

**Westbrook Public Schools  
Integrated Science Curriculum  
Grade 9**

<b>Unit 1: Ecology</b>	<b>Anticipated Length: 12 weeks</b>
<p><b>Standards:</b></p> <p>9.7 Elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles.</p> <p>9.8 The use of resources by human populations may affect the quality of the environment.</p> <p>10.6 Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.</p> <p>Stability in an ecosystem is a balance between competing effects.</p>	
<p><b>Knowledge:</b> <i>Students will know/understand:</i></p> <ul style="list-style-type: none"> <li>• Biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.</li> <li>• Changes in an ecosystem can result from changes in climate, human activity, introduction of nonnative species, or changes in population size.</li> <li>• A vital part of an ecosystem is the stability of its producers and decomposers.</li> <li>• At each link in a food web some energy is stored in newly made structures, but much energy is dissipated into the environment as heat.</li> </ul>	<p><b>Skills:</b> <i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• Explain the differences between biotic and abiotic factors and how the interactions between them make up an ecosystem.</li> <li>• Explain what a species is, what a population is and what diversity in an ecosystem refers to.</li> <li>• Explain the special properties of water (high thermal capacity, universal solvent), what pH is and how pH depends on the balance between Hydrogen and Hydroxide ions.</li> <li>• Explain the differences between a habitat and niche.</li> <li>• Explain trophic levels and the types of organisms that may be found at each level.</li> <li>• Explain symbiosis and its 3 main categories (parasitism, mutualism, and commensalism).</li> <li>• Explain the similarities and differences between a food chain, food web, and the energy pyramid.</li> <li>• Identify the carbon, water, and nitrogen cycles.</li> <li>• Explain exponential growth and carrying capacity.</li> <li>• Explain some of the factors that can limit population growth.</li> <li>• Explain the differences between primary and secondary succession.</li> </ul>

	<ul style="list-style-type: none"> <li>• Discuss the affects of pollution on the environment – especially acid precipitation, farm runoff, and sewage.</li> <li>• Discuss the effects of CO<sub>2</sub> accumulation in the atmosphere on the earth’s climate.</li> <li>• Describe the factors that affect the carrying capacity of the environment. (D 43)</li> <li>• Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations. (D44)</li> <li>• Explain how technological advances have affected the size and growth rate of human populations throughout history. (D 45)</li> <li>• Explain how the release of sulfur dioxide (SO<sub>2</sub>) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures. (D 22)</li> <li>• Explain how the accumulation of carbon dioxide (CO<sub>2</sub>) in the atmosphere increases Earth’s “greenhouse” effect and may cause climate changes. (D 23)</li> <li>• Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans. (D 24)</li> </ul>
<p><b>Essential Questions:</b></p> <ul style="list-style-type: none"> <li>• How do living organisms interact with each other and the non-living factors of an environment?</li> <li>• How do humans have an impact on the diversity and stability of ecosystems?</li> <li>• How and why do populations and communities change over time?</li> </ul>	<p><b>Unit Questions:</b></p> <ul style="list-style-type: none"> <li>• What are some biotic and abiotic factors?</li> <li>• What is diversity and how does it relate to various ecological communities?</li> <li>• How does a habitat relate to a niche and how do they differ?</li> <li>• What is a trophic level and how do various organisms fit on these levels?</li> <li>• What are the three forms of symbiosis?</li> <li>• What is the carbon cycle; water cycle; nitrogen cycle?</li> <li>• What is meant by exponential growth of a population and what are some of the factors that can limit growth?</li> <li>• How does the burning of fossil fuels relate to acid precipitation and climate change?</li> </ul>

	<ul style="list-style-type: none"> <li>• What are the differences between primary and secondary succession?</li> <li>• What is a food web, a food chain, and an energy pyramid?</li> <li>• What are some unique properties of water and how does pH relate to the level of ions in water?</li> <li>• How does the input of CO<sub>2</sub> and other gases from the burning of fossil fuels affect the environment</li> </ul>
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**Expectations for Student Learning Addressed** - *The Westbrook HS student will...*

Access and evaluate information through the use of technology and various media.

**Possible Assessments:**

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Teacher Created Tests          | <input checked="" type="checkbox"/> Student Presentations |
| <input checked="" type="checkbox"/> Unit Tests                     | <input type="checkbox"/> Entrance/exit slips              |
| <input checked="" type="checkbox"/> Quizzes                        | <input checked="" type="checkbox"/> Group Projects        |
| <input checked="" type="checkbox"/> Others: CAPT Performance Tasks |   |

**Benchmark Assessment:**

- Unit Test

**Performance Task:**

**Required**

**Optional**

Goal:

Role:

Audience:

Situation:

Product, Performance, Purpose:

Standards for Success: Passing grade

**Assessment Techniques:**

Lab Rubric  
 Teacher Created Criteria  
 School Wide Technology Rubric

**Technology Integration:** SMART board, DVDs, Internet sites

**Resources/Materials:**

- **Texts:**
  - Integrated Science Book 4 Chapter 4, 5, 6
- **Internet Sites:**
  - Scientific American Frontiers (Old shows online)

- **Videos/DVD (Multimedia):**
  - Planet Earth (DVD)
- **Speakers:**
- **Other:**
  - CAPT Performance Tasks: World Population Dynamics STS, Yeast Population Dynamics, Brownfield Sites STS, Solar Cooker

**Sample Lessons/Learning Activities:**

- Decomposers Lab

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<b>Unit 2: Biochemistry &amp; Foods</b>	<b>Anticipated Length: 6 weeks</b>
<b>Standards:</b>	
<p>9.4 Atoms react with one another to form new molecules</p> <p>9.5 Due to its unique chemical structure, carbon forms many organic and inorganic compounds</p> <p>10.1 Fundamental life process depend on the physical structure and the chemical activities of the cell</p>	
<b>Knowledge:</b>	<b>Skills:</b>
<p><i>Students will know/understand:</i></p> <ul style="list-style-type: none"> <li>• Atoms have a positively charged nucleus surrounded by negatively charged electrons.</li> <li>• The configuration of atoms and molecules determines the properties of the materials.</li> <li>• Most of the chemical activities of the cell are catalyzed by enzymes that function only in a narrow range of temperature and acidity.</li> <li>• The three main categories of foods are carbohydrates, lipids, and proteins.</li> <li>• The human digestive system breaks down the food we eat so that the energy and nutrients contained within can be utilized.</li> <li>• Digestion primarily involves the chemical process of hydrolysis assisted by specific enzymes</li> </ul>	<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• Describe the general structure of the atom and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structure. (D 10)</li> <li>• Describe how atoms form new substances by transferring electron (ionic bonding) or sharing electrons (covalent bonding) (D 11)</li> <li>• Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules. (D 13)</li> <li>• Describe the general role of enzymes in metabolic cell processes. (D 29)</li> <li>• Describe the structure of the atom and explain how electrons exist in a cloud around the nucleus</li> <li>• Explain how the properties of materials are related to the configurations of atoms and molecules and by the type of bonding that is involved</li> <li>• Explain how enzymes are utilized during digestive processes to speed up reactions</li> <li>• Explain how the narrow range of temperature and/or acidity that enzymes operate under can lead to complications of illnesses</li> <li>• Explain the three main food categories and the main enzymes used in their respective digestion</li> <li>• Describe how the process of hydrolysis relates to digestion</li> <li>• Describe the main locations in the digestive system that the main food categories are broken down</li> </ul>

	<ul style="list-style-type: none"> <li>• Explain how foods are broken down during the digestive process and how this leads to the availability of the energy and nutrients that are contained within these foods.</li> </ul>								
<p><b>Essential Questions:</b></p> <ul style="list-style-type: none"> <li>• Why are enzymes essential to the proper functioning of the body?</li> <li>• How does a balanced diet lead to overall better health?</li> </ul>	<p><b>Unit Questions:</b></p> <ul style="list-style-type: none"> <li>• What are the subatomic particles that make up the atom?</li> <li>• How do these subatomic particles exist in the structure of the atom?</li> <li>• What is covalent and ionic bonding and how do these types of bonding lead to different properties of materials?</li> <li>• What is an enzymes and what is their function during digestion?</li> <li>• What is hydrolysis?</li> <li>• What are some of the factors that could be involved in inhibiting the role of enzymes?</li> <li>• What are the three main categories of food?</li> <li>• Which enzymes(s) are involved in the digestion of each of the three food categories?</li> <li>• Where is each of the three food categories digested in the body?</li> <li>• What are some of the products of digestion and how are these essential to life?</li> <li>• How do the properties of elements relate to their atomic structure?</li> <li>• How do enzymes assist in the chemical processes of digestion?</li> <li>• What are the three main categories of food and how do enzymes play a role in their digestion?</li> </ul>								
<p><b>Expectations for Student Learning Addressed</b> - <i>The Westbrook HS student will...</i>          Demonstrate independence and proficiency in problem solving, reasoning, critical and creative thinking.</p>									
<p><b>Possible Assessments:</b></p> <table border="0"> <tr> <td><input checked="" type="checkbox"/> Teacher Created Tests</td> <td><input type="checkbox"/> Student Presentations</td> </tr> <tr> <td><input type="checkbox"/> Unit Tests</td> <td><input type="checkbox"/> Entrance/exit slips</td> </tr> <tr> <td><input checked="" type="checkbox"/> Quizzes</td> <td><input checked="" type="checkbox"/> Group Projects - CAPT Activity –</td> </tr> <tr> <td><input checked="" type="checkbox"/> Others: CAPT Activities</td> <td>Enzymes</td> </tr> </table>		<input checked="" type="checkbox"/> Teacher Created Tests	<input type="checkbox"/> Student Presentations	<input type="checkbox"/> Unit Tests	<input type="checkbox"/> Entrance/exit slips	<input checked="" type="checkbox"/> Quizzes	<input checked="" type="checkbox"/> Group Projects - CAPT Activity –	<input checked="" type="checkbox"/> Others: CAPT Activities	Enzymes
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<p><b>Benchmark Assessment:</b></p>									

<b>Performance Task:</b>	<input type="checkbox"/> <b>Required</b>	<input type="checkbox"/> <b>Optional</b>
Goal:  Role:  Audience:  Situation:  Product, Performance, Purpose:  Standards for Success:		
<b>Assessment Techniques:</b> Lab rubric Teacher created criteria School Wide Problem Solving Rubric		
<b>Technology Integration:</b> SMART board, DVDs, Internet sites		
<b>Resources/Materials:</b> <ul style="list-style-type: none"> <li>• <b>Texts:</b> <ul style="list-style-type: none"> <li>○ Integrated Science Book 4 Chapter 7</li> </ul> </li> <li>• <b>Internet Sites:</b> <ul style="list-style-type: none"> <li>○ Various video Clips from NOVA Science NOW and Scientific American Frontiers</li> </ul> </li> <li>• <b>Videos/DVD (Multimedia):</b> <ul style="list-style-type: none"> <li>○ The Body Atlas - Digestion</li> </ul> </li> <li>• <b>Speakers:</b></li> <li>• <b>Other:</b> <ul style="list-style-type: none"> <li>○ CAPT Performance Tasks – Bioengineered Foods STS, Enzymes</li> </ul> </li> </ul>		
<b>Sample Lessons/Learning Activities:</b> <ul style="list-style-type: none"> <li>• CAPT Activity – Enzymes (as modified)</li> </ul>		

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<b>Unit 3: Resources</b>	<b>Anticipated Length: 15 Weeks</b>
<p><b>Standards:</b></p> <p>9.1 Energy cannot be created or destroyed; however, energy can be converted from one form into another</p> <p>9.3 Various sources of energy are used by humans and all have advantages and disadvantages</p> <p>9.5 Due to its unique chemical structure, carbon forms many organic and inorganic compounds</p> <p>9.6 Chemical technologies present both risks and benefits to the health and well-being of humans, plants and animals</p>	
<p><b>Knowledge:</b> <i>Students will know/understand:</i></p> <ul style="list-style-type: none"> <li>• The differences between renewable and non-renewable resources and between reusable and recyclable resources</li> <li>• How solar energy is converted into electricity by hydroelectric power plants, wind turbines, or photovoltaic cells</li> <li>• The three main classification of earth’s rocks</li> <li>• The difference in crystal size and texture between intrusive and extrusive igneous rocks</li> <li>• The three main ways in which sedimentary rocks may form</li> <li>• The differences between contact and regional metamorphism</li> <li>• How the earth’s rock materials are recycled through plate tectonics and the rock cycle</li> <li>• What petroleum is composed of, the basics of how it is formed and of its chemical composition</li> <li>• How petroleum migrates through rock to a reservoir that is sealed by a cap rock</li> <li>• The methods used to search for petroleum</li> <li>• How petroleum is refined and what some of the products of the refining process are</li> <li>• What a polymer is and be able to describe some natural and man-made polymers</li> <li>• How the properties of different plastics relate to the arrangement of their polymers</li> </ul>	<p><b>Skills:</b> <i>Students will be able to:</i></p> <ul style="list-style-type: none"> <li>• Define what a renewable and non-renewable resource is, providing examples</li> <li>• Define what a recyclable versus a reusable resource is, providing examples</li> <li>• Describe the basic operation of a hydroelectric power plant, a wind turbine, and photovoltaic cells</li> <li>• Explain how igneous rocks form and describe the expected crystal size of an extrusive versus an intrusive igneous rock</li> <li>• Describe the three methods that sedimentary rocks may form</li> <li>• Describe how a metamorphic rock may form by both regional and contact metamorphism</li> <li>• Describe the rock cycle and explain how it is related to plate tectonics</li> <li>• Describe what petroleum is, how it is formed, and what its basic chemical makeup</li> <li>• Describe how petroleum migrated upward in the source rock until it “pools” in a reservoir that is sealed by a cap rock</li> <li>• Describe some of the methods used to explore for petroleum, including geologic mapping, seismic profiling, and logging the well</li> <li>• Describe how petroleum is refined in fractionating towers and cracking towers</li> </ul>

	<ul style="list-style-type: none"> <li>• Describe some of the products of petroleum refining</li> <li>• Explain what a polymer is</li> <li>• Explain how different plastics have properties that are related to the structure of the polymer they are made from – amorphous versus crystalline structure</li> </ul>								
<p><b>Essential Questions:</b></p> <ul style="list-style-type: none"> <li>• In what ways are Earth’s resources important to humans?</li> <li>• How does the use of Earth’s resources affect Earth’s environment?</li> </ul>	<p><b>Unit Questions:</b></p> <ul style="list-style-type: none"> <li>• How are renewable and non-renewable resources different</li> <li>• How are recyclable and reusable resources different</li> <li>• What are the tree main types of rocks?</li> <li>• What are some of the resources obtained from each of the main types of rocks?</li> <li>• What is the rock cycle and how does it differ from most other cycles in the sciences?</li> <li>• What is petroleum and do the differences in the arrangement of its polymers lead to different petroleum products?</li> <li>• What are the methods used to search for, extract, and refine petroleum?</li> <li>• What are polymers and are properties of different plastics related to their arrangement</li> <li>• What are nonrenewable and renewable energy resources?</li> <li>• What is petroleum and how does its extraction and use affect society and the environment?</li> <li>• What are the different types of resources on Earth?</li> </ul>								
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<b>Performance Task:</b>	<input type="checkbox"/> <b>Required</b>	<input type="checkbox"/> <b>Optional</b>
Goal: Role: Audience: Situation: Product, Performance, Purpose: Standards for Success:		
<b>Assessment Techniques:</b> Lab rubric School Wide Technology Rubric Teacher created criteria		
<b>Technology Integration:</b> SMART Board, DVDs, Internet Sites		
<b>Resources/Materials:</b> <ul style="list-style-type: none"> <li>• <b>Texts:</b> <ul style="list-style-type: none"> <li>○ Integrated Science Book 4 Chapters 11, 12, 13</li> </ul> </li> <li>• <b>Internet Sites:</b></li> <li>• <b>Videos/DVD (Multimedia):</b> <ul style="list-style-type: none"> <li>○ EcoTrip : Bottled Water</li> <li>○ Ideas for a Small Planet: Energy</li> <li>○ Naked Science: Plate Tectonics</li> <li>○ History of Oil</li> <li>○ Alaskan Oil</li> </ul> </li> <li>• <b>Speakers:</b></li> <li>• <b>Other:</b> <ul style="list-style-type: none"> <li>○ CAPT Performance Tasks - Energy Uses in CT, Acid Rain, CT Brownfield Sites, Synthetic Polymers Lab, Synthetic Polymers STS</li> <li>○ NEED Secondary Energy Infobook</li> </ul> </li> </ul>		
<b>Sample Lessons/Learning Activities:</b> <ul style="list-style-type: none"> <li>• Looking for Petroleum</li> </ul>		

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<b>Unit 4: Future Cars &amp; Fuels</b>	<b>Anticipated Length: 2 weeks</b>
<b>Standards:</b> 9.3 Various sources of energy are used by humans and all have advantages and disadvantages	
<b>Knowledge:</b> <i>Students will know/understand:</i> <ul style="list-style-type: none"> <li>• The present state of technology for the propulsion of automobiles</li> <li>• The possible future of automobile propulsion technology, including advanced hybrids, electric, hydrogen fuel cell, and solar.</li> <li>• The advantages and disadvantages of each of these propulsion technologies</li> </ul>	<b>Skills:</b> <i>Students will be able to:</i> <ul style="list-style-type: none"> <li>• Describe how gasoline or diesel propulsion works in today’s automobile</li> <li>• Describe how today’s hybrid technology works and how advanced hybrids of the future may be different</li> <li>• Describe how hydrogen fuel cell propulsion works</li> <li>• Describe how 100% electric propulsion works</li> <li>• Describe how 100% solar propulsion works</li> <li>• Describe the advantages and disadvantages of each of the above propulsion technologies</li> </ul>
<b>Essential Questions:</b> <ul style="list-style-type: none"> <li>• What might fuel our cars in the future?</li> </ul>	<b>Unit Questions:</b> <ul style="list-style-type: none"> <li>• How does a gasoline or diesel propulsion system work?</li> <li>• How does hybrid technology work?</li> <li>• How does a hydrogen fuel cell technology work?</li> <li>• How does 100% electric propulsion work?</li> <li>• How does 100% solar propulsion work?</li> <li>• What are some of the similarities between advanced propulsion systems?</li> <li>• What are the advantages of each of the above systems?</li> <li>• What are the disadvantages of each of the above systems?</li> <li>• What are the advantages and disadvantages to society of various transportation propulsion methods?</li> </ul>

	<ul style="list-style-type: none"> <li>• How can the use of advanced propulsion systems help to reduce greenhouse gas and other pollutant emissions?</li> </ul>								
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<p><b>Benchmark Assessment:</b></p>									
<p><b>Performance Task:</b></p>	<p><input type="checkbox"/> Required      <input type="checkbox"/> Optional</p>								
<p>Goal:</p> <p>Role:</p> <p>Audience:</p> <p>Situation:</p> <p>Product, Performance, Purpose:</p> <p>Standards for Success:</p>									
<p><b>Assessment Techniques:</b>          Lab rubric          Teacher created criteria          School Wide Technology Rubric</p>									
<p><b>Technology Integration:</b> SMART Board, Internet sites, DVDs, Powerpoint</p>									
<p><b>Resources/Materials:</b></p> <ul style="list-style-type: none"> <li>• <b>Texts:</b></li> <li>• <b>Internet Sites:</b> <ul style="list-style-type: none"> <li>○ www.cartalk.com</li> </ul> </li> <li>• <b>Videos/DVD (Multimedia):</b> <ul style="list-style-type: none"> <li>○ Future Cars: Fuels, NOVA: Future Cars</li> </ul> </li> <li>• <b>Speakers:</b></li> <li>• <b>Other:</b></li> </ul>									
<p><b>Sample Lessons/Learning Activities:</b></p> <ul style="list-style-type: none"> <li>• Advanced propulsion PowerPoint activity</li> </ul>									