



CHEMISTRY

MATTER AND CHANGE

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STANDARDS	PAGE REFERENCES
Chemistry I: Embedded Inquiry	
Embedded Conceptual Strand <i>Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century.</i>	
Guiding Question <i>What tools, skills, knowledge, and dispositions are needed to conduct scientific inquiry?</i>	
Course Level Expectations	
CLE 3221.Inq.1 Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.	Student Edition: <i>Figure 4.10</i> 110-111 <i>Figure 6.9</i> 184-185 <i>Figure 7.6</i> 212-213 <i>Figure 14.11</i> 490-491 <i>Figure 18.4</i> 636-637 <i>Figure 22.18</i> 810-811 <i>Figure 24.22</i> 882-883 <i>Concepts in Motion</i> 111, 185, 213, 491, 637, 811, 883 Teacher Wraparound Edition: CIM 111, 185, 213, 491, 637, 811, 883; CJ 184; CP 185

STANDARDS	PAGE REFERENCES
CLE 3221.Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.	Student Edition: <i>Data Analysis Lab</i> 478 <i>Inquiry Extension</i> 92, 164, 230, 432, 466, 584, 698, 850 <i>Launch Lab</i> 31, 281, 401, 633, 679, 707 Teacher Wraparound Edition: DAL 478; DI 415, 450
CLE 3221.Inq.3 Use appropriate tools and technology to collect precise and accurate data.	Student Edition: <i>CHEMLAB</i> 60, 230, 356, 390, 466, 502, 550, 584, 670, 734, 776, 816, 850, 892 <i>Launch Lab</i> 3 <i>Mini Lab</i> 39, 342, 378, 526, 571, 648
CLE 3221.Inq.4 Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.	Student Edition: <i>CHEMLAB</i> 24, 390, 550, 698 <i>Launch Lab</i> 3
CLE 3221.Inq.5 Compare experimental evidence and conclusions with those drawn by others.	Student Edition: <i>CHEMLAB</i> 550, 584, 698, 816 <i>Inquiry Extension</i> 60, 390
CLE 3221.Inq.6 Communicate and defend scientific findings.	Student Edition: <i>CHEMLAB</i> 584, 698, 816 <i>Inquiry Extension</i> 506
Checks for Understanding	
3221.Inq.1 Trace the historical development of a scientific principle or theory.	Student Edition: 106-114 <i>Concepts in Motion</i> 111 <i>Figure 4.10</i> 110-111 Teacher Wraparound Edition: CIM 111; E 108; Ex 114
3221.Inq.2 Identify an answerable question and formulate a hypothesis to guide a scientific investigation.	Student Edition: <i>CHEMLAB</i> 164, 506, 698, 850, 892 <i>Inquiry Extension</i> 92, 584, 698 <i>Mini Lab</i> 227
3221.Inq.3 Design a simple experiment including appropriate controls.	Student Edition: <i>Data Analysis Lab</i> 478 <i>Inquiry Extension</i> 92, 230, 310, 356, 432, 466, 670, 698, 734, 776, 816, 850 <i>Launch Lab</i> 69 Teacher Wraparound Edition: As 419; D 344-345; DAL 478; DI 415, 450

STANDARDS	PAGE REFERENCES
3221.Inq.4 Perform and understand laboratory procedures directed at testing hypothesis.	Student Edition: <i>CHEMLAB</i> 506, 850, 892 <i>Data Analysis</i> 478
3221.Inq.5 Select appropriate tools and technology to collect precise and accurate quantitative and qualitative data.	Student Edition: <i>CHEMLAB</i> 24, 230, 356, 390, 466, 550, 584, 698, 734, 816, 892 <i>Launch Lab</i> 3 <i>Mini Lab</i> 39, 342, 378, 526, 648
3221.Inq.6 Correctly read a thermometer, balance, metric ruler, graduated cylinder, pipette, and burette.	Student Edition: <i>CHEMLAB</i> 60, 230, 356, 390, 466, 550, 584, 670, 776, 816, 850, 892 <i>Launch Lab</i> 3 <i>Mini Lab</i> 39, 342, 378, 502, 526, 571, 648 Teacher Wraparound Edition: D 34-35
3221.Inq.7 Record observations and/or data using correct scientific units and significant figures.	Student Edition: <i>CHEMLAB</i> 60, 230, 356, 390, 466, 550, 584, 670, 734, 776, 816, 850 <i>Mini Lab</i> 39, 342, 378, 502, 526, 571
3221.Inq.8 Export data into the appropriate form of data presentation (e.g., equation, table, graph, or diagram).	Student Edition: <i>CHEMLAB</i> 60, 432, 466, 550, 584, 734, 850 <i>Practice Problems</i> 963 <i>Mini Lab</i> 526
3221.Inq.9 Translate data into the correct units and dimension using conversion factors and scientific notation.	Student Edition: <i>CHEMLAB</i> 466, 550, 584, 670, 776 <i>Mini Lab</i> 457, 571
3221.Inq.10 Analyze information in a table, graph or diagram (e.g., compute the mean of a series of values or determine the slope of a line).	Student Edition: <i>CHEMLAB</i> 60, 432, 466, 550, 584, 734, 776, 850 <i>Data Analysis Lab</i> 113, 387, 691, 805
3221.Inq.11 If accepted values are known, calculate the percent error for an experiment.	Student Edition: <i>CHEMLAB</i> 60, 356, 390, 550, 734 <i>Mini Lab</i> 378, 526
3221.Inq.12 Determine the accuracy and precision of experimental results.	Student Edition: <i>CHEMLAB</i> 60, 164, 230, 310, 356, 390, 550, 624, 670, 698, 776, 816 <i>Mini Lab</i> 378, 526

STANDARDS	PAGE REFERENCES
3221.Inq.13 Analyze experimental results and identify possible sources of bias or experimental error.	Student Edition: <i>CHEMLAB</i> 24, 164, 230, 310, 356, 390, 466, 506, 584, 624, 670, 698, 734, 776, 850, 892 <i>Data Analysis Lab</i> 805 <i>Mini Lab</i> 378, 526, 571
3221.Inq.14 Recognize, analyze, and evaluate alternative explanations for the same set of observations.	Student Edition: <i>CHEMLAB</i> 466 <i>Inquiry Extension</i> 816, 892
3221.Inq.15 Design a model based on the correct hypothesis that can be used for further investigation.	Student Edition: <i>CHEMLAB</i> 584 <i>Inquiry Extension</i> 550, 816
State Performance Indicators	
SPI 3221 Inq.1 Select a description or scenario that reevaluates and/or extends a scientific finding.	Student Edition: <i>Chemistry and Health</i> 163 <i>Data Analysis Lab</i> 113, 387, 478 <i>How It Works</i> 549, 775 <i>Inquiry Extension</i> 310, 670 <i>Problem-Solving Lab</i> 180, 842, 890 Teacher Wraparound Edition: B 163; CJ 17; DAL 113; DI 175; E 421; Ex 177; TS 549, 775
SPI 3221 Inq.2 Analyze the components of a properly designed scientific investigation.	Student Edition: 12-16 <i>Figure 1.9</i> 12 <i>Figure 1.10</i> 13 <i>Mini Lab</i> 13 Teacher Wraparound Edition: As 12; DI 14; Ex 16; MI 12; QD 14
SPI 3221 Inq.3 Determine appropriate tools to gather precise and accurate data.	Student Edition: <i>CHEMLAB</i> 60, 230, 356, 390, 466, 502, 550, 584, 670, 734, 776, 816, 850, 892 <i>Launch Lab</i> 3 <i>Mini Lab</i> 39, 342, 378, 526, 571, 648

STANDARDS	PAGE REFERENCES
SPI 3221 Inq.4 Evaluate the accuracy and precision of data.	Student Edition: <i>CHEMLAB</i> 60, 164, 230, 310, 356, 390, 550, 624, 670, 698, 776, 816 <i>Example & Practice Problems</i> 49 <i>Mini Lab</i> 378, 526 <i>Problem Solving Lab</i> 50 <i>Table 2.3</i> 48 Teacher Wraparound Edition: Ex 48; MI 47
SPI 3221 Inq.5 Defend a conclusion based on scientific evidence.	Student Edition: <i>CHEMLAB</i> 584, 698 Teacher Wraparound Edition: As 112
SPI 3221 Inq.6 Determine why a conclusion is free of bias.	Student Edition: 15
SPI 3221 Inq.7 Compare conclusions that offer different, but acceptable explanations for the same set of experimental data.	Student Edition: <i>CHEMLAB</i> 550, 584, 698, 816 <i>Inquiry Extension</i> 60, 390

STANDARDS	PAGE REFERENCES
Chemistry I: Embedded Technology and Engineering	
Conceptual Strand <i>Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies.</i>	
Guiding Question <i>How do science concepts, engineering skills, and applications of technology improve the quality of life?</i>	
Course Level Expectations	
CLE 3221.T/E.1 Explore the impact of technology on social, political, and economic systems.	Student Edition: <i>Connection to Biology</i> 18 <i>Chemistry and Health</i> 163, 389, 465 <i>How It Works</i> 549, 733, 775 <i>In the Field</i> 505, 697, 849, 891 <i>Figure 7.6</i> 212-213 <i>Figure 9.9</i> 290-291 <i>Figure 14.11</i> 490-491 <i>Figure 18.4</i> 636-637 <i>Figure 22.18</i> 810-811 <i>Figure 24.22</i> 882-883 <i>Writing in Chemistry</i> 163 <i>Uses of Radiation</i> 886-888 Teacher Wraparound Edition: B 163, 389; CB 18; CD 888; CJ 290, 491, 882; CP 212; DI 213; E 883; TS 389, 465, 505, 697, 849
CLE 3221.T/E.2 Differentiate among elements of the engineering design cycle: design constraints, model building, testing, evaluating, modifying, and retesting.	The following reference can be used to be introduced and compared to the Scientific Method. Student Edition: <i>Figure 1.9</i> 12
CLE 3221.T/E.3 Explain the relationship between the properties of a material and the use of the material in the application of a technology.	Student Edition: 864 <i>Figure 3.6</i> 74 <i>Figure 7.6</i> 212-213 <i>Figure 24.22</i> 882-883 <i>Uses of Radiation</i> 886-888 Teacher Wraparound Edition: AC 417, 491; CB 810, 882; CJ 117; CP 212, 810, 811, 886; DI 213, 887; Ex 75

STANDARDS	PAGE REFERENCES
<p>CLE 3221.T/E.4 Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.</p>	<p>Student Edition: <i>Concepts in Motion</i> 213, 291, 637, 811 <i>Figure 7.6</i> 212-213 <i>Figure 9.9</i> 290-291 <i>Figure 14.11</i> 490-491 <i>Figure 18.4</i> 636-637 <i>Figure 22.18</i> 810-811 <i>Figure 24.22</i> 882-883</p> <p>Teacher Wraparound Edition: AC 213; CIM 213, 290, 637, 811; CJ 491, 882; CP 636, 811; E 883</p>
Checks for Understanding	
<p>3221.1 Select appropriate tools to conduct a scientific inquiry.</p>	<p>Student Edition: CHEMLAB 24, 230, 356, 390, 466, 550, 584, 698, 734, 816, 892 <i>Launch Lab 3</i> <i>Mini Lab</i> 39, 342, 378, 526, 648</p>
<p>3221.2 Apply the engineering design process to construct a prototype that meets developmentally appropriate specifications.</p>	
<p>3221.3 Explore how the unintended consequences of new technologies can impact human and non-human communities.</p>	<p>Student Edition: 7-8, 20-21, 889 <i>Connection to Biology</i> 888 <i>Data Analysis Lab</i> 21 <i>Everyday Chemistry</i> 229 <i>Figure 1.5</i> 7 <i>Figure 24.29</i> 888</p> <p>Teacher Wraparound Edition: CB 880; CD 888; CJ 882; CP 879; CU 8; Ex 8, 880</p>
<p>3221.4 Present research on current bioengineering technologies that advance health and contribute to improvements in our daily lives.</p>	<p>Student Edition: <i>Chemistry and Health</i> 163, 389, 465 <i>How It Works</i> 733, 775 <i>In the Field</i> 505</p> <p>Teacher Wraparound Edition: B 465, 505, 733, 775; TS 389, 775</p>
<p>3221.5 Design a series of multi-view drawings that can be used by other students to construct an adaptive design and test its effectiveness.</p>	

STANDARDS	PAGE REFERENCES
State Performance Indicators	
SPI 3221.T/E.1 Distinguish among tools and procedures best suited to conduct a specified scientific inquiry.	Student Edition: <i>CHEMLAB</i> 24, 230, 356, 390, 466, 550, 584, 698, 734, 816, 892 <i>Launch Lab</i> 3 <i>Mini Lab</i> 39, 342, 378, 526, 648
SPI 3221.T/E.2 Evaluate a protocol to determine the degree to which an engineering design process was successfully applied.	
SPI 3221.T/E.3 Evaluate the overall benefit to cost ratio of a new technology.	Benefits versus risks examined in <i>Treating Cancer</i> in the following reference. Student Edition: 887 Teacher Wraparound Edition: CD 888; CJ 888
SPI 3221.T/E.4 Use design principles to determine if a new technology will improve the quality of life for an intended audience.	

STANDARDS	PAGE REFERENCES
Chemistry I: Embedded Mathematics	
Conceptual Strand <i>Science applies mathematics to investigate questions, solve problems, and communicate findings.</i>	
Guiding Question <i>What mathematical skills and understandings are needed to successfully investigate chemistry?</i>	
Course Level Expectations	
CLE 3221.Math.1 Understand the mathematical principles associated with the science of chemistry.	Student Edition: 32-37, 322-323, 352, 371-372, 380-381, 386, 409, 443, 454, 520, 524, 534-536 <i>Data Analysis Lab</i> 408 <i>Example & Practice Problems</i> 324, 446 <i>Figure 10.11</i> 340 <i>Figure 10.15</i> 347 <i>Lab Solutions</i> 46T-47T <i>Launch Lab</i> 319 <i>Math Handbook</i> 953-967 <i>Percentage Composition</i> 341-342 <i>Problem Solving-Strategy</i> 458 <i>Problem Solving-Lab</i> 326 <i>Section 11.1 Assessment</i> 372 #8 <i>Section 11.4 Assessment</i> 388 #33 <i>Table 12.4</i> 421 <i>Table 13.1</i> 451 Teacher Wraparound Edition: CJ 331, 369; CU 388; DI 327; ICE 382; MIC 118, 190-191, 320; R 388

STANDARDS	PAGE REFERENCES
<p>CLE 3221.Math.2 Utilize appropriate mathematical equations and processes to solve chemistry problems.</p>	<p>Student Edition: 35, 37, 40-45, 322-323, 456 <i>Chapter 10 Assessment</i> 358-362 <i>Data Analysis Lab</i> 387 <i>Example & Practice Problems</i> 38, 41-43, 45-46, 324, 328-331, 334-339, 343-346, 353, 370-371, 382-383, 386-387, 443, 450, 455 <i>Lab Solutions</i> 46T-47T <i>Math Handbook</i> 953-967 <i>Practice Problems</i> 323, 372 <i>Problem-Solving Lab</i> 326 <i>Section 11.1 Assessment</i> 372 <i>Section 11.4 Assessment</i> 388 #34-#35</p> <p>Teacher Wraparound Edition: As 331, 374; CD 352; CJ 342, 343; CU 340; DI 327, 368; ICE 324, 343, 345, 382, 386, 443, 450; MIC 118</p>
Checks for Understanding	
<p>3221.Math.1 Use a variety of appropriate notations (e.g., exponential, functional, square root).</p>	<p>Student Edition: 40-41, 404-405, 652 <i>Example & Practice Problems</i> 41, 46, 49, 51, 143, 405, 653 <i>Math Handbook</i> 946-951 <i>Section 2.2 Assessment</i> 46 #25, #28</p> <p>Teacher Wraparound Edition: As 41; Ex 45; ICE 41; MIC 406</p>
<p>3221.Math.2 Select and apply appropriate methods for computing with real numbers and evaluate the reasonableness of the results.</p>	<p>Student Edition: 44-45, 48-49 CHEMLAB 60, 356, 390, 550, 734 <i>Example & Practice Problems</i> 38, 49, 51, 443, 448, 450, 481, 483, 521, 540-541 <i>Mini Lab</i> 378, 526 <i>Problem-Solving Lab</i> 50</p> <p>Teacher Wraparound Edition: DI 616; ICE 49</p>

STANDARDS	PAGE REFERENCES
<p>3221.Math.3 Apply algebraic properties, formulas, and relationships to perform operations on real-world problems (e.g., solve for density, determine the concentration of a solution in a variety of units: ppm, ppb, molarity, molality, and percent composition) calculate heats of reactions and phase changes, and manipulate gas law equations.</p>	<p>Student Edition: 35, 37, 87, 142-143 <i>Example & Practice Problems</i> 38, 443, 446, 448, 450, 455, 481, 483, 486-487, 503, 521, 525, 532, 536-537, 548 <i>Mini Lab</i> 39 <i>Practice Problems</i> 88 <i>Problem-Solving Lab</i> 150 Teacher Wraparound Edition: CD 482; CJ 483; Ex 488; ICE 446, 450, 481, 487; MIC 87, 483; PSL 150</p>
<p>3221.Math.4 Interpret rates of change from graphical and numerical data (e.g., phase diagrams, solubility graphs, colligative properties, nuclear decay or half-life).</p>	<p>Student Edition: CHEMLAB 850 <i>Data Analysis Lab</i> 21, 216 <i>Figure 12.29</i> 429 <i>Figure 13.1</i> 442 <i>Figure 14.15</i> 493 <i>Figure 16.16</i> 575 <i>Figure 17.20</i> 620 <i>Figure 24.11</i> 871 <i>Problem-Solving Lab</i> 531, 566 <i>Section 24.2 Assessment</i> 874 #18 Teacher Wraparound Edition: As 871; DAL 21, 216; DI 429</p>
<p>3221.Math.5 Analyze graphs to describe the behavior of functions (e.g., concentration of a solution, phase diagrams, solubility graphs, colligative properties, nuclear decay half-life).</p>	<p>Student Edition: <i>Figure 14.21</i> 501 <i>Figure 16.5 & 16.6</i> 565 <i>Figure 16.16</i> 575 <i>Figure 17.20</i> 620 <i>Figure 24.7</i> 866 <i>Problem-Solving Lab</i> 531, 890 <i>Table 24.4</i> 871 Teacher Wraparound Edition: As 866; MIC 191; VL 501</p>

STANDARDS	PAGE REFERENCES
<p>3221.Math.6 Model real-world phenomena using functions and graphs.</p>	<p>Student Edition: <i>Chemistry and Health</i> 623 <i>CHEMLAB</i> 850 <i>Data Analysis Lab</i> 21, 216, 269 <i>Figure 13.1</i> 442 <i>Figure 13.2</i> 445 <i>Problem-Solving Lab</i> 890 <i>Section 24.2 Assessment</i> 874 #18 Teacher Wraparound Edition: CP 448; D 492-493; DAL 21, 216</p>
<p>3221.Math.7 Apply and interpret algebraic properties in symbolic manipulation (e.g., density, concentration of a solution, chemical equations, effect of volume, temperature or pressure on behavior of a gas, percent composition of elements in a compound, molar mass, number of moles, and molar volume, amount of products or reactants given mole, molarity, volume at STP or mass amounts, heat loss or gain using mass, temperature change and specific heat, and half-life of an isotope)</p>	<p>Student Edition: 142-143, 150, 409, 443, 445, 447, 449, 454, 456, 481, 482, 486-488, 496, 500, 520, 534-536, 539-540, 546-547, 868 <i>Example & Practice Problems</i> 409, 446, 448, 450, 455, 486, 497, 503, 521, 536-537, 540-541, 548, 869, 872 <i>Problem-Solving Strategy</i> 458 <i>Table 13.1</i> 451 Teacher Wraparound Edition: As 500; CD 535; CU 488; DI 147; ICE 446, 448, 486; MIC 118</p>
<p>3221.Math.8 Apply and communicate measurement units, concepts and relationships in algebraic problem-solving situations.</p>	<p>Student Edition: 44-45 <i>Example & Practice Problems</i> 46, 497, 525, 532, 616-617 <i>Figure 13.1</i> 442 <i>Figure 15.8</i> 527 <i>Figure 15.9</i> 528 <i>Practice Problems</i> 45 <i>Problem-Solving Lab</i> 444, 621, 668 <i>Section 2.2 Assessment</i> 46 #27-#29 <i>Table 13.1</i> 451 Teacher Wraparound Edition: CP 617; D 442-443, 492-493; DI 531, 575; ICE 497, 525, 617; PSL 444</p>

STANDARDS	PAGE REFERENCES
<p>3221.Math.9 Select appropriate units, scales, and measurement tools for problem situations involving proportional reasoning and dimensional analysis.</p>	<p>Student Edition: 44-45, 956 <i>Example & Practice Problems</i> 46, 956-957 <i>Practice Problems</i> 45 <i>Section 2.2 Assessment</i> 46 Teacher Wraparound Edition: As 45; BM 44; DI 44, 499; ICE 46; R 45</p>
<p>3221.Math.10 Select, construct, and analyze appropriate graphical representations for a data set.</p>	<p>Student Edition: <i>CHEMLAB</i> 60, 850 <i>Data Analysis Lab</i> 408 <i>Math Handbook</i> 959-963 <i>Mini Lab</i> 873 <i>Problem-Solving Lab</i> 531 <i>Section 2.4 Assessment</i> 58 <i>Section 24.2 Assessment</i> 874 #18 Teacher Wraparound Edition: D 492-493; PSL 531</p>
<p>3221.Math.11 Identify and solve different types of stoichiometry problems (e.g., volume at STP to mass, moles to mass, molarity).</p>	<p>Student Edition: <i>Chapter 11 Assessment</i> 393 #61-63, #68 <i>Example & Practice Problems</i> 370-371, 375-377, 461-463 <i>Mini Lab</i> 378 <i>Problem-Solving Strategy</i> 374 <i>Section 13.3 Assessment</i> 464 Teacher Wraparound Edition: As 371; CD 461; CP 370; Ex 377; ICE 370, 375-377, 461, 463</p>
<p>3221.Math.12 Calculate the amount of product expected in a lab experience and determine percent yield.</p>	<p>Student Edition: <i>CHEMLAB</i> 390 <i>Data Analysis Lab</i> 805 Teacher Wraparound Edition: QD 386</p>
<p>3221.Math.13 Convert among the quantities of a substance: mass, number of moles, number of particles, molar volume at STP.</p>	<p>Student Edition: 322-323, 327-330, 452 <i>Example & Practice Problems</i> 324, 328-331, 453 <i>Figure 10.8</i> 332 <i>Practice Problems</i> 323 Teacher Wraparound Edition: As 329, 331; CJ 329, 331, 369; CU 323; DI 323; Ex 332; ICE 324, 328, 331, 453</p>

STANDARDS	PAGE REFERENCES
State Performance Indicators	
<p>SPI 3221.Math.1 Use real numbers to represent real-world applications (e.g., slope, rate of change, probability, and proportionality).</p>	<p>Student Edition: <i>CHEMLAB</i> 60 <i>Data Analysis Lab</i> 21, 216, 408 <i>Figure 13.2</i> 445 <i>Figure 16.16</i> 575 <i>Problem-Solving Lab</i> 531 Teacher Wraparound Edition: DAL 21, 216; MIC 191</p>
<p>SPI 3221.Math.2 Perform operations on algebraic expressions and informally justify the procedures chosen.</p>	<p>Student Edition: <i>Example & Practice Problems</i> 43, 443, 446, 450, 497, 503, 613 <i>Problem-Solving Strategy</i> 621 <i>Table 13.1</i> 451 Teacher Wraparound Edition: DI 575; ICE 43; MIC 613</p>
<p>SPI 3221.Math.3 Interpret graphs that depict real-world phenomena.</p>	<p>Student Edition: <i>CHEMLAB</i> 60, 850 <i>Data Analysis Lab</i> 21, 269 <i>Figure 2.16</i> 57 <i>Figure 13.1</i> 442 <i>Figure 13.3</i> 447 <i>Figure 16.11</i> 570 <i>Figure 16.16</i> 575 <i>Mini Lab</i> 873 Teacher Wraparound Edition: CP 570; MIC 191</p>
<p>SPI 3221.Math.4 Apply measurement unit relationships including Avogadro's number, molarity, molality, volume, and mass to balance chemical equations.</p>	<p>Student Edition: 368-369 <i>Example & Practice Problems</i> 370-371, 375 <i>Problem-Solving Strategy</i> 374 <i>Table 11.1</i> 369 Teacher Wraparound Edition: CJ 369; DI 368; Ex 371; ICE 370</p>
<p>SPI 3221.Math.5 Use concepts of mass, length, area, and volume to estimate and solve real-world problems.</p>	<p>Student Edition: <i>Example & Practice Problems</i> 38 <i>Mini Lab</i> 39 <i>Problem-Solving Lab</i> 50 Teacher Wraparound Edition: CU 38; E 37; Ex 56; ICE 38</p>

STANDARDS	PAGE REFERENCES
Chemistry I: Standard 1 – Atomic Structure	
Conceptual Strand 1 <i>Atomic theory is the foundation for understanding the interactions and changes in matter.</i>	
Guiding Question 1 <i>How does the structure of matter determine its chemical and physical properties?</i>	
Course Level Expectations	
CLE 3221.1.1 Compare and contrast historical models of the atom.	Student Edition: 110-114 <i>Figure 4.9</i> 110 <i>Figure 4.11</i> 111 <i>Figure 4.13</i> 112 <i>Figure 4.14</i> 114 Section 4.2 Assessment 114 #2 Teacher Wraparound Edition: CJ 110; CP 153; R 114
CLE 3221.1.2 Analyze the organization of the modern periodic table.	Student Edition: 177-181, 183-185, 187-194 <i>Figure 6.8</i> 183 <i>Figure 6.11</i> 188 <i>Figure 6.14</i> 190 <i>Figure 6.15</i> 191 <i>Figure 6.17</i> 193 <i>Figure 6.18</i> 194 Teacher Wraparound Edition: CD 178, 187; CJ 192; CP 177; E 116; Ex 181; R 194; Re 179
CLE 3221.1.3 Describe the atom in terms of its composition and electron characteristics.	Student Edition: 115-117, 119-120, 187-194 <i>Example & Practice Problems</i> 116 <i>Figure 4.17</i> 117 <i>Table 5.4</i> 158 <i>Table 5.5</i> 159 Teacher Wraparound Edition: As 183; CD 115; CJ 117; CP 119, 188; CU 121; DI 115, 183, 187; Ex 119; IM 117

STANDARDS	PAGE REFERENCES
Checks for Understanding	
<p>3221.1.1 Identify the contributions of the major atomic theorists: Neils Bohr, James Chadwick, John Dalton, Max Planck, Ernest Rutherford, and J.J. Thomson.</p>	<p>Student Edition: 104-105, 110-114, 141-142, 146-148 <i>Figure 4.2</i> 104 <i>Figure 4.9</i> 110 <i>Figure 4.10</i> 110-111 <i>Figure 4.13</i> 112 Section 4.1 Assessment 105 #3, #4 Table 4.2 104</p> <p>Teacher Wraparound Edition: CP 153; CU 145; DI 104; Ex 104, 112</p>
<p>3221.1.2 Compare the Bohr model and the quantum mechanical electron-cloud models of the atom.</p>	<p>Student Edition: 152 <i>Figure 5.15</i> 152 Section 5.2 Assessment 155 #20</p> <p>Teacher Wraparound Edition: CB 149; CD 148; CP 153</p>
<p>3221.1.3 Draw Bohr models of the first 18 elements.</p>	<p>Using the following references, students can refer to the periodic table to guide the drawings for the 18 elements. Concepts in Motion may also be helpful references with the above tables.</p> <p>Student Edition: <i>Figure 5.10</i> 146 Tables 5.4 & 5.5 158-159</p>
<p>3221.1.4 Interpret a Bohr model of an electron moving between its ground and excited states in terms of the absorption or emission of energy.</p>	<p>Student Edition: 146-148 <i>Concepts in Motion</i> 147, 148 <i>Figure 5.11</i> 147 <i>Figure 5.12</i> 148</p> <p>Teacher Wraparound Edition: As 147; CIM 147, 148; DI 146</p>
<p>3221.1.5 Use the periodic table to identify an element as a metal, nonmetal, or metalloid.</p>	<p>Student Edition: 177-183 Chapter 6 Assessment 198-200 #33, #77 Section 6.1 Assessment 181 #2</p> <p>Teacher Wraparound Edition: As 177, 179; CP 177; R 186; Re 179</p>

STANDARDS	PAGE REFERENCES
<p>3221.1.6 Apply the periodic table to determine the number of protons and electrons in a neutral atom.</p>	<p>Student Edition: 115-116, 182-185 <i>Example & Practice Problems</i> 116 <i>Figure 4.15</i> 115 <i>Figure 6.3</i> 177 Teacher Wraparound Edition: CD 182; CJ 184</p>
<p>3221.1.7 Determine the number of protons and neutrons for a particular isotope of an element.</p>	<p>Student Edition: 117 <i>Chapter 4 Assessment</i> 129 #67, #72-#74 <i>Example & Practice Problems</i> 118 <i>Figure 4.16 & 4.17</i> 117 Teacher Wraparound Edition: As 117; IM 117; MIC 118</p>
<p>3221.1.8 Explain the formation of anions and cations, and predict the charge of an ion usually formed by the main-group elements.</p>	<p>Student Edition: 206-209 <i>Figure 7.2</i> 207 <i>Figure 7.4</i> 209 <i>Section 7.1 Assessment</i> 209 #5 <i>Table 7.2</i> 208 Teacher Wraparound Edition: As 209; CD 206, 208; CU 209; DI 207; MI 206</p>
<p>3221.1.9 Sequence selected atoms from the main-group elements based on their atomic or ionic radii.</p>	<p>Student Edition: <i>Example & Practice Problems</i> 189 <i>Figure 6.11</i> 188 <i>Figure 6.14</i> 190 <i>Section 6.3 Assessment</i> 194 #21 Teacher Wraparound Edition: CJ 189; DI 187; ICE 189</p>
<p>3221.1.10 Sequence selected atoms from the main-group elements based on first ionization energy, electron affinity or electronegativity.</p>	<p>Student Edition: <i>Chapter 6 Assessment</i> 199 #64 <i>Section 6.3 Assessment</i> 194 #21, #23 Teacher Wraparound Edition: CU 194</p>
<p>3221.1.11 Determine an atom's Lewis electron-dot structure or number of valence electrons from an element's atomic number or position in the periodic table.</p>	<p>Student Edition: <i>Chapter 5 Assessment</i> 168 #90 <i>Example & Practice Problems</i> 162 <i>Table 5.6</i> 161 Teacher Wraparound Edition: As 159; R 162</p>

STANDARDS	PAGE REFERENCES
<p>3221.1.12 Represent an atom's electron arrangement in terms of orbital notation, electron configuration notation, and electron-dot notation.</p>	<p>Student Edition: 156-162 <i>Chapter 5 Assessment</i> 167 #85-#88, #90 <i>Example & Practice Problems</i> 162 <i>Figure 5.18</i> 156 <i>Practice Problems</i> 160 <i>Section 5.3 Assessment</i> 162 #29, #32 <i>Table 5.4</i> 158 <i>Table 5.5</i> 159</p> <p>Teacher Wraparound Edition: As 159; DI 158; MI 156; VL 158</p>
<p>3221.1.13 Compare s and p orbitals in terms of their shape, and order the s, p, d and f orbitals in terms of energy and number of possible electrons.</p>	<p>Student Edition: 153-154, 156-167 <i>Chapter 5 Assessment</i> 167 #84, 169 #109 <i>Figure 5.17</i> 154 <i>Figure 5.18</i> 156 <i>Figure 5.19</i> 158</p> <p>Teacher Wraparound Edition: CD 154; CJ 154; MI 156</p>
<p>State Performance Indicators</p>	
<p>SPI 3221.1.1 Compare and contrast the major models of the atom (e.g., Democritus, Thomson, Rutherford, Bohr, and the quantum mechanical model).</p>	<p>Student Edition: 103, 110-113 <i>Figure 4.9</i> 110 <i>Figure 4.13</i> 112 <i>Figure 5.10</i> 146 <i>Figure 5.15</i> 152 <i>Section 4.2 Assessment</i> 114 #8 <i>Section 5.2 Assessment</i> 155 #20 <i>Table 4.1</i> 103</p> <p>Teacher Wraparound Edition: CB 149; CJ 110; CP 153</p>
<p>SPI 3221.1.2 Interpret the periodic table to describe an element's atomic makeup.</p>	<p>Student Edition: 115, 117, 182-183 <i>Example & Practice Problems</i> 116 <i>Figure 4.15</i> 115 <i>Figure 4.17</i> 117 <i>Figure 6.3</i> 177</p> <p>Teacher Wraparound Edition: ICE 116</p>

STANDARDS	PAGE REFERENCES
<p>SPI 3221.1.3 Describe the trends found in the periodic table with respect to atomic size, ionization energy, electron affinity or electronegativity.</p>	<p>Student Edition: 187-194 <i>Chapter 6 Study Guide</i> 197 <i>Figure 6.11 & 6.12</i> 188 <i>Figure 6.14</i> 190 <i>Figure 6.15</i> 191 <i>Figure 6.17</i> 193 <i>Figure 6.18</i> 194 <i>Section 6.3 Assessment</i> 194 #20, #24 Teacher Wraparound Edition: CD 187; CP 188; CU 194; MIC 191; R 194; VL 192</p>
<p>SPI 3221.1.4 Determine the Lewis electron-dot structure or number of valence electrons for an atom of any main-group element, given its atomic number or its position in the periodic table.</p>	<p>Student Edition: <i>Chapter 5 Assessment</i> 168 #90 <i>Example & Practice Problems</i> 162 <i>Table 5.6</i> 161 Teacher Wraparound Edition: As 159; R 162</p>
<p>SPI 3221.1.5 Represent an electron's location in the quantum mechanical model of an atom in terms of the shape of electron clouds (s and p orbitals in particular), relative energies of orbitals, and the number of electrons possible in the s, p, d and f orbitals.</p>	<p>Student Edition: 152-155, 156-160 <i>Figure 5.15</i> 152 <i>Figure 5.17</i> 154 <i>Figure 5.19</i> 158 <i>Table 5.2</i> 155 <i>Table 5.4</i> 158 <i>Table 5.5</i> 159 Teacher Wraparound Edition: CD 154; CJ 154; DI 160; Ex 155; R 155</p>

STANDARDS	PAGE REFERENCES
Chemistry I: Standard 2 – Matter and Energy	
Conceptual Strand 2 <i>The properties of matter determine how it interacts with energy.</i>	
Guiding Question 2 <i>What is the relationship between matter and energy?</i>	
Course Level Expectations	
CLE 3221.2.1 Investigate the characteristic properties of matter.	Student Edition: 73-75 <i>Chapter 3 Assessment 94 #34, #38</i> <i>Figure 3.5 73</i> <i>Real-World Chemistry 73</i> <i>Section 3.1 Assessment 75 #3-#4</i> <i>Table 3.1 73</i> <i>Table 3.2 74</i> Teacher Wraparound Edition: DI 72; Ex 75; IM 73; QD 74
CLE 3221.2.2 Explore the interactions between matter and energy.	Student Edition: 216, 247, 530-531 <i>Example & Practice Problems 532</i> <i>Figure 15.10 530</i> Teacher Wraparound Edition: DI 531; E 246
CLE 3221.2.3 Apply the kinetic molecular theory to describe solids, liquids, and gases.	Student Edition: 68, 71-72, 402-403, 415, 420 <i>Figure 3.2 & 3.3 71</i> <i>Figure 3.4 72</i> Teacher Wraparound Edition: As 71; BI 400; CP 403; CU 75; DI 71; R 75; UP 68
CLE 3221.2.4 Investigate characteristics associated with the gaseous state.	Student Edition: 5-7, 403-405 <i>Data Analysis Lab 408</i> <i>Figure 1.3 6</i> <i>Figure 12.2 403</i> <i>Figure 12.3 404</i> <i>In the Field 505</i> <i>Problem-Solving Lab 72, 444</i> <i>Real-World Chemistry 448</i> Teacher Wraparound Edition: AC 449; As 6, 72, 405; CD 452-453; CJ 444, 455; CP 448; PSL 444; R 6; TS 505

STANDARDS	PAGE REFERENCES
<p>CLE 3221.2.5 Discuss phase diagrams of one-component systems.</p>	<p>Student Edition: 429-430 <i>Chapter 12 Assessment</i> 435 #81, 437 #99 <i>Concepts in Motion</i> 430 <i>Figure 12.29</i> 429 <i>Figure 12.30</i> 430 <i>Section 12.4 Assessment</i> 430 #31-#33 Teacher Wraparound Edition: As 429; CIM 430; DI 429</p>
<p>Checks for Understanding</p>	
<p>3221.2.1 Identify a material as an element, compound or mixture; identify a mixture as homogeneous or heterogeneous; and/or identify a mixture as a solution, colloid or suspension.</p>	<p>Student Edition: 80-81, 84-85, 476-479 <i>Figure 3.19</i> 87 <i>Section 3.3 Assessment</i> 83 #16, #18 <i>Section 3.4 Assessment</i> 90 #24 <i>Section 14.1 Assessment</i> 479 #2, #8 Teacher Wraparound Edition: As 80, 479; BI 474; CD 476; CP 82; CU 83, 479; DI 80; Ex 83, 479; IM 477; MI 476; UP 474</p>
<p>3221.2.2 Identify the solute and solvent composition of a solid, liquid or gaseous solution.</p>	<p>Student Edition: 299, 489, 495 <i>Solutions Systems: Table 3.3</i> 81 Teacher Wraparound Edition: As 489; IM 490</p>
<p>3221.2.3 Express the concentration of a solution in units of ppm, ppb, molarity, molality, and percent composition.</p>	<p>Student Edition: 480-482, 487-488 <i>Chapter 14 Assessment</i> 508 <i>Example & Practice Problems</i> 481, 483, 487 <i>Practice Problems</i> 482 <i>Section 14.2 Assessment</i> 488 #33 <i>Table 14.3</i> 480 Teacher Wraparound Edition: As 487; CJ 483; CU 488; DI 480; Ex 488; ICE 481, 483, 487</p>
<p>3221.2.4 Describe how to prepare solutions of given concentrations expressed in units of ppm, ppb, molarity, molality, and percent composition.</p>	<p>Student Edition: 484-485 <i>Chapter 14 Assessment</i> 508 <i>Example & Practice Problems</i> 486 <i>Practice Problems</i> 484 Teacher Wraparound Edition: As 485</p>

STANDARDS	PAGE REFERENCES
<p>3221.2.5 Investigate factors that affect the rate of solution.</p>	<p>Student Edition: 492-495 <i>Chapter 14 Assessment</i> 509 #87 <i>CHEMLAB</i> 506</p> <p>Teacher Wraparound Edition: CD 492; D 492-493; VL 494</p>
<p>3221.2.6 Describe how to prepare a specific dilution from a solution of known molarity.</p>	<p>Student Edition: 485 <i>Chapter 14 Assessment</i> 508 #75 <i>Example & Practice Problems</i> 486</p>
<p>3221.2.7 Determine the colligative properties of a solution based on the molality and freezing point or boiling points of the solvent.</p>	<p>Student Edition: 500-502</p> <p>Teacher Wraparound Edition: As 500; CP 500</p>
<p>3221.2.8 Use a solubility graph, composition of a solution and temperature to determine if a solution is saturated, unsaturated or supersaturated.</p>	<p>The following references discuss saturated, unsaturated and supersaturated and may be used to meet this objective.</p> <p>Student Edition: 493-494 <i>Figure 14.15</i> 493</p>
<p>3221.2.9 Classify properties and changes in matter as physical, chemical, or nuclear.</p>	<p>Student Edition: 74-77, 883 <i>Connection to Earth Science</i> 76 <i>Section 3.1 Assessment</i> 75 #3 <i>Section 3.2 Assessment</i> 79 #10-#12 <i>Table 3.2</i> 74 <i>Table 24.1</i> 860</p> <p>Teacher Wraparound Edition: DI 72; MI 76; QD 74</p>
<p>3221.10 Use calorimetry to: identify unknown substances through specific heat, determine the heat changes in physical and chemical changes, determine the mass of an object, and determine the change in temperature of a material.</p>	<p>Student Edition: 524 <i>Chapter 15 Assessment</i> 552 #67, #78 <i>Example & Practice Problems</i> 525 <i>Figure 15.6</i> 524 <i>Mini Lab</i> 526</p> <p>Teacher Wraparound Edition: As 524; ICE 525; ML 526</p>

STANDARDS	PAGE REFERENCES
<p>3221.2.11 Perform calculations on heat of solvation, heat of reaction, and heat of formation, and heat of phase change.</p>	<p>Student Edition: 527-528 <i>Chapter 15 Assessment</i> 553 #92-#94, 554 #109 <i>Example & Practice Problems</i> 540-541 <i>Figure 15.8</i> 527 <i>Figure 15.9</i> 528 <i>Figure 15.15</i> 538 <i>Section 15.4 Assessment</i> 541 #42 <i>Supplemental Practice Problems</i> 987 Teacher Wraparound Edition: As 527, 532; CD 527; CJ 527, 539; DI 537, 531; Ex 541; ICE 540</p>
<p>3221.2.12 Use particle spacing diagrams to identify solids, liquids, or gases.</p>	<p>Student Edition: <i>Figure 3.2 & 3.3</i> 71 <i>Figure 3.4</i> 72 <i>Figure 12.23</i> 425 Teacher Wraparound Edition: As 429</p>
<p>3221.2.13 Distinguish among the solid, liquid, and gaseous states of a substance in terms of the relative kinetic energy of its particles.</p>	<p>Student Edition: 402-403, 411, 415, 420 <i>Figure 12.23</i> 425 <i>Figure 12.24</i> 426 Teacher Wraparound Edition: MI 415; Re 429</p>
<p>3221.2.14 Use a phase diagram to correlate changes in temperature and energy with phases of matter.</p>	<p>Student Edition: 429-430 <i>Figure 12.29</i> 429 <i>Figure 12.30</i> 430 Teacher Wraparound Edition: DI 429</p>

STANDARDS	PAGE REFERENCES
<p>3221.2.15 Graph and interpret the results of experiments that explore relationships among pressure, temperature, and volume of gases.</p>	<p>Student Edition: <i>Figure 13.1</i> 442 <i>Figure 13.2</i> 445 <i>Figure 13.3</i> 447</p>
<p>3221.2.16 Solve gas law problems.</p>	<p>Student Edition: <i>Chapter 13 Assessment</i> 468-470 <i>CHEMLAB</i> 466 <i>Example & Practice Problems</i> 443, 446, 448, 450, 453, 455, 461-463 <i>Mini Lab</i> 457 <i>Problem-Solving Strategy</i> 458 <i>Section 13.1 Assessment</i> 451 #18 <i>Supplemental Practice Problems</i> 984-985 Teacher Wraparound Edition: As 448, 454; DI 445; ICE 443, 446, 448, 450, 453, 455</p>
<p>State Performance Indicators</p>	
<p>SPI 3221.2.1 Distinguish among elements, compounds, solutions, colloids, and suspensions.</p>	<p>Student Edition: 80-81, 84-85, 476-479 <i>Figure 3.19</i> 87 <i>Section 3.3 Assessment</i> 83 #16, #18 <i>Section 3.4 Assessment</i> 90 #24 <i>Section 14.1 Assessment</i> 479 #2, #8 Teacher Wraparound Edition: As 80, 479; BI 474; CD 476; CP 82; CU 83, 479; DI 80; Ex 83, 479; IM 477; MI 476; UP 474</p>
<p>SPI 3221.2.2 Identify properties of a solution: solute and solvent in a solid, liquid or gaseous solution; procedure to make or determine the concentration of a solution in units of ppm, ppb, molarity, molality, percent composition, factors that affect the rate of solution, and colligative properties.</p>	<p>Student Edition: 299, 480-482, 484-485, 487-489, 492-495 <i>Chapter 14 Assessment</i> 508, 509 #87 <i>CHEMLAB</i> 506 <i>Example & Practice Problems</i> 481, 483, 486-487 <i>Practice Problems</i> 482, 484 <i>Section 14.2 Assessment</i> 488 #33 <i>Solutions Systems: Table 3.3</i> 81 <i>Table 14.3</i> 480 Teacher Wraparound Edition: As 485, 487, 489; CD 492; CJ 483; CU 488; D 492-493; DI 480; Ex 488; ICE 481, 483, 487; IM 490; VL 494</p>

STANDARDS	PAGE REFERENCES
SPI 3221.2.3 Classify a solution as saturated, unsaturated or supersaturated, based on its composition and temperature and a solubility graph.	Student Edition: 493-494 <i>Figure 14.15</i> 493
SPI 3221.2.4 Classify a property of change in matter as physical, chemical, or nuclear.	Student Edition: 883 <i>Connection to Earth Science</i> 76 <i>Section 3.2 Assessment</i> 79 #10-#12 <i>Table 24.1</i> 860 Teacher Wraparound Edition: MI 76
SPI 3221.2.5 Compare and contrast heat and temperature changes in chemical and physical processes.	Student Edition: 247, 526-527 <i>Example & Practice Problems</i> 532 <i>Figure 15.8</i> 527 <i>Figure 15.9</i> 528 <i>Figure 15.10</i> 530 <i>Mini Lab</i> 242 Teacher Wraparound Edition: CD 527; DI 531; MIC 527
SPI 3221.2.6 Investigate similarities and differences among solids, liquids and gases in terms of energy and particle spacing.	Student Edition: 402-403, 411, 415, 420 <i>Figure 3.2 & 3.3</i> 71 <i>Figure 3.4</i> 72 <i>Figure 12.23</i> 425 <i>Figure 12.24</i> 426 Teacher Wraparound Edition: As 429; MI 415; Re 429
SPI 3221.2.7 Predict how changes in volume, temperature, and pressure affect the behavior of a gas.	Student Edition: 404, 406-409, 442-445, 447 <i>Figure 12.3</i> 404 <i>Figure 13.1</i> 442 <i>Figure 13.2</i> 445 <i>Figure 13.3</i> 447 Teacher Wraparound Edition: CJ 444; D 442-443; DI 441; MI 442

STANDARDS	PAGE REFERENCES
Chemistry I: Standard 3 – Interactions of Matter	
Conceptual Strand 3 <i>Interactions between matter generate substances with new physical and chemical properties.</i>	
Guiding Question 3 <i>What types of interactions between matter generate new substances?</i>	
Course Level Expectations	
CLE 3221.3.1 Investigate chemical bonding.	Student Edition: 206, 210-211, 225, 241-247 <i>Chapter 8 Assessment 274 #78-#80, #85</i> CHEMLAB 230 <i>Figure 7.11 225</i> <i>Figure 8.8 245</i> <i>Mini Lab 242</i> <i>Section 8.1 247</i> <i>Table 7.4 211</i> Teacher Wraparound Edition: BM 243; CD 245; CJ 241; CP 210, 244; DI 246; MI 240; UP 204
CLE 3221.3.2 Analyze chemical and nuclear reactions.	Student Edition: 289-294, 296-298, 300-301, 303, 305, 307, 875-880 <i>Example & Practice Problems 295</i> <i>Figure 9.14 296</i> <i>Figure 9.20 307</i> <i>Mini Lab 301</i> <i>Practice Problems 291, 292</i> <i>Section 9.2 Assessment 298 #29, #31-#32</i> <i>Section 9.3 Assessment 308 #50</i> <i>Table 9.4 298</i> Teacher Wraparound Edition: As 307; CB 292; CJ 293; CP 289, 292, 296, 306; D 284-285; DI 300; ICE 295; MI 289; QD 293; R 298; Re 879

STANDARDS	PAGE REFERENCES
<p>CLE 3221.3.3 Explore the mathematics of chemical formulas and equations.</p>	<p>Student Edition: 285-286 <i>Example & Practice Problems</i> 287, 295, 302, 304, 306 <i>Figure 9.6</i> 288 <i>Section 9.3 Assessment</i> 308 #53-56 <i>Table 9.3</i> 297</p> <p>Teacher Wraparound Edition: As 287; CJ 293; DI 286; Ex 298; ICE 287; IM 286; MIC 283; R 288</p>
<p>CLE 3221.3.4 Explain the law of conservation of mass/energy.</p>	<p>Student Edition: 77, 79, 288, 517 <i>Example & Practice Problem</i> 370-371</p> <p>Teacher Wraparound Edition: As 374; CJ 78; CP 78</p>
<p>Checks for Understanding</p>	
<p>3221. 3.1 Determine the type of chemical bond that occurs in a chemical compound.</p>	<p>Student Edition: 206, 210-211, 225, 241-247 <i>Chapter 8 Assessment</i> 274 #78-#80, #85 CHEMLAB 230 <i>Figure 7.11</i> 225 <i>Figure 8.8</i> 245 <i>Mini Lab</i> 242 <i>Section 8.1</i> 247 <i>Table 7.4</i> 211</p> <p>Teacher Wraparound Edition: BM 243; CD 245; CJ 241; CP 210, 244; DI 246; MI 240; UP 204</p>
<p>3221.3.2 Differentiate between ionic and covalent bond models.</p>	<p>Student Edition: 210-211, 241, 245 <i>Figure 8.4</i> 242 <i>Figure 8.5</i> 243 <i>Figure 8.7 & 8.8</i> 245 <i>Mini Lab</i> 242 <i>Table 7.4</i> 211</p> <p>Teacher Wraparound Edition: BM 243; CD 245; D 248-249</p>

STANDARDS	PAGE REFERENCES
<p>3221.3.3 Identify the chemical formulas of common chemical compounds.</p>	<p>Student Edition: 218-224, 248-252 <i>Example & Practice Problems</i> 220-222, 249 <i>Figure 8.12</i> 252 <i>Practice Problems</i> 223, 251 <i>Problem-Solving Strategy</i> 224 <i>Table 7.9</i> 221 <i>Table 7.10</i> 222 <i>Table 8.3</i> 248 <i>Table 8.5</i> 251</p> <p>Teacher Wraparound Edition: As 224, 250, 251; CJ 251; CP 250; CU 252; DI 223; Ex 224, 252; ICE 220, 249; IM 219; MI 218; R 224; Re 249; VL 248</p>
<p>3221.3.4 Employ a table of polyvalent cations and polyatomic ions to name and describe the chemical formula of ionic compounds.</p>	<p>Student Edition: <i>Chapter 7 Assessment</i> 233 #86 <i>Example & Practice Problems</i> 222 <i>Practice Problems</i> 223 <i>Table 7.9</i> 221 <i>Table 7.10</i> 222 <i>Table 7.11</i> 223 <i>Table R-5</i> 970</p> <p>Teacher Wraparound Edition: As 223; ICE 222</p>
<p>3221.3.5 Convert percent composition information into the empirical or molecular formula of a compound.</p>	<p>Student Edition: 344, 346-347 <i>Example & Practice Problems</i> 345-346, 348-350 <i>Figure 10.15</i> 347</p> <p>Teacher Wraparound Edition: As 348; ICE 345, 348</p>
<p>3221.3.6 Apply information about the molar mass, number of moles, and molar volume to the number of particles of the substance.</p>	<p>Student Edition: <i>Example & Practice Problems</i> 324, 330-331 <i>Practice Problems</i> 323 <i>Problem-Solving Lab</i> 326 <i>Section 10.1 Assessment</i> 324 #13</p> <p>Teacher Wraparound Edition: As 321, 324, 329; CJ 326, 329, 331; ICE 324, 330</p>

STANDARDS	PAGE REFERENCES
<p>3221.3.7 Balance an equation for a chemical reaction.</p>	<p>Student Edition: 285-286 <i>Chapter 9 Assessment</i> 313 #84, 314 #124 <i>Example & Practice Problems</i> 287 <i>Figure 9.6</i> 288 <i>Section 9.1 Assessment</i> 288 #13 <i>Table 9.2</i> 286 Teacher Wraparound Edition: As 287, 288; DI 286; Ex 288, 298; ICE 287; IM 286</p>
<p>3221.3.8 Classify a chemical reaction as composition, decomposition, single replacement, double replacement, and combustion.</p>	<p>Student Edition: <i>Chapter 9 Assessment</i> 312-314 #76-#77, #81-#82, #102 <i>Table 9.4</i> 298 Teacher Wraparound Edition: R 298</p>
<p>3221.3.9 Use activity series or solubility product table information to predict the products of a chemical reaction.</p>	<p>Student Edition: <i>Chapter 9 Assessment</i> 313 #88, 315 (Table 9.6) #137-#139 <i>Example & Practice Problems</i> 295 <i>Section 9.2 Assessment</i> 298 #34 <i>Table R-8</i> 974 Teacher Wraparound Edition: CJ 293; CU 298; ICE 295</p>
<p>3221.3.10 Predict the products of a neutralization reaction involving inorganic acids and bases.</p>	<p>Teacher Wraparound Edition: CJ 660; CU 667; MI 659</p>
<p>3221.3.11 Interpret a chemical equation to determine molar ratios.</p>	<p>Student Edition: 371-372 <i>Chapter 11 Assessment</i> 392 #47, #49, 396 #101 CHEMLAB 390 <i>Practice Problems</i> 372 <i>Section 11.1 Assessment</i> 372 #8-#9 Teacher Wraparound Edition: As 371; CU 371; R 371</p>

STANDARDS	PAGE REFERENCES
<p>3221.3.12 Convert between the following quantities of a substance: mass, number of moles, number of particles, and molar volume at STP.</p>	<p>Student Edition: 322-323, 327-330, 452 <i>Example & Practice Problems</i> 324, 328-331, 453 <i>Figure 10.8</i> 332 <i>Practice Problems</i> 323 Teacher Wraparound Edition: As 329, 331; CJ 329, 331, 369; CU 323; DI 323; Ex 332; ICE 324, 328, 331, 453</p>
<p>3221.3.13 Solve different types of stoichiometry problems (e.g., volume at STP to mass, moles to mass, molarity,).</p>	<p>Student Edition: <i>Chapter 11 Assessment</i> 393 #61-#63, #68 <i>Example & Practice Problems</i> 370-371, 375-377, 461-463 <i>Mini Lab</i> 378 <i>Problem-Solving Strategy</i> 374 <i>Section 13.3 Assessment</i> 464 Teacher Wraparound Edition: As 371; CD 461; CP 370; Ex 377; ICE 370, 375-377, 461, 463</p>
<p>3221.3.14 Determine the amount of expected product in a lab activity and calculate percent yield.</p>	<p>Student Edition: <i>CHEMLAB</i> 390 <i>Data Analysis Lab</i> 805 Teacher Wraparound Edition: QD 386</p>
<p>3221.3.15 Calculate the amount of heat lost or gained by a substance based on its mass, change in temperature, and specific heat during physical and chemical processes.</p>	<p>Student Edition: <i>Chapter 15 Assessment</i> 552 #74-#76 <i>Example & Practice Problems</i> 521, 525, 532 <i>Mini Lab</i> 526 <i>Section 15.1 Assessment</i> 522 #10 Teacher Wraparound Edition: ICE 525, 532</p>
<p>3221.3.16 Research applications of thermal changes in nuclear reactions.</p>	<p>Student Edition: 878, 880-884 <i>Figure 24.20</i> 881 <i>Section 24.3 Assessment</i> 884 #24 Teacher Wraparound Edition: As 881; BM 882; CB 876, 880; CU 884; E 883; Ex 881</p>

STANDARDS	PAGE REFERENCES
<p>3221.3.17 Identify a substance as an acid or base according to its formula.</p>	<p>Student Edition: 637-643, 665 <i>Chapter 18 Assessment</i> 672 #57 <i>Practice Problems</i> 640, 665 <i>Table 18.1</i> 641 Teacher Wraparound Edition: As 641; BI 632; CB 640; CD 665; DI 639; MI 634; Re 639, 665, 666</p>
<p>3221.3.18 Investigate the acidity/basicity of substances with various indicators.</p>	<p>Student Edition: 660-661 CHEMLAB 670 <i>Figure 18.24</i> 662 <i>Figure 18.26</i> 665 <i>Launch Lab</i> 633 <i>Mini Lab</i> 648 Teacher Wraparound Edition: DI 663; Ex 656; ML 648; QD 634, 635, 638, 652</p>
<p>3221.3.19 Write the nuclear equation involving alpha or beta particles based on the mass number of the parent isotope and complete symbols for alpha or beta emissions.</p>	<p>Student Edition: 862-863, 867 <i>Chapter 24 Assessment</i> 894 #51-#53 <i>Example & Practice Problems</i> 869 <i>Figure 24.8</i> 867 <i>Figure 24.9</i> 868 <i>Section 24.2 Assessment</i> 874 #15 Teacher Wraparound Edition: ICE 869; R 874</p>
<p>3221.3.20 Determine the half-life of an isotope by examining a graph or with an appropriate equation.</p>	<p>Student Edition: 870-871 <i>Example & Practice Problems</i> 872 <i>Section 24.2 Assessment</i> 874 #16-#17 Teacher Wraparound Edition: As 871; ICE 872</p>
<p>3221.3.21 Write a balanced nuclear equation to compare nuclear fusion and fission.</p>	<p>Student Edition: 883 <i>Example & Practice Problems</i> 876 Teacher Wraparound Edition: CP 883; ICE 876</p>

STANDARDS	PAGE REFERENCES
<p>3221.3.22 Describe the benefits and hazards of nuclear energy.</p>	<p>Student Edition: 880-881 <i>Chapter 24 Assessment 895 #67</i></p> <p>Teacher Wraparound Edition: CB 876, 880; CJ 882, 888; CP 879; DI 880; E 881, 883; Ex 880, 881</p>
<p>State Performance Indicators</p>	
<p>SPI 3221.3.1 Analyze ionic and covalent compounds in terms of how they form, names, chemical formulas, percent composition, and molar masses.</p>	<p>Student Edition: 218-219, 221-224, 248-252, 344 <i>Example & Practice Problems 220-222, 249, 334-335, 345-346</i> <i>Figure 8.12 252</i> <i>Practice Problems 223, 251</i> <i>Problem-Solving Strategy 224</i> <i>Section 8.2 Assessment 252</i> <i>Table 7.4 211</i> <i>Table 8.5 251</i></p> <p>Teacher Wraparound Edition: As 224, 348; CJ 214, 251; Ex 224, 252; ICE 220, 249, 348; MI 218; R 224; VL 248</p>
<p>SPI 3221.3.2 Identify the reactants, products, and types of different types of chemical reactions (composition, decomposition, double replacement, single replacement, combustion).</p>	<p>Student Edition: 289-298 <i>Chapter 9 Assessment 312-313 #76-#77, #81-#84</i> <i>Figure 9.14 296</i> <i>Figure 9.20 307</i> <i>Practice Problems 291, 292, 297</i></p> <p>Teacher Wraparound Edition: BM 297; CB 292; CP 289, 292</p>
<p>SPI 3221.3.3 Predict the products of a chemical reaction.</p>	<p>Student Edition: <i>Chapter 9 Assessment 313 #85-#88, #96</i> <i>CHEMLAB 310</i> <i>Example & Practice Problems 295</i></p> <p>Teacher Wraparound Edition: As 307; CJ 293; CP 292; ICE 295; QD 293</p>

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<p>SPI 3221.3.4 Balance a chemical equation to determine molar ratios.</p>	<p>Student Edition: 371-372 <i>Chapter 11 Assessment</i> 392 #47, #49, 396 #101 CHEMLAB 390 <i>Practice Problems</i> 372 <i>Section 11.1 Assessment</i> 372 #8-9</p> <p>Teacher Wraparound Edition: As 371; CU 371; R 371</p>
<p>SPI 3221.3.5 Convert among the following quantities of a substance: mass, number of moles, number of particles, molar volume at STP.</p>	<p>Student Edition: 322-323, 327-330, 452 <i>Example & Practice Problems</i> 324, 328-331, 453 <i>Figure 10.8</i> 332 <i>Practice Problems</i> 323</p> <p>Teacher Wraparound Edition: As 329, 331; CJ 329, 331, 369; CU 323; DI 323; Ex 332; ICE 324, 328, 331, 453</p>
<p>SPI 3221.3.6 Identify and solve stoichiometry problems: volume at STP to mass, moles to mass, and molarity.</p>	<p>Student Edition: <i>Chapter 11 Assessment</i> 393 #61-#63, #68 <i>Example & Practice Problems</i> 370-371, 375-377, 461-463 <i>Mini Lab</i> 378 <i>Problem-Solving Strategy</i> 374 <i>Section 13.3 Assessment</i> 464</p> <p>Teacher Wraparound Edition: As 371; CD 461; CP 370; Ex 377; ICE 370, 375-377, 461, 463</p>
<p>SPI 3221.3.7 Classify substances as acids or bases based on their formulas and how they react with various indicators.</p>	<p>Student Edition: 637-643, 660-661, 665 <i>Chapter 18 Assessment</i> 672 #57 CHEMLAB 670 <i>Figure 18.24</i> 662 <i>Figure 18.26</i> 665 <i>Launch Lab</i> 633 <i>Mini Lab</i> 648 <i>Practice Problems</i> 640, 665 <i>Table 18.1</i> 641</p> <p>Teacher Wraparound Edition: As 641; BI 632; CB 640; CD 665; DI 639, 663; Ex 656; MI 634; ML 648; QD 634, 635, 638, 652; Re 639, 665, 666</p>

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<p>SPI 3221.3.8 Describe radioactive decay through a balanced nuclear equation and through an analysis of the half-life concept.</p>	<p>Student Edition: 862-863, 867, 870-871 <i>Chapter 24 Assessment</i> 894 #51-#53 <i>Example & Practice Problems</i> 869, 872 <i>Figure 24.8</i> 867 <i>Figure 24.9</i> 868 <i>Section 24.2 Assessment</i> 874 #15-#17 Teacher Wraparound Edition: As 871; ICE 869, 872; R 874</p>
<p>SPI 3221.3.9 Compare and contrast nuclear fission and fusion.</p>	<p>Student Edition: 878-880, 883-884 <i>Chapter 24 Assessment</i> 895 #66 <i>Figure 24.15 & 24.16</i> 879 <i>Figure 24.17</i> 880 <i>Figure 24.23</i> 884 <i>Real-World Chemistry</i> 883 <i>Section 24.3 Assessment</i> 884 #22 Teacher Wraparound Edition: CP 883; MI 875</p>
<p>SPI 3221.3.10 Relate the law of conservation of mass/energy to thermal changes that occur during physical, chemical or nuclear processes.</p>	<p>Student Edition: 288 <i>Figure 15.8</i> 527 <i>Figure 15.9</i> 528 <i>Mini Lab</i> 526 Teacher Wraparound Edition: CU 528; DI 286</p>