  *Reading Essentials for Biology Manual:*  
  2.1 *Organisms and Their Environment,* pp. 10-16.  
  3.1 *Communities,* pp. 24-27.  
  3.2 *Biomes,* pp. 28-33.  
  5.1 *Vanishing Species,* pp. 44-49.  
  5.2 *Conservation of Biodiversity,* pp. 50-52.  
  **Virtual Labs CD**  
  *Chapter 4: Population Biology.*  
  *Chapter 5: Assessing Water Quality.*  
  **DVD**  
  *Inconvenient Truth, Presentation by Al Gore*  
  **Reteaching Skills Transparencies:**  
  Secondary Succession |
| **6.2 Identify and analyze the role succession plays in the distribution and interrelationships between species (parasitism, mutualism, commensalism, etc.).  
  **Video**  
  *Succession*  
  *Closing Remarks: Succession and Climax Communities*  
  *How Quickly Changes in Succession Take Place*  
  *Introduction: Succession and Climax Communities*  
  *What Determines the Course of Succession Over Time?*  
  *Historical Changes in the Study of Succession*  
  *Factors That Influence Succession*  
  *Description of the Area Where the Study of Succession is Taking Place*  
  *Plant Adaptation: Succession in the Forest System*  |
| **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.** |
### 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
OFFICE OF SCIENTIFIC STUDIES
Curriculum Instructional Sequence and Pacing Chart
Biology - Grade 9

Ecosystems – Population and Human Impact
Semester Two

| Pace     | District Core Outcome                                                                                                                                                                                                 | High School Content Expectation (HSCE)                                                                                                                                                                                                 | Performance Indicators                                                                                                                                                                                                                     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Week 27  | 7. Discuss the effect of human population on natural resources.  
8. Describe some implications of human activity and technology on the balance of ecosystems and related issues in bioethics  
9. Investigate and analyze the role of agriculture, manufacturing and human activities as they relate to atmospheric conditions in ecosystems.  
10. Make information judgments related to global environmental issues, based on critical analysis of available information.                                                                                           | B3.4d – Describe the greenhouse effect and list possible causes.  
B3.4e – List the possible causes and consequences of global warming.  
B3.5e – Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of population dynamics within ecosystems.  
B3.5f – Graph an example of exponential growth. Then show the population leveling off at the caring capacity of the environment.  
B3.5g – Diagram and describe the stages of the life cycle for a human disease-causing organism. (recommended)                                                                 | 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.  
Through the perspective of a government agency develop plausible solutions to environmental problems (Bioethics).                                                                 |
## Ecosystems – Population and Human Impact
### Semester Two

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<tr>
<td><strong>7.1</strong> 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. <strong>Video</strong> Marine Harvests and the Endangerment and Extinction of Ocean Species Protecting Native Species The Threat to Biodiversity Change and Biodiversity Interdependence, Recycling, and Adaptation <strong>Images</strong> Food web Stream food web Rocky bottom food web Sandy shore food web Polar food web (Antarctic) <strong>Biology: The Dynamics of Life Ancillary Materials</strong> Activity 9 Effects of Water Quality Changes on Protists, pp. 39-42. <strong>Virtual Labs CD</strong> Chapter 5: Assessing Water Quality. <strong>Performance Assessment in the Science Classroom Manual</strong>, The Environmental Choice-Paper or Foam, p. 43. <strong>4.1 How Does the Environment Affect an Eagle Population?</strong> pp. 15-18. <a href="http://www.ecofootprint">http://www.ecofootprint</a> <strong>Reteaching Skills Transparencies; Linear Versus Exponential Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8.1</strong> Identify several ways that man impacts the environment. <strong>Videos:</strong> Human Impact on Rainforests Human Impact on Catchments Human Impact on the Carbon Cycle Human Impact Scientists Study the Impact of the Oil Spill on Sea Otter Populations March 24, 1989, A Look at the Exxon Valdez Oil Spill in Alaska's Prince William Sound Environments Under Stress Studying the Effects of Humans on Their Environment</td>
<td>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.</td>
<td></td>
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</tbody>
</table>
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 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
**8.5** Analyze what factors in the environment (physical and chemical) would be considered limiting factors that would influence birth rates and death rates.

**Video**

- Introduction: Gene Frequencies, Natural Selection and Speciation
- Darwin, the Beagle, and Finches: Darwin Discovers Evidence of Natural Selection
- Natural Selection: Examples from the Galapagos
- Species on the Island of Java: A Leopard's Feast
- Darwin Studies Two Types of Evolution: Economic and Natural Selection
- Darwin Develops a Non-Random Theory of Evolution: Natural Selection and Adaptation
- Earth's Carrying Capacity
- Using and Conserving Our Land: A Look at Sheep Farming
- Overpopulation: The Case of the White-Tailed Deer
- Characteristics of Deserts and Animal Adaptations
- Representing Populations on Growth Curves
- Changes in Population Size
- Population
- Population Growth
- Now and Then: Population Growth
- Using and Conserving Our Land: A Look at Sheep Farming
- Earth's Carrying Capacity
- Exponential Growth
- Closing Remarks: Patterns of Population Growth and
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<td>Family Planning in Latin America</td>
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<td>Human Population and Strained Resources</td>
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<td>Types of Interactions Within Ecosystems</td>
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<td>Interacting Organisms</td>
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<td>Deforestation</td>
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<td>Tracking Human Impact on the Environment</td>
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<td>Human Impact on Biomes</td>
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<td>Invasive Species</td>
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<tr>
<td>Zebra Mussels and Other Invasive Species in the Great Lakes Basin</td>
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<tr>
<td>Controlling Invasive Species: Helpful Tips for What You Can Do Agriculture and the Environment</td>
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<tr>
<td>Change and Biodiversity</td>
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<td>The Scientific Study of Biodiversity</td>
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<td>Renewable Resources</td>
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<td>Irreplaceable: Using of Non-renewable Resources</td>
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## Detroit Public Schools
Office of Scientific Studies
Curriculum Instructional Sequence and Pacing Chart
Biology - Grade 9

### Ecosystems – Population and Human Impact
Semester Two

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</table>
| 9.1 Research how agriculturalists maintain a sustainable environment for crops and animals.  | Biology: The Dynamics of Life  
Chapter 4 Population Biology, pp. 90-109.  
Section 4.1 Population Dynamics, pp. 91-99.  
Section 4.2 Human Populations, pp. 100-103.  
Chapter 5 Biological Diversity and Conservation, pp. 110-131.  
Section 5.1 Vanishing Species, pp. 111-120.  
Section 5.2 Conservation of Biodiversity pp. 121-125.  
Ancillary Materials  
Interactive Chalkboard CD  
Chapters 4 and 5 slideshows.  
Reteaching Skills Transparencies  
7a, 7b & 7c. Acid precipitation  
Virtual Labs CD  
Chapter 4: Population Biology. | Biology: The Dynamics of Life SE  
Unit 2 Review, Standardized Test Practice Items 1-15, pp. 136-137. |

**Video**
- Soil Health and Sustainability
- Sustainable Agriculture
- Why Libraries Are Important for Research
- Five Steps to Researching a Paper
- Defining Your Topic
- Determining Your Information Needs
- Finding and Retrieving Information: From a Book
- Finding and Retrieving Information: In the Computer Catalog
- Finding and Retrieving Information: The Reference Section
- Finding and Retrieving Information: Periodicals
- Evaluating Your Information
- Organizing Your Information: Index Cards
- Plagiarism and Information Literacy
- Environmental Management for the Dairy Industry
- Waste and Insect Management in the Everglades
- Waste Management in Citrus Processing

9.2 Research manufacturing practices and their affect on the surrounding atmosphere and ecosystems.

**Video**
- Sustainability
- Promoting Sustainability
- BMW and Eco-friendly Design
- Why Libraries Are Important for Research
- Five Steps to Researching a Paper
- Defining Your Topic
- Determining Your Information Needs
- Finding and Retrieving Information: From a Book
- Finding and Retrieving Information: In the Computer Catalog
10.1 Analyze how human behaviors contribute to the depletion of the ozone layer.

**Video**
- Changes in the Ozone Layer
- CFCs and the Ozone

**Images**
- Ozone layer, location in atmosphere of
- Greenhouse effect
- Ozone layer blocks ultraviolet rays
- CFC and ozone molecules
- Ozone molecule, extent of destruction by chlorine atom

**Article**
- Ozone layer

**Finding and Retrieving Information: The Reference Section**
**Finding and Retrieving Information: Periodicals**
**Evaluating Your Information**
**Organizing Your Information: Index Cards**
**Plagiarism and Information Literacy**
**Consequences of Unchecked Industrial Growth**
**Economic Development and the Environment**
**Ways to Avoid Pollution**
**Industrial Chicken Farms Major Contributor to Water Pollution**
**Industrial Pollution**
## Biological Evolution – Unity and Diversity
### Semester Two

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<tr>
<td><strong>Week 28</strong></td>
<td><strong>13 a.</strong> Classify living organisms based on structural, embryological and biochemical similarities.</td>
<td><strong>B2.4A</strong> Explain that living things can be classified based on structural, embryological, and molecular (relatedness of DNA sequence) evidence.</td>
<td>Design and construct a foldable summarizing the features of a six-kingdom system of classification.</td>
</tr>
<tr>
<td><strong>Week 29</strong></td>
<td><strong>13 b.</strong> Compare and contrast living organisms based on structural, embryological similarities</td>
<td><strong>B2.4d</strong> 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.</td>
<td>Use a cladogram to identify phylogenetic relationships among a group of closely related organisms.</td>
</tr>
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## Biological Evolution – Unity and Diversity
### Semester Two

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

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| Week 30 | 18. Describe evidence of evolutionary relationships among living organisms. | **B5.2a** – Describe species as reproductively distinct groups of organisms that can be classified based on morphological, behavioral, and molecular similarities.  
**B5.2b** – Explain that the degree of kinship between organisms or species can be estimated from the similarity of their DNA and protein.  
**B5.2c** – Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of subpopulations.  
**B5.r2d** – Interpret a cladogram of phylogenetic tree showing evolutionary relationships among organisms. (recommended) | Research the evolutionary history of the modern horse (Equus) from its ancestor (Eohippus): 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. |
**Biology - Grade 9**

**Biological Evolution – Organization of Living Things**

**Semester Two**

| Week 31 | 18. Describe evidence of evolutionary relationships among living organisms. | **B5.1A** – Summarize the major concepts of natural selection (differential survival and reproduction of chance inherited variants, depending on environmental conditions). **B5.1B** – Describe how natural selection provides a mechanism for evolution. **B5.1c** – 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). **B5.1d** – Explain how a new species or variety originates through the evolutionary process of natural selection. **B5.1e** – 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). **B5.1f** – Explain, using examples, how the fossil record, comparative anatomy, and other evidence supports the theory of evolution. **B5.1g** – Illustrate how genetic variation is preserved or eliminated from a population through natural selection (evolution) resulting in biodiversity. | Research the evolutionary history of the modern horse (Equus) from its ancestor (Eohippus): 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. |
## Biological Evolution – Organization of Living Things  
### Semester Two

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| **18.1** Compare and contrast the characteristic features of a given species (i.e. Finches, horses, or elephants).  
**Video**  
*Evolution Islands*  
*Darwin, the Beagle, and Finches: Darwin Discovers Evidence of Natural Selection*  
*The World of Birds*  
**Images**  
*Darwin’s finches; importance of heritability* | **Biology: The Dynamics of Life**  
Chapter 15 *The Theory of Evolution*, pp. 392-419.  
Section 15.1, *Natural Selection and Evidence for Evolution* pp. 393-403; Evolution FOLDABLE, p. 393.  
**Problem-Solving Lab 15.1, How can natural selection be observed?**, p. 397.  
**MiniLab 15.1, Camouflage Provides and Adaptive Advantage**, p. 398.  
**Ancillary Materials**  
**Virtual Labs CD**, Chapter 15, *Natural Selection*.  
**Interactive Chalkboard CD**, Chapter 15, PowerPoint slide show. (absent student tutor)  
**Voyage of the Beagle:**  
**Evolution Processes, Evolution Patterns:**  
www.indiana.edu/~ensiweb/home.html  
**Teaching Biology:**  
http://highschool!hub.org/hub/biology.cfm  
**Teaching About Evolution and Natural Selection:**  
http://biology.about.com/cs/lessonplan912/ | 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)  
**Biology: The Dynamics of Life, Ancillary Materials**  
Write a paragraph explaining Darwin’s observations. |
| **18.2** Compare and contrast Darwin’s initial view of evolution with the observations that led him to the theory of evolution by natural selection.  
**Video**  
*Introduction to Charles Darwin’s Theory of Evolution*  
*Islands of Theory: Charles Darwin and Why Evolution Occurs*  
*Darwin’s Discoveries*  
*Darwin’s Theory of Evolution*  
*Darwin Develops a Non-Random Theory of Evolution: Natural Selection and Adaptation*  
*Scientific Writing: Darwin’s The Origin of Species*  
**Images**  
*The English naturalist Charles Darwin.*  
**Article**  
*Darwin, Charles Robert* | | |
| **18.3** Interpret a graphical presentation of *Biology: The Dynamics of Life*  
Chapter 15 *The Theory of Evolution*, pp. 392-419.  
Section 15.1, *Natural Selection and Evidence for Evolution* pp. 393-403; Evolution FOLDABLE, p. 393. | | |
the correlation between food supply, population and natural selection.

**Video**
- Natural Selection: Survival of the Fittest
- Natural Selection, Competition, and Adaptations
  - Adaptation and Natural Selection
  - Speciation
  - What Are Populations and Gene Pools?
  - Five Conditions of the Hardy-Weinberg Principle
  - Basic Difference Between Mendelian Genetics and Population Genetics
  - Genetic Drift
  - Mutation
  - Selection
  - Genetic Mutations: Good & Bad
  - The DNA Molecule & DNA Mutations
  - Darwin, the Beagle, and Finches: Darwin Discovers Evidence of Natural Selection
  - Selection
  - Dressing for Desire: Manifestations of Sexual Selection

**Images**
- Evolution by natural selection; requirements

**Article**
- Natural selection
- Darwin, Charles Robert
- Galapagos Islands or Colon Archipelago
- Wallace, Alfred Russel
- Fisher, Sir Ronald

**Audio**
- Evolution: Natural Selection: Fitness
- Evolution: Natural Selection: Environmental Effects on Natural Selection
- Evolution: Natural Selection: A Summary
- Evolution: Natural Selection: The Hardy-Weinberg Law
- Evolution: Natural Selection: Genes & Natural Selection
- Evolution: Natural Selection: Five Patterns of Natural Selection
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
## Biological Evolution – Organization of Living Things
### Semester Two

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| **18.5** Identify and describe the three possible theories for the origin of life on Earth. **Video**  
Could the "Spark of Life" Reoccur?  
The History of Life On Earth  
How Life Formed on Earth | **Biology: The Dynamics of Life, SE**  
Chapter 14 The History of Life, pp. 368-391.  
**Problem-solving Lab 14.2, Can a clock model Earth’s history?** pp. 384.  
**Evolution:** www.pbs.org/evolution.  
**The Talk Origins Archive; Evolution:**  
**Evolution Update:**  
http://mcb.Harvard.edu/Biolinks?Evolution.html. | 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.  
**Biology: The Dynamics of Life, Ancillary Materials**  
Unit 5 Resources Manual, Chapter 14, The History of Life, 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. |
| **18.6** Research and diagram a comparison of the modern Earth’s atmosphere with the models proposed by Miller and Lerman. **Video**  
The Atmosphere  
The Atmosphere  
Earth’s Atmosphere: The Properties of the Atmosphere  
Chemical Origins of Life | | |
| **18.7** 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. **Video**  
Where Did Life on Earth Originate?  
Water and the Origin of Life  
RNA’s Role in Creating Life | | |

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**Images**  
Atmosphere, layers of  
Atmosphere, composition of; pie chart
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<td>18.8 Infer evolutionary relationships among species by biochemical comparison of amino acid sequences in different organisms. <strong>Video</strong> In the Beginning There Was Soup: Examining Animals With Common Origins</td>
<td><strong>Biology: The Dynamics of Life,</strong> Chapter 15 The Theory of Evolution, pp. 392-419. Section 15.1, Natural Selection and the Evidence for Evolution, pp. 393-403. <strong>Ancillary Materials</strong> Interactive Chalkboard CD, Chapter 15, PowerPoint slide show. (absent student tutor) <strong>Sources on Fossils and Phylogenetics:</strong> <a href="http://www.ucmp.berkeley.edu/help/topic.html">www.ucmp.berkeley.edu/help/topic.html</a>. <strong>The Tree of Life:</strong> <a href="http://meb.harvard.edu/Biolinks/Evolution.html">http://meb.harvard.edu/Biolinks/Evolution.html</a>. <strong>Radioactive Dating:</strong> <a href="http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/raddat.html">http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/raddat.html</a>. <strong>Radiometric Dating and the Geological Time Scale:</strong> <a href="http://www.talk.origins.org/faqs-evolution-definition.html">www.talk.origins.org/faqs-evolution-definition.html</a>.</td>
<td>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 MCIIMB SCI III.4.h.1) <strong>Biology: The Dynamics of Life, Ancillary Materials</strong> Reinforcement and Study Guide Manual, Chapter 15, Section 15.1, Natural Selection and the Evidence for Evolution pp. 65-66.</td>
</tr>
<tr>
<td>18.9 Research several radioisotopes and demonstrate how they are used in dating the age of rocks and fossils. <strong>Video</strong> Radiocarbon Dating Interpreting the Fossil Record Changing Theories on Evolution Finding the Age of Fossils Fossil Formation Relative Dating Radioactive Dating Looking at Changes in Allele Frequencies in Shale Strata from Different Ages What is the Relationship Between the Burgess Shale Prehistoric Populations and Populations of Today? Radiocarbon Dating</td>
<td><strong>Activity</strong></td>
<td><strong>Reference</strong></td>
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<td>In the Beginning There Was Soup: Examining Animals With Common Origins</td>
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</table>
18.10 Construct a geological timetable of sedimentary rock that illustrates the approximate age of fossils present in the rocks.

**Video**
- Geological Time Scale
- Adaptation and Natural Selection
- Fossils in Undersea Caves
- Fossils, Zoology, and Comparative Anatomy
- Other Important Discoveries
- Visiting the Burgess Shale
- Looking at Changes in Allele Frequencies in Shale Strata from Different Ages
- The Theory of Uniformitarianism
- More Fundamental Principles of Layer Formation
- Superposition
- What is the Geologic Time Scale?
- Geological Time Scale
- What is the Precambrian?
- What is the Paleozoic Era?
- What Happened During the Cambrian Period?
- What Happened During the Ordovician Period?
- What Happened During the Silurian Period?
- What Happened During the Devonian Period?
- What Happened During the Carboniferous Period?
- What Happened During the Permian Period?
- What is the Mesozoic Era?
- What Happened During the Triassic Period?
- What Happened During the Jurassic Period?
- What Happened During the Cretaceous Period?
- What is the Cenozoic Era?

**Images**
- Geologic time line; Earth's history
- Geologic time; orders of magnitude
- Geologic time line; Earth's history

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**Biology: The Dynamics of Life,**
- Chapter 14 The History of Life, pp. 368-391.
- Problem-Solving Lab 14.1, Could ferns have lived in Antarctica? p. 372.
- Investigate BioLab, Determining a Rocks Age, pp. 386-387.

**Ancillary Materials**
- Interactive Chalkboard CD, Chapter 14, PowerPoint presentation.
- Prehistoric Animals: www.anglia.co.uk/angmulti/learning/science/prehistoric
- Time Machine: http://www.indiana.edu/~ensiweb/lessons/time.mac.html
- The Fossil Record: http://school.discovery.com/lessonplans/programs/ancient

**Biology: The Dynamics of Life,**
- Chapter 17 Organizing Life Diversity, pp. 442-471.
  - Section 17.1, Classification, pp. 443-449.

**Biology: The Dynamics of Life, SE**
- Section Assessment, Skill Review, p. 379, item 6.
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
| The Five Kingdoms of Life | Classification Into Smaller Sub-Groups | Video Quiz: How Living Things are Classified |
### Biological Evolution – Natural and Artificial Selection

#### Semester Two

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| **Week 32** | **19. 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.** | **B5.3A** – 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.  
**B5.3B** – Describe the role of geographic isolation in speciation.  
**B5.3C** – Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.  
**B5.3d** – Explain how evolution through natural selection can result in changes in biodiversity.  
**B5.3e** – Explain how changes at the gene level are the foundation for changes in populations and eventually the formation of new species.  
**B5.3f** – Demonstrate and explain how biotechnology can improve a population and species. | Prepare a report on the results of selective breeding in various plants and/or animals.  
Develop a concept map demonstrating the relationship between microevolution and macroevolution. Use the terms from chapter 12.  
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. |
### Biological Evolution – Natural and Artificial Selection

**Semester Two**

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

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**Note:** All references are from the provided curriculum materials and resources.
### Biological Evolution – Natural and Artificial Selection
#### Semester Two

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| **19.3** Compare and contrast natural selection and artificial selection.  
Video Selection  
Natural Selection, Competition, and Adaptations  
Adaptation and Natural Selection | **Biology: The Dynamics of Life, Ancillary Materials**  
Virtual Labs CD, *Natural Selection.*  
1995 Access Excellence Collections: Not Just a Bag of Beans:  
http://www.accessexcellence.org/AE.  
Learning from Fossil Records:  
Fossils:  
1996 Access Excellence Collection Fossil Hunt:  
http://www.accessexcellence.org/AE/.* | 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.  
Trace the major feature changes in organisms, using the geologic time scale. Select one particular organism to illustrate the evolutionary changes. |
| **19.4** Demonstrate how fossils reveal changes within a species, extinction and relationships between other species.  
Video Interpreting the Fossil Record  
Evolution  
Evolution and Variation | * | * |
## Biological Evolution – Natural and Artificial Selection
### Semester Two

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<td><strong>19.6</strong> Demonstrate how fossils, homologous structures and similarities among embryos are evidence of evolution. <strong>Video</strong> Looking at Changes in Allele Frequencies in Shale Strata from Different Ages Finding the Age of Fossils</td>
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<td><strong>19.7</strong> Describe how natural selection has affected the European peppered moth. <strong>Video</strong> Relationships Between Populations: Predator-Prey Images Protective coloration, definition of Camouflage, definition</td>
<td><strong>Biology: The Dynamics of Life, SE</strong> Problem-Solving Lab 15.1, How can natural selection be observed? p. 397. Island Biogeography and Evolution: Solving a Phylogenetic Puzzle Using Molecular Genetics: <a href="http://www.ucmp.Berkeley.edu/fosrec/filson.html">http://www.ucmp.Berkeley.edu/fosrec/filson.html</a>.</td>
<td>Research the Peppered Moth and construct an evolutionary tree that depicts the changes that have occurred within the species.</td>
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<td><strong>19.8</strong> Describe the factors involved in species formation <strong>Video</strong> The Proliferation of Species Introduction: Gene Frequencies, Natural Selection and Speciation</td>
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<td>5 Factors That Contribute to Gene Pool Changes Over Time</td>
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## Biological Evolution – Fossils Evidence and Modern Humans
### Semester Two

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|         | 20. Use fossil evidence to trace the origin of modern humans to Africa. | **B5.2a** – Describe species as reproductively distinct groups of organisms that can be classified based on morphological, behavioral, and molecular similarities.  
**B5.2b** – Explain that the degree of kinship between organisms or species can be estimated from the similarity of their DNA and protein.  
**B5.2c** – Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of subpopulations.  
**B5.r2d** – Interpret a cladogram of phylogenetic tree showing evolutionary relationships among organisms. (recommended) | Construct an evolutionary tree that traces from the first hominid to modern man. Research a hominid and include the following:  
• Sketch of its origin on a map.  
• Details: who, when and where.  
• Detailed description and/or illustrations of the fossilized remains. |

| Week 34 | Final Exams |
### Biological Evolution – Fossils Evidence and Modern Humans
#### Semester Two

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<th>Text/Instructional Materials</th>
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<td><strong>20.3</strong> Create a chronology of the evolution of modern humans from the ancestral hominids. <strong>Video</strong> The Human Family Tree A New Hominid Genus New Chapter in Hominid Evolution Ardi's Hands and Feet Lucy's Discovery: Australopithecus afarensis The Mystery of the First Americans Before We Ruled the Earth The Development of the Genus Homo</td>
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**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. **Biology: The Dynamics of Life, Ancillary Materials** MindJogger Videoquiz, Chapter 16, Reinforcement and Study Guide Manual, Chapter 16, Primate Evolution, pp. 69-72

Create a timeline illustrating the evolution of modern man.
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<td><strong>20.4</strong> Describe the anatomical and biochemical evidence that reveals an evolutionary relationship between humans and primates. <strong>Video</strong>&lt;br&gt;Are Humans Related to Chimpanzees? Berkley Studies Human Lineage&lt;br&gt;World Population&lt;br&gt;How We Define a Human Species&lt;br&gt;Chimpanzees: Community Living</td>
<td><strong>Biology: The Dynamics of Life, SE Chapter 16 Primate Evolution, pp. 420-441.</strong>&lt;br&gt;<strong>MiniLab 16.2, Compare Human Proteins with Those of Other Primates, p. 429.</strong>&lt;br&gt;Figure 16.15, p. 435.&lt;br&gt;Section 16.2, Human Ancestry, pp. 428-435.</td>
<td>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. <strong>Biology: The Dynamics of Life, SE Chapter 16 Assessment, Standardized Test Practice, p. 441 Items 19-23.</strong></td>
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<td><strong>20.5</strong> Describe the evidence that indicates human ancestors walked upright before their brains enlarged. <strong>Video</strong>&lt;br&gt;Evolutionary Advantages of Walking Upright&lt;br&gt;Walking Upright as a Great Achievement&lt;br&gt;Origins of Bipedalism</td>
<td><strong>Images</strong>&lt;br&gt;Human characteristics: upright posture&lt;br&gt;<strong>Problem-Solving Lab, How similar are Neanderthals and humans? p. 433.</strong>&lt;br&gt;Holt Biology Videodisc:&lt;br&gt;77 Disc 2 Side A #19821-26705.&lt;br&gt;Holt Biology Videodisc:&lt;br&gt;80 Disc 2 Side A #23983-26104.</td>
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<td><strong>20.6</strong> Contrast the two theories of the origin of Homo sapiens. <strong>Video</strong>&lt;br&gt;The Cradle of Humankind&lt;br&gt;The Birthplace of Humanity</td>
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