



CHEMISTRY

MATTER AND CHANGE

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STANDARDS	PAGE REFERENCES
S11.A The Nature of Science	
S11.A.1 Reasoning and Analysis	
S11.A.1.1 Analyze and explain the nature of science in the search for understanding the natural world and its connection to technological systems. <i>Reference: 3.1.10.A, 3.2.10.A, 3.1.10.E</i>	
S11.A.1.1.1 Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).	Student Edition: 16, 102-114, 146-152, 174-176, 744 <i>Chapter Assessment 26 #41</i> <i>Section Assessment 16 #18</i> Teacher Wraparound Edition: E 104; IM 15; R 16
S11.A.1.1.2 Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.	Student Edition: 12-16, 106-114, 146-152, 174-176, 744 Teacher Wraparound Edition: CJ 596; CP 153, 338; DI 745; E 104
S11.A.1.1.3 Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).	Student Edition: 14 <i>ChemLab (Inquiry Extension) 92, 164, 310, 698</i> <i>Launch Lab 401, 707</i> Teacher Wraparound Edition: MI 12; QD 70

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<p>S11.A.1.1.4 Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton’s universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur’s germ theory, relativity, heliocentric theory, ideal gas laws).</p>	<p>Student Edition: 873-874 <i>Everyday Chemistry</i> 431, 669 <i>How It Works</i> 271 <i>In the Field</i> 23 <i>Problem-Solving Lab</i> 622 Teacher Wraparound Edition: AC 419; CP 212; D 518-519; E 421</p>
<p>S11.A.1.1.5 Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p>	<p>Student Edition: 10, 13 <i>Connection to Astronomy</i> 145 <i>Launch Lab</i> 135 <i>MiniLab</i> 13 Teacher Wraparound Edition: DI 143; QD 103</p>
<p>S11.A.1.2 Identify and analyze the scientific or technological challenges of societal issues; propose possible solutions and discuss implications. Reference: 3.2.10.A, 4.3.10.B</p>	
<p>S11.A.1.2.1 Explain and apply scientific concepts to societal issues using case studies (e.g., spread of HIV, deforestation, environmental health, energy).</p>	<p>Student Edition: <i>Chemistry & Health</i> 389 <i>Everyday Chemistry</i> 229 <i>How It Works</i> 549, 775 <i>In the Field</i> 505 Teacher Wraparound Edition: CJ 290, 882; CP 788, 879; DI 724</p>
<p>S11.A.1.2.2 Use case studies (e.g., Wright brothers’ flying machine, Tacoma Narrows Bridge, Henry Petroski’s Design Paradigms) to propose possible solutions and analyze economic and environmental implications of solutions for real-world problems.</p>	<p>Student Edition: <i>How It Works</i> 549, 775 <i>In the Field</i> 505 Teacher Wraparound Edition: A 539; CJ 501, 530; CP 729; DI 880; TS 505, 549</p>
<p>S11.A.1.3 Describe and interpret patterns of change in natural and human-made systems. Reference: 3.1.10.C, 3.1.10.E, 4.8.10.A</p>	
<p>S11.A.1.3.1 Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).</p>	<p>Student Edition: <i>ChemLab</i> 624 <i>Data Analysis Lab</i> 724 <i>Problem-Solving Lab</i> 668</p>

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<p>S11.A.1.3.2 Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).</p>	<p>Student Edition: 606-611, 666-667 <i>Chemistry & Health</i> 583, 623 <i>MiniLab</i> 611 <i>Problem-Solving Lab</i> 668 Teacher Wraparound Edition: A 609; E 498; R 610; TS 583</p>
<p>S11.A.1.3.3 Describe how changes in physical and biological indicators (e.g., soil, plants, animals) of water systems reflect changes in these systems (e.g., changes in bloodworm populations reflect changes in pollution levels in streams).</p>	<p>Student Edition: <i>Real-World Chemistry</i> 257 Teacher Wraparound Edition: CJ 664; CP 636; E 496; MI 606</p>
<p>S11.A.1.3.4 Compare the rate of use of natural resources and their impact on sustainability.</p>	<p>Student Edition: 747-749, 880-882 <i>How It Works</i> 549 Teacher Wraparound Edition: A 517, 539; CJ 517, 748, 847; DI 724; E 883</p>
<p>S11.A.2 Processes, Procedures and Tools of Scientific Investigations</p>	
<p>S11.A.2.1 Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process. Reference: 3.2.10.B, 3.2.10.B</p>	
<p>S11.A.2.1.1 Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.</p>	<p>Student Edition: <i>ChemLab</i> 126, 356, 432, 466, 506, 816 <i>MiniLab</i> 478 Teacher Wraparound Edition: DI 14; E 14, 16</p>
<p>S11.A.2.1.2 Critique the elements of the design process (e.g., identify the problem, understand criteria, create solutions, select solution, test/evaluate, communicate results) applicable to a specific technological design.</p>	<p>Student Edition: <i>In the Field</i> 505 Teacher Wraparound Edition: A 867; AC 695; CP 810; DI 370</p>
<p>S11.A.2.1.3 Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.</p>	<p>Student Edition: <i>ChemLab</i> 60, 698 <i>Data Analysis Lab</i> 269, 408 <i>Problem-Solving Lab</i> 566 Teacher Wraparound Edition: A 215; CJ 664; CP 448; TS 505; VL 192</p>

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<p>S11.A.2.1.4 Critique the results and conclusions of scientific inquiry for consistency and logic.</p>	<p>Student Edition: <i>ChemLab</i> 60, 92, 126, 164, 390, 584, 816 <i>MiniLab</i> 82 Teacher Wraparound Edition: CJ 89; MI 55</p>
<p>S11.A.2.1.5 Communicate results of investigations using multiple representations.</p>	<p>Student Edition: <i>ChemLab</i> 432 <i>Writing in Chemistry</i> 125, 431, 465 Teacher Wraparound Edition: A 294, 569; CP 5, 227, 267; DI 262</p>
<p>S11.A.2.2 Evaluate appropriate technologies for a specific purpose, or describe the information the instrument can provide. Reference: 3.7.10.B, 3.8.10.B</p>	
<p>S11.A.2.2.1 Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).</p>	<p>Student Edition: 32-38 <i>ChemLab</i> 670 <i>MiniLab</i> 39, 526 Teacher Wraparound Edition: A 662, 811; CJ 664; CP 49; DI 36, 415</p>
<p>S11.A.2.2.2 Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meters, probe, interfaces, imaging technology, telescope) is used to extend human abilities and precision.</p>	<p>Student Edition: <i>Chemistry & Health</i> 163 <i>Connection to Biology</i> 107 <i>Data Analysis Lab</i> 113 <i>How It Works</i> 125 Teacher Wraparound Edition: CJ 120; CP 110; DI 871; E 107, 141, 347</p>
<p>S11.A.3 Systems, Models and Patterns</p>	
<p>S11.A.3.1 Analyze the parts of a simple system, their roles, and their relationships to the system as a whole. Reference: 3.1.10.A, 3.1.10.E, 4.3.10.C</p>	
<p>S11.A.3.1.1 Apply systems analysis, showing relationships (e.g., flowcharts, decision trees, dichotomous keys, mind map), input and output, and measurements to explain a system and its parts.</p>	<p>Student Edition: 594-598, 666-667 <i>Chemistry & Health</i> 583, 623 <i>Connection to Biology</i> 504 <i>Problem-Solving Lab</i> 668 Teacher Wraparound Edition: CD 597; CJ 846; DI 603, 710</p>

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<p>S11.A.3.1.2 Analyze and predict the effect of making a change in one part of a system on the system as a whole.</p>	<p>Student Edition: 606-611, 666-667 <i>Chemistry & Health</i> 583, 623 <i>MiniLab</i> 611 <i>Problem-Solving Lab</i> 668 Teacher Wraparound Edition: A 609; CP 426; MI 606; R 610</p>
<p>S11.A.3.1.3 Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).</p>	<p>Student Edition: 599-605, 711-717 <i>ChemLab</i> 624 <i>Problem-Solving Lab</i> 622, 668 Teacher Wraparound Edition: A 716; DI 602</p>
<p>S11.A.3.1.4 Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating systems, motor, food production) and identify the resources necessary for operation of the system.</p>	<p>Student Edition: <i>Chemistry & Health</i> 583, 623 <i>How It Works</i> 775 <i>Problem-Solving Lab</i> 444, 622, 668 Teacher Wraparound Edition: CJ 523; DI 603; IM 709</p>
<p>S11.A.3.2 Compare observations of the real world to observations of a constructed model. Reference: 3.1.10.B, 3.2.10.B, 4.1.10.B, 4.6.10.A</p>	
<p>S11.A.3.2.1 Compare the accuracy of predictions represented in a model to actual observations and behavior.</p>	<p>Student Edition: 106-114, 146-152, 457-459 <i>ChemLab</i> 126, 734 Teacher Wraparound Edition: A 215, 413; CP 153; DI 175, 450</p>
<p>S11.A.3.2.2 Describe advantages and disadvantages of using models to simulate processes and outcomes.</p>	<p>Student Edition: 10, 106-114, 146-152 <i>Section Assessment</i> 11 #11 & #12 Teacher Wraparound Edition: BM 157; CB 149; CU 145; DI 115</p>
<p>S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).</p>	<p>Student Edition: 261-264 <i>ChemLab</i> 272 <i>MiniLab</i> 423, 873 <i>Problem-Solving Lab</i> 842 Teacher Wraparound Edition: A 105; BM 142; MC 262; QD 767; TS 163</p>

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<p>S11.A.3.3 Compare and analyze repeated processes or recurring elements in patterns. Reference: 3.1.10.C, 3.2.10.B</p>	
<p>S11.A.3.3.1 Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.</p>	<p>Student Edition: 182-194 <i>ChemLab</i> 196 <i>MiniLab</i> 193 <i>Problem-Solving Lab</i> 180, 294 Teacher Wraparound Edition: A 188; CD 187; D 190-191; MC 191</p>
<p>S11.A.3.3.2 Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties.</p>	<p>Student Edition: 214-215, 225-228, 270, 420-424 <i>MiniLab</i> 227 Teacher Wraparound Edition: QD 211; R 228, 270; VL 225</p>
<p>S11.A.3.3.3 Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).</p>	<p>Student Edition: 402-405, 425-429 <i>Launch Lab</i> 401 Teacher Wraparound Edition: A 409; CJ 417; D 76-77; E 37, 543; MI 415; QD 137</p>
<p>S11.B Biological Sciences</p>	
<p>S11.B.1 Structure and Function of Organisms</p>	
<p>S11.B.1.1 Explain structure and function at multiple levels of organization. Reference: 3.3.10.A, 3.3.10.B, 4.6.10.A, 4.7.10.B</p>	
<p>S11.B.1.1.1 Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).</p>	<p>Student Edition: 212-215, 813, 826-831, 840-843 <i>Connection to Biology</i> 262 <i>How It Works</i> 271 Teacher Wraparound Edition: AC 419; CP 244, 768</p>
<p>S11.B.1.1.2 Compare and contrast the structural and functional similarities and differences among living things (e.g., classify organisms into classification groups, compare systems).</p>	<p>Student Edition: 844-848 <i>Connection to Biology</i> 693, 838 <i>How It Works</i> 309 <i>Writing in Chemistry</i> 815 Teacher Wraparound Edition: AC 500; CJ 651; R 838; TS 815</p>

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<p>S11.B.1.1.3 Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).</p>	<p>Student Edition: 826-831, 835-848 <i>ChemLab</i> 850 <i>Problem-Solving Lab</i> 842 Teacher Wraparound Edition: A 841; CJ 830; E 828, 847, 848; R 848</p>
<p>S11.C Physical Sciences</p>	
<p>S11.C.1 Structure, Properties, and Interaction of Matter and Energy</p>	
<p>S11.C.1.1 Explain the relationship between the structure and properties of matter. Reference: 3.4.10.A</p>	
<p>S11.C.1.1.1 Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons).</p>	<p>Student Edition: 106-114 <i>Chapter Assessment</i> 128 #39 & #42 Teacher Wraparound Edition: CD 136; CJ 110; DI 115; E 114</p>
<p>S11.C.1.1.2 Explain the relationship between the physical properties of a substance and its molecular or atomic structure.</p>	<p>Student Edition: 212-215, 267-268, 765-769, 826-829 <i>Launch Lab</i> 785 Teacher Wraparound Edition: A 270; AC 419; BM 766; CJ 268; CP 244</p>
<p>S11.C.1.1.3 Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories.</p>	<p>Student Edition: 210-215, 240-247, 269-270 <i>ChemLab</i> 230 <i>MiniLab</i> 242 Teacher Wraparound Edition: CJ 214, 241; CP 210; D 248-249; QD 211</p>
<p>S11.C.1.1.4 Explain how the relationships of chemical properties of elements are represented in the repeating patterns within the periodic table.</p>	<p>Student Edition: 177-181, 187-194, 265-266 <i>ChemLab</i> 196 <i>MiniLab</i> 193 <i>Problem-Solving Lab</i> 180, 294 Teacher Wraparound Edition: D 190-191; DI 187; MC 191</p>

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<p>S11.C.1.1.5 Predict the behavior of gases through the application of laws (e.g., Boyle’s law, Charles’ law, or ideal gas law).</p>	<p>Student Edition: 442-456 <i>Chapter Assessment</i> 468-469 #55-60 & #67-78 <i>ChemLab</i> 466 Teacher Wraparound Edition: BM 448; D 442-443; DI 450</p>
<p>S11.C.1.1.6 Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, temperature).</p>	<p>Student Edition: 568-570 <i>Chemistry & Health</i> 583 <i>ChemLab</i> 584 <i>MiniLab</i> 571 <i>Section Assessment</i> 573 #14 Teacher Wraparound Edition: A 573, 574; D 568-569; R 573</p>
<p>S11.C.2 Forms, Sources, Conversion, and Transfer of Energy</p>	
<p>S11.C.2.1 Analyze energy sources and transfer of energy, or conversion of energy. Reference: 3.4.10.B</p>	
<p>S11.C.2.1.1 Compare or analyze waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, X-rays, microwaves) as well as their properties, energy levels, and motion.</p>	<p>Student Edition: 137-140 <i>ChemLab</i> 164 <i>Section Assessment</i> 145 #14 Teacher Wraparound Edition: A 145; CB 139; DI 136; MI 136; QD 137, 139</p>
<p>S11.C.2.1.2 Describe energy changes in chemical reactions.</p>	<p>Student Edition: 247, 534-541 <i>ChemLab</i> 550 <i>Launch Lab</i> 515 Teacher Wraparound Edition: CJ 539; D 284-285, 518-519; DI 220; E 246</p>
<p>S11.C.2.1.3 Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration, rocket propulsion, heat pump).</p>	<p>Student Edition: 516-518 Teacher Wraparound Edition: AC 538; CJ 78; E 519; MI 516</p>
<p>S11.C.2.1.3 Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration, rocket propulsion, heat pump).</p>	<p>Student Edition: 516-518 Teacher Wraparound Edition: AC 538; CJ 78; E 519; MI 516</p>