

Seymour Public Schools Curriculum

General Science

General Science is an introductory survey of earth and physical science. The course examines forces and motion, properties of matter, electricity and magnetism, and the nature of energy and energy transformation. The course will also explore topics in earth and space sciences, such as astronomy, geology, and meteorology as they relate to the principals of physical science examined during the year. Laboratory activities and problem solving are important aspects of the course. At least two independent investigations will be self designed as well as conducted.

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Narrative.....

- The intent of this unit is to continue the integration of scientific inquiry, literacy and numeracy throughout the entire course.
- Scientific inquiry is a state-wide standard that is included in each grade level throughout a student’s science career.
- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain, and predict natural phenomena.

Grade: 9	Subject: General Science
CSDE Standard	Scientific Methods and Measurement
Enduring Understanding	There are many ways to solve a problem. Research and experimentation are examples of ways to solve problems.
Essential Questions	How do you solve a problem? How is scientific knowledge created, explored, investigated, and communicated?
Content Standard:	<p>Scientific Inquiry:</p> <ol style="list-style-type: none"> 1. is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. 2. progresses through a continuous process of questioning, data collection, analysis and interpretation. 3. requires the sharing of findings and ideas for critical review by colleagues and other scientists. <p>Scientific Literacy:</p> <ol style="list-style-type: none"> 1. includes the ability to read, write, discuss and present coherent ideas about science. 2. includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media. <p>Scientific Numeracy:</p> <ol style="list-style-type: none"> 1. includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.
Performance Expectations (Student)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Identify questions that can be answered through scientific investigation (CT Expected Performance D-INQ.1)

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outcomes)	<p>2. Read, interpret and examine the credibility and validity of scientific claims in different sources of information including, but not limited to Internet websites, periodical, and local news media (CT Expected Performance D-INQ.2)</p> <p>3. Formulate testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment (CT Expected Performance D-INQ.3)</p> <p>4. Design and conduct appropriate types of scientific investigations to answer different questions (CT Expected Performance D-INQ.4)</p> <p>5. Identify independent and dependent variables, including those that are kept constant and those used as controls Identify and utilize proper laboratory equipment and laboratory safety Use appropriate tools and techniques to make observations and gather data</p> <p>D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms</p> <p><u>Guiding Topics:</u></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Experimental Design</td> <td style="width: 33%;">Variables</td> <td style="width: 33%;">Constants</td> </tr> <tr> <td>Hypothesis</td> <td>Validity</td> <td>Graphing</td> </tr> <tr> <td>Research (Internet, etc.)</td> <td>Safety</td> <td>Observations</td> </tr> <tr> <td>Data Analysis</td> <td>Interpretation</td> <td></td> </tr> </table>			Experimental Design	Variables	Constants	Hypothesis	Validity	Graphing	Research (Internet, etc.)	Safety	Observations	Data Analysis	Interpretation	
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<u>Strategies/Modes (examples)</u>	<u>Materials/Resources (examples)</u>	<u>Assessments (examples)</u>													
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- Energy enters the Earth system primarily as solar radiation, is captured by materials and photosynthetic process, and eventually is transformed into heat.

Grade: 9	Subject: General Science												
CSDE Standard	Energy Transfer and Transformations (General)												
Enduring Understanding	Energy cannot be created or destroyed.												
Essential Questions	What is the role of energy in our world? Why is it important?												
Content Standard:	9.1 Energy cannot be created or destroyed; however, energy can be converted from one form to another												
Performance Expectations (Student outcomes)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes. (CT Expected Performance D 1) 2. Explain how energy is transferred by conduction, convection and radiation. (CT Expected Performance D 2) 3. Describe energy transformations among heat, light, electricity and motion. (CT Expected Performance D 3) <p>Guiding Topics:</p> <table> <tr> <td>States of Matter</td> <td>Energy Transfer</td> <td>Heat</td> <td>Radiation</td> </tr> <tr> <td>Temperature</td> <td>Kinetic Energy</td> <td>Potential Energy</td> <td></td> </tr> <tr> <td>Energy Transformation</td> <td>Conduction</td> <td>Convection</td> <td></td> </tr> </table>	States of Matter	Energy Transfer	Heat	Radiation	Temperature	Kinetic Energy	Potential Energy		Energy Transformation	Conduction	Convection	
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<u>Strategies/ Lecture</u>	<u>Materials/Resources (examples)</u>	<u>Assessments (examples)</u>
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- Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force.
- Electrical current can be transformed into light through excitation of electrons.

Grade: 9	Subject: General Science												
CSDE Standard	Energy Transfer and Transformations (Electricity and magnetism)												
Enduring Understanding	Energy can be neither created nor destroyed, but may be transformed or transferred												
Essential Questions	What is the role of energy in our world?												
Content Standard:	The electrical force is a universal force that exists between any two charged objects.												
Performance Expectations (Student outcomes)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Explain the relationship among voltage, current and resistance in a simple series circuit. (CT Expected performance D 4.) 2. Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements. (CT Expected performance D 5.) 3. Describe the relationship between current and magnetism. (CT Expected performance D 6.) <p><u>Guiding Topics:</u></p> <table style="width: 100%; border: none;"> <tr> <td>Ohms Law</td> <td>Voltage</td> <td>Current</td> <td>Heat</td> </tr> <tr> <td>Resistance</td> <td>Power</td> <td>Magnetism</td> <td></td> </tr> <tr> <td>Electromagnetism</td> <td>Static Charges</td> <td>Static Electricity</td> <td></td> </tr> </table>	Ohms Law	Voltage	Current	Heat	Resistance	Power	Magnetism		Electromagnetism	Static Charges	Static Electricity	
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- During the burning of fossil fuels, stored chemical energy is converted to electrical energy through heat transfer processes.
- In Nuclear fission, matter is transformed directly into energy in a process that is several million times as energetic as chemical burning.
- Alternative energy sources are being explored and used to address the disadvantages of using fossil and nuclear fuels.

Grade: 9	Subject: General Science						
CSDE Standard	Energy Transfer and Transformations (Science and Technology in society)						
Enduring Understanding	Science and technology affect the quality of lives both positively and negatively.						
Essential Questions	<ul style="list-style-type: none"> • How do science and technology affect the quality of our lives? 						
Content Standard:	9.3 Various sources of energy are used by humans and all have advantages and disadvantages.						
Performance Expectations (Student outcomes)	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Explain how heat is used to generate electricity. (CT Expected performance D 7.) 2. Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity. (CT Expected performance D 8.) 3. Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity. (CT Expected performance D 9.) <p><u>Guiding Topics:</u></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Energy Sources</td> <td style="width: 33%;">Fossil Fuels</td> <td style="width: 33%;">Alternative Energy</td> </tr> <tr> <td>Electricity</td> <td>Generators</td> <td></td> </tr> </table>	Energy Sources	Fossil Fuels	Alternative Energy	Electricity	Generators	
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- Atoms have a positively charged nucleus surrounded by negatively charged electrons.
- The configuration of atoms and molecules determines the properties of the materials.
- Carbon atoms can bond to one another in chains, rings and branching networks to form a variety of structures, including fossil fuels, synthetic polymers and the large molecules of life.
- Materials produced from the cracking of petroleum are the starting points for the production of many synthetic compounds.
- The products of chemical technologies include synthetic fibers, pharmaceuticals, plastics and fuels.

Grade: 9	Subject: General Science
CSDE Standard	Chemical Structures and Properties
Enduring Understanding	The structure of matter determines the properties of the materials that the atoms make. Science and technology affects the quality of life of all organisms both positively and negatively.
Essential Questions	<ul style="list-style-type: none"> • How does the structure of matter affect the properties and uses of materials? • How do science and technology affect the quality of our lives?
Content Standard:	<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>9.6 Chemical technologies present both risks and benefits to the health and well-being of humans, plants, and animals.</p>

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<p>Performance Expectations (Student outcomes)</p>	<p>The students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the general structure of the atom, and explain how the properties of the 1st 20 elements in the Periodic Table are related to their atomic structure. (CT expected Performances D 10.) 2. Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding). (CT expected Performances D 11.) 3. Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions. (CT expected Performances D 12.) 4. Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules. (CT expected Performances D 13.) 5. Describe combustion reactions of hydrocarbons and their resulting by-products. (CT expected Performances D 14.) 6. Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate. (CT expected Performances D 15.) 7. Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers. (CT expected Performances D 16.) 8. Explain how the chemical structure of polymers affects their physical properties. (CT expected Performances D 17.) 9. Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment. (CT expected Performances D 18.) <p><u>Guiding Topics:</u></p> <table> <tr> <td>Periodic Table</td> <td>Atom Structure</td> <td>Bonding</td> </tr> <tr> <td>pH</td> <td>Acids / Bases</td> <td>Carbon Bonding</td> </tr> <tr> <td>Carbon Structure</td> <td>Polymers</td> <td>Hydrocarbons</td> </tr> <tr> <td>Combustion</td> <td>Biopolymers</td> <td>Monomers</td> </tr> <tr> <td>Plastic Properties</td> <td>Landfills</td> <td>Wastes</td> </tr> </table>	Periodic Table	Atom Structure	Bonding	pH	Acids / Bases	Carbon Bonding	Carbon Structure	Polymers	Hydrocarbons	Combustion	Biopolymers	Monomers	Plastic Properties	Landfills	Wastes
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- Elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs.
- The cyclical movement of matter between reservoirs is driven by the Earth’s internal and external sources of energy.

Grade:	Subject: General Science
CSDE Standard	Global Interdependence (Changing earth/cycles)
Enduring Understanding	1. Elements on Earth move among oceans, atmosphere and organisms. (CT content standard 9.7)
Essential Questions	<ul style="list-style-type: none"> • How do materials cycle through the Earth’s systems?
Content Standard:	Elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles.
Performance Expectations (Student outcomes)	<p>The students will be able to:</p> <ul style="list-style-type: none"> A. Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs. (CT Expected performance D 19.) B. Explain how solar energy causes water to cycle through the major earth reservoirs. (CT Expected performance D 20.)

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- Emissions of combustion by-products, such as SO₂, CO₂, and NO_x by industries and vehicles are a major source of air pollution.
- Accumulation of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution.

Grade: 9	Subject: General Science									
CSDE Standard	Global Interdependence (Science and technology in society/Environmental quality)									
Enduring Understanding	<i>I.</i> The use of resources by human populations may affect the quality of life.									
Essential Questions	<ul style="list-style-type: none"> • How science and technology affect the quality of our lives? 									
Content Standard:	9.8 The use of resources by human populations may affect the quality of the environment.									
Performance Expectations (Student outcomes)	<p>The students will:</p> <ul style="list-style-type: none"> A. Explain how the release of sulfur dioxide (SO₂) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures. (CT Expected performance D 22.) B. Explain how the accumulation of carbon dioxide (CO₂) in the atmosphere increases the Earth’s “greenhouse” effect and may cause climate change. (CT Expected performance D 23.) C. Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans. (CT Expected performance D 24.) <p><u>Guiding Topics:</u></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Greenhouse Effect</td> <td style="width: 33%;">Water Quality</td> <td style="width: 33%;">Acid Rain</td> </tr> <tr> <td>Carbon Dioxide</td> <td>Sulfur Dioxide</td> <td></td> </tr> <tr> <td>Global Climate Chang</td> <td></td> <td></td> </tr> </table>	Greenhouse Effect	Water Quality	Acid Rain	Carbon Dioxide	Sulfur Dioxide		Global Climate Chang		
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