



# Physical Science with Earth Science

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CONTENT STANDARDS	EXPECTED PERFORMANCES	PAGE REFERENCES
Grades 9-10		
Core Scientific Inquiry, Literacy and Numeracy		
<i>How is scientific knowledge created and communicated?</i>		

<p><b>SCIENTIFIC INQUIRY</b></p> <ul style="list-style-type: none"> <li>Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul>	<p><b>D INQ.1</b> Identify questions that can be answered through scientific investigation.</p>	<p><b>Student Edition:</b> 6-13 <i>Science Online 7</i> <i>Design Your Own Lab</i> 88-89, 242-243 <i>Model and Invent Lab</i> 176-177 <i>Lab</i> 278-279, 741 <i>Use the Internet Lab</i> 476-477, 508-509 <b>Teacher Wraparound Edition:</b> ACT 9; DI 7; IL 12, 109, 434</p>
	<p><b>D INQ.2</b> Read, interpret and examine the credibility and validity of scientific claims in different sources of information.</p>	<p><b>Student Edition:</b> 10 <b>Teacher Wraparound Edition:</b> CC 10; DI 23</p>
	<p><b>D INQ.3</b> Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment.</p>	<p><b>Student Edition:</b> 7-10, 419 #16 <i>Design Your Own Lab</i> 28-29, 88-89, 144-145, 242-243, 344-345, 414-415, 446-447, 540-541, 568-569</p>
	<p><b>D INQ.4</b> Design and conduct appropriate types of scientific investigations to answer different questions.</p>	<p><b>Student Edition:</b> 7-10, 419 #16 <i>Design Your Own Lab</i> 28-29, 88-89, 144-145, 242-243, 344-345, 414-415, 446-447, 540-541, 568-569 <b>Teacher Wraparound Edition:</b> A 13; R 13</p>

<p><b>SCIENTIFIC LITERACY</b></p> <ul style="list-style-type: none"> <li>Scientific literacy includes the ability to read, write, discuss and present coherent ideas about science.</li> <li>Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul>	<p><b>D INQ.5</b> Identify independent and dependent variables, including those that are kept constant and those used as controls.</p>	<p><b>Student Edition:</b> 7-10, 419 #16 <i>MiniLAB</i> 25 <i>Lab</i> 27 <i>Design Your Own Lab</i> 88-89, 242-243, 344-345, 540-541 <i>Science Skill Handbook</i> 854 <b>Teacher Wraparound Edition:</b> A 13</p>
	<p><b>D INQ.6</b> Use appropriate tools and techniques to make observations and gather data.</p>	<p><b>Student Edition:</b> <i>Lab</i> 87, 196, 310-311, 445, 559, 636-637, 741 <i>Design Your Own Lab</i> 88-89, 144-145, 344-345, 414-415, 446-447, 540-541, 568-569</p>
	<p><b>D INQ.7</b> Assess the reliability of the data that was generated in the investigation.</p>	<p><b>Student Edition:</b> <i>Communicating Your Data</i> 243, 777 <i>Lab</i> 379, 380-381, 636-637 <i>Design Your Own Lab</i> 568-569 <b>Teacher Wraparound Edition:</b> EA 29, 89, 279, 447</p>
	<p><b>D INQ.8</b> Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.</p>	<p><b>Student Edition:</b> 76-80, 104-107, 154-159, 162-165 <i>Lab</i> 51, 278-279, 310-311, 379, 559 <i>Launch Lab</i> 69, 217 <i>Integrate Astronomy</i> 74 <i>Design Your Own Lab</i> 88-89</p>

<p><b>SCIENTIFIC NUMERACY</b></p> <ul style="list-style-type: none"> <li>Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul>	<p><b>D INQ.9</b></p> <p>Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.</p>	<p><b>Student Edition:</b></p> <p><i>Design Your Own Lab</i> 88-89, 144-145, 242-243, 344-345, 414-415, 446-447, 540-541, 568-569</p> <p><i>Lab</i> 380-381, 776-777, 807</p> <p><i>Use the Internet Lab</i> 508-509</p> <p><i>Model and Invent Lab</i> 840-841</p>
	<p><b>D INQ.10</b></p> <p>Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.</p>	<p><b>Student Edition:</b></p> <p>22-26</p> <p><i>Design Your Own Lab</i> 88-89, 144-145, 242-243, 414-415, 446-447, 540-541</p> <p><i>Lab</i> 118-119, 208-209, 380-381</p> <p><i>Use the Internet Lab</i> 476-477, 508-509, 598-599</p> <p><i>Communicating Your Data</i> 677</p> <p><b>Teacher Wraparound Edition:</b></p> <p>A 345</p>

Grade 9

Core Themes, Content Standards and Expected Performances

Strand I: Energy Transformations

*Energy Transfer and Transformations – What is the role of energy in our world?*

**9.1 - Energy cannot be created or destroyed; however, energy can be converted from one form to another.**

- ◆ Energy enters the Earth system primarily as solar radiation, is captured by materials and photosynthetic processes, and eventually is transformed into heat.

**D 1.**

Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes.

**Student Edition:**

254-255, 260-265  
*Science Online* 261

**Teacher Wraparound Edition:**

A 279; PR 265; UAA 262

**D 2.**

Explain how energy is transferred by conduction, convection and radiation.

**Student Edition:**

266-270  
*National Geographic* 268  
*Lab* 271, 278-279  
*MiniLAB* 510

**Teacher Wraparound Edition:**

A 270; AIL 278; CD 273; PR 270; QD 268;  
RP 266; SCB 252E-F, 516E; VL 267

**D 3.**

Describe energy transformations among heat, light, electricity and motion.

**Student Edition:**

128-133, 135-143, 272-277, 434-437, 438-440,  
486-493, 501-506  
*National Geographic* 138

**Teacher Wraparound Edition:**

A 444; R 133

<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p><b>9.2 - The electrical force is a universal force that exists between any two charged objects.</b></p> <ul style="list-style-type: none"> <li>◆ Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force.</li> <li>◆ Electrical current can be transformed into light through the excitation of electrons.</li> </ul>	<p><b>D 4.</b> Explain the relationship among voltage, current and resistance in a simple series circuit.</p>	<p><b>Student Edition:</b> 400-405, 407-408 <i>MiniLAB 402</i></p> <p><b>Teacher Wraparound Edition:</b> A 405; ACT 403; IM 390F; TFYI 409; UAA 402</p>
	<p><b>D 5.</b> Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.</p>	<p><b>Student Edition:</b> 272-277, 400-405, 407-413, 438-444 <i>MiniLAB 402</i> <i>Design Your Own Lab 414-415</i></p> <p><b>Teacher Wraparound Edition:</b> A 277; ACT 408; CFU 413; LD 408; QD 273</p>
	<p><b>D 6.</b> Describe the relationship between current and magnetism.</p>	<p><b>Student Edition:</b> 431-437, 438-444, 456-461 <i>Lab 445</i> <i>Design Your Own Lab 446-447</i></p> <p><b>Teacher Wraparound Edition:</b> CC 433; CFU 437; IM 439; QD 433; R 437, 444; TFYI 432; VL 433</p>

<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>9.3 - Various sources of energy are used by humans and all have advantages and disadvantages.</b></p> <ul style="list-style-type: none"> <li>◆ During the burning of fossil fuels, stored chemical energy is converted to electrical energy through heat transfer processes.</li> <li>◆ In nuclear fission, matter is transformed directly into energy in a process that is several million times as energetic as chemical burning.</li> <li>◆ Alternative energy sources are being explored and used to address the disadvantages of using fossil and nuclear fuels.</li> </ul>	<p><b>D 7.</b> Explain how heat is used to generate electricity.</p>	<p><b>Student Edition:</b> 440, 490-493, 505-506 <i>Science Online</i> 505</p>
	<p><b>D 8.</b> Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.</p>	<p><b>Student Edition:</b> 486-493, 494-500, 800-802 <i>Applying Science</i> 49 <i>Science Online</i> 141, 803 <i>Science and Society</i> 510 <b>Teacher Wraparound Edition:</b> ACT 488, 492; CC 489, 495; D 487, 492; DI 490, R 493</p>
	<p><b>D 9.</b> Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.</p>	<p><b>Student Edition:</b> 501-506, 513 #21 <i>Science Online</i> 274 <i>Use the Internet Lab</i> 508-509 <i>Integrate Life Science</i> 827 <b>Teacher Wraparound Edition:</b> DI 502; IM 503; PR 493; R 506; SCB 484F; VL 502</p>

## Strand II: Chemical Structures and Properties

<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p><b>9.4 - Atoms react with one another to form new molecules.</b></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> </ul>	<p><b>D 10.</b></p> <p>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 structures.</p>	<p><b>Student Edition:</b></p> <p>588-596</p> <p><i>Use the Internet Lab</i> 598-599</p> <p><b>Teacher Wraparound Edition:</b></p> <p>ACT 590, 594; CFU 596; D 593; DI 592; FF 591; IM 591; R 596; VL 590</p>
	<p><b>D 11.</b></p> <p>Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding).</p>	<p><b>Student Edition:</b></p> <p>688-692, 694-702</p> <p><i>MiniLAB</i> 698</p> <p><i>National Geographic</i> 699</p> <p><i>Model and Invent Lab</i> 710-711</p> <p><b>Teacher Wraparound Edition:</b></p> <p>A 702; ACT 697; CFU 702; DI 697; PR 701; R 702; SCB 686E; TFYI 696; V 699</p>
	<p><b>D 12.</b></p> <p>Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions.</p>	<p><b>Student Edition:</b></p> <p>764-770, 771-774</p> <p><i>Lab</i> 775</p> <p><i>Science and Society</i> 778</p> <p><b>Teacher Wraparound Edition:</b></p> <p>ACT 778; D 769; FF 767; QD 766, 773; R 770; SCB 750E-F</p>

<p><i>Properties of Matter – How does the structure of matter affect the properties and uses of materials?</i></p> <p><b>9.5 – Due to its unique chemical structure, carbon forms many organic and inorganic compounds.</b></p> <ul style="list-style-type: none"> <li>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.</li> </ul>	<p><b>D 13.</b> Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules.</p>	<p><b>Student Edition:</b> <i>Integrate Chemistry</i> 613 <b>Teacher Wraparound Edition:</b> IC 164</p>
	<p><b>D 14.</b> Describe combustion reactions of hydrocarbons and their resulting by-products.</p>	<p><b>Student Edition:</b> 136, 275-277, 486-493, 738 <i>Society and Society</i> 778 <b>Teacher Wraparound Edition:</b> CFU 729; DI 277; LD 537; PR 276; R 277; SCB 484E; VL 136</p>
	<p><b>D 15.</b> Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate.</p>	<p><b>Student Edition:</b> <i>Accidents in Science</i> 60, 712 <b>Teacher Wraparound Edition:</b> CB 60</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>9.6 - Chemical technologies present both risks and benefits to the health and well-being of humans, plants and animals.</b></p> <ul style="list-style-type: none"> <li>Materials produced from the cracking of petroleum are the starting points for the production of many synthetic compounds.</li> <li>The products of chemical technologies include synthetic fibers, pharmaceuticals, plastics and fuels.</li> </ul>	<p><b>D 16.</b> Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers.</p>	<p><b>Student Edition:</b> <i>Accidents in Science</i> 712</p>
	<p><b>D 17.</b> Explain how the chemical structure of polymers affects their physical properties.</p>	<p><b>Student Edition:</b> <i>Accidents in Science</i> 60, 712 <b>Teacher Wraparound Edition:</b> ATE 60</p>
	<p><b>D 18.</b> Explain the short- and long-term impacts of landfills and incineration of waste materials on the quality of the environment.</p>	<p><b>Student Edition:</b> <i>Integrate Environment</i> 667</p>

**Strand III: Global Interdependence**

<p><i>The Changing Earth – How do materials cycle through the Earth’s systems?</i></p> <p><b>9.7 - Elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles.</b></p> <ul style="list-style-type: none"> <li>◆ Elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs.</li> <li>◆ The cyclical movement of matter between reservoirs is driven by the Earth’s internal and external sources of energy.</li> </ul>	<p><b>D 19.</b> Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs.</p>	<p><b>Student Edition:</b> 536-537, 545#28 <i>Applying Math</i> 537 <b>Teacher Wraparound Edition:</b> VL 536</p>
	<p><b>D 20.</b> Explain how solar energy causes water to cycle through the major earth reservoirs.</p>	<p><b>Student Edition:</b> 521-522, 545 #29, 663 <i>Integrate Life Science</i> 522 <b>Teacher Wraparound Edition:</b> CFU 522, 668</p>
	<p><b>D 21.</b> Explain how internal energy of the Earth causes matter to cycle through the magma and the solid earth.</p>	<p><b>Student Edition:</b> 358-361, 373-378, 617-623 <i>Lab</i> 379 <b>Teacher Wraparound Edition:</b> IM 618; QD 360, 374; SCB 352F, 606E; TFYI 360</p>

<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>9.8 - The use of resources by human populations may affect the quality of the environment.</b></p> <ul style="list-style-type: none"> <li>◆ Emission of combustion by-products, such as SO<sub>2</sub>, CO<sub>2</sub> and NO<sub>x</sub> by industries and vehicles is a major source of air pollution.</li> <li>◆ Accumulation of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution.</li> </ul>	<p><b>D 22.</b> 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.</p>	<p><b>Student Edition:</b> <i>Science and Society</i> 778 <b>Teacher Wraparound Edition:</b> CB 778; ITI 778</p>
	<p><b>D 23.</b> Explain how the accumulation of carbon dioxide (CO<sub>2</sub>) in the atmosphere increases Earth’s “greenhouse” effect and may cause climate changes.</p>	<p><b>Student Edition:</b> 576-588 <i>Lab</i> 51 <b>Teacher Wraparound Edition:</b> AR 536; CFU 539; PR 539; SCB 516F</p>
	<p><b>D 24.</b> Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans.</p>	<p>See Glencoe’s <i>Earth Science</i> © 2005.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>9.9 - Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems.</b></p> <ul style="list-style-type: none"> <li>◆ New technologies and changes in lifestyle can have positive and/or negative effects on the environment.</li> </ul>	<p><b>D 25.</b> Explain how land development, transportation options and consumption of resources may affect the environment.</p>	<p><b>Student Edition:</b> 498-499, 503 <i>Science and Society</i> 778 <b>Teacher Wraparound Edition:</b> A 509; ACT 492; SCB 644E</p>
	<p><b>D 26.</b> Describe human efforts to reduce the consumption of raw materials and improve air and water quality.</p>	<p><b>Student Edition:</b> <i>Integrate Environment</i> 48 <i>Science and Society</i> 678 <b>Teacher Wraparound Edition:</b> A 51, 652, 668; D 667; PR 467; R 668; TFYI 538</p>