

GLENCOE CORRELATION
CHEMISTRY: MATTER AND CHANGE
MARYLAND
Science Content Standards
Grade Twelve

CONTENT STANDARDS	PAGE REFERENCES
1.0 Skills and Processes - Students will demonstrate the thinking and acting inherent in the practice of science.	
Scientific Inquiry	
By the end of grade 12 , students know and are able to do everything required at earlier grades and:	
1.12.1 access and process information from readings, investigations, and/or oral communications. (SFS 3.2) (SFS 4.1)	
The student will read a technical selection and interpret it appropriately. (CLG 1.5.6)	SE: 641-642 <i>ChemLab</i> 46-47, 480-481, 688-689 TWE: EX 101, 545, 607 E 103 CJ 67, 843
<i>The student will learn the use of new instruments and equipment by following instructions in a manual or from oral direction. (CLG 1.3.4)</i>	SE: 389 <i>ChemLab</i> 480-481, 626-627, 688-689, 832-833 TWE: A 437 EX 433
The student will use relationships discovered in the lab to explain phenomena observed outside the laboratory. (CLG 1.2.7)	SE: <i>ChemLab</i> 19, 143, 203, 343, 481, 689 <i>MiniLab</i> 230 TWE: P 388, 441 A 395
The student will create and/or interpret graphics (scale drawings, photographs, digital images, etc.). (CLG 1.5.4)	SE: <i>Problem-Solving Lab</i> 96, 130, 219, 424, 720 TWE: EX 611 A 537 VL 560 E 103 P 538
1.12.2 formulate questions that lead to a testable hypothesis , which demonstrates the logical connections between the scientific concepts and the design of an investigation .	
The student will identify meaningful, answerable scientific questions. (CLG 1.2.1)	SE: <i>ChemLab</i> 78-79, 142-143, 170-171, 410-411, 766-767 TWE: A 399, 746 E 183 CJ 430
<i>The student will pose meaningful, answerable, scientific questions. (CLG 1.2.2)</i>	SE: <i>ChemLab</i> 18-19, 202-203, 268-269, 520-521, 862-863 TWE: A 185, 373, 423 EX 461
1.12.3 use observations, research, and select appropriate scientific information to form predictions and hypotheses .	
The student will formulate a working hypothesis. (CLG 1.2.3)	SE: 11 <i>Discovery Lab</i> 25, 385 <i>MiniLab</i> 230, 439 <i>ChemLab</i> 78, 627, 862-863 TWE: A 109, 533

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1.12.4 design experimental approaches, which answer scientific questions.	
The student will select appropriate instruments and materials to conduct an investigation. (CLG 1.2.5)	SE: <i>Problem-Solving Lab</i> 478 <i>ChemLab</i> 18-19, 268-269, 626-627, 688-689 TWE: A 409, 725, 746 MIN 711, 842
The student will identify appropriate methods for conducting an investigation and affirm the need for proper controls in an experiment. (CLG 1.2.6)	SE: 10-13 <i>Problem-Solving Lab</i> 372, 478, 533 <i>ChemLab</i> 18-19 TWE: EX 11, 13 A 411, 497, 618
1.12.5 <i>demonstrate safety when conducting an investigation.</i>	
The student will recognize safe laboratory procedures. (CLG 1.3.2)	SE: 16 <i>Section Assessment</i> 17 <i>ChemLab</i> 78, 232, 550 <i>Problem-Solving Lab</i> 478 <i>MiniLab</i> 184 TWE: P 16 CDEV 16 R 16
<i>The student will demonstrate safe handling of the chemicals and materials of science. (CLG 1.3.3)</i>	SE: 16 <i>Discovery Lab</i> 55 <i>ChemLab</i> 170, 268, 410, 654-655 <i>MiniLab</i> 295 TWE: A 405 EX 433 P 578
1.12.6 use mathematical processes (measuring, calculating, etc.) when conducting investigations, analyzing information, and/or displaying information.	
The student will recognize mathematics as part of the scientific endeavor, comprehend the nature of mathematical thinking, and become familiar with key mathematical ideas and skills. (CLG 4.6.2)	SE: 31-35, 36-42, 313-319, 328-337, 358-363 <i>Math Handbook</i> 887-911 TWE: R 40 CU 427 MC 315, 610
The student will recognize the important role that mathematics serves when solving problems in physics. (CLG 5.7.2)	SE: 121, 124, 493-495 <i>Problem-Solving Lab</i> 130, 830 TWE: A 820, 830 VL 127 MIN 821 IM 493
<i>The student will recognize mathematics as an integral part of the scientific process. (CLG 1.7.4)</i>	SE: 31-35, 313-319, 328-337, 358-363, 428-433, 817-819 TWE: A 35 MC 218, 315 E 246

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The student will use ratio and proportion in appropriate situations to solve problems. (CLG 1.6.1)	SE: 328-330, 462-470, 529-531 <i>MiniLab</i> 102, 539 TWE: IM 133 CJ 531 MC 776 A 467 CDEV 331
<i>The student will use computers and/or graphing calculators to perform calculations for tables, graphs, or spreadsheets. (CLG 1.6.2)</i>	SE: <i>ChemLab</i> 480-481, 688-689, 796-797, 832-833, 862-863 <i>Section Assessment</i> 820 TWE: MC 192, 315 MIN 371
The student will express and/or compare small and large quantities using scientific notation and relative order of magnitude. (CLG 1.6.3)	SE: 31-33, 90-91, 310-312 <i>Discovery Lab</i> 309 <i>Chapter Assessment</i> 50-51 TWE: CDEV 577 A 32, 89, 612 RT 35
<i>The student will manipulate quantities and/or numerical values in algebraic equations. (CLG 1.6.4)</i>	SE: 124, 428-430, 496-498 <i>MiniLab</i> 102 <i>ChemLab</i> 46 <i>Problem-Solving Lab</i> 130 TWE: MIN 128 A 517 CJ 544 EX 568
The student will judge the reasonableness of an answer. (CLG 1.6.5)	SE: 330, 429, 442, 491, 494, 519 <i>Chapter Assessment</i> 382 TWE: A 504 MIN 424 R 103
1.12.7 collect, organize, and display data in multiple ways that fit the context using appropriate instruments to effectively convey the information (e.g., <i>calculators, spreadsheets, and databases and graphing programs</i>). (SFS 3.2) (SFS 4.1)	
<i>The student will test a working hypothesis. (CLG 1.2.4)</i>	SE: <i>ChemLab</i> 18-19, 202-203, 300-301, 550-551 <i>MiniLab</i> 439 TWE: A 109, 395, 399, 533 AC 428
<i>The student will develop and demonstrate skills in using lab and field equipment to perform investigative techniques. (CLG 1.3.1)</i>	SE: <i>ChemLab</i> 142-143, 268-269, 480-481, 626-627, 832-833 TWE: A 405, 437 CJ 620 E 468 CU 779

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The student will organize data appropriately using techniques such as tables, graphs, and webs (for graphs: axes labeled with appropriate quantities, appropriate units on axes, axes labeled with appropriate intervals, independent and dependent variables on correct axes, appropriate title). (CLG 1.4.1)	SE: 43-45 <i>Problem-Solving Lab</i> 44, 267 <i>ChemLab</i> 46-47 <i>Math Handbook</i> 903-907 TWE: MC 167, 218, 315 MIN 61 CU 819
The student will use computers and/or graphing calculators to produce tables, graphs, and spreadsheet calculations. (CLG 1.5.5)	SE: <i>MiniLab</i> 164, 819 <i>ChemLab</i> 47, 796-797 <i>Section Assessment</i> 439 TWE: MC 167, 192, 465 MIN 371 CU 819
1.12.8 analyze appropriate data to identify trends to form conclusions and apply what has been learned to evaluate the hypothesis.	
The student will analyze data to make predictions, decisions, or form conclusions. (CLG 1.4.2)	SE: <i>Section Assessment</i> 77 <i>ChemLab</i> 143, 171 <i>Problem-Solving Lab</i> 155 <i>Discovery Lab</i> 697 TWE: A 130 IM 152 CJ 430 MC 192 QD 194
The student will use experimental data from various investigators to validate results. (CLG 1.4.3)	SE: <i>ChemLab</i> 19, 79, 551, 797 TWE: A 15, 797 P 614 MC 167
The student will determine the relationships between quantities and develop the mathematical model that describes these relationships. (CLG 1.4.4)	SE: <i>Problem-Solving Lab</i> 390, 830 <i>Section Assessment</i> 783 TWE: VL 127 A 372, 830 MIN 567
The student will check graphs to determine that they do not misrepresent results. (CLG 1.4.5)	TWE: RT 45
The student will describe trends revealed by data. (CLG 1.4.6)	SE: 163-169 <i>Problem-Solving Lab</i> 191, 288, 860 <i>Section Assessment</i> 6 TWE: A 372, 492 MC 165 D 166-167 QD 182
The student will use analyzed data to confirm, modify, or reject an hypothesis. (CLG 1.4.9)	SE: <i>MiniLab</i> 439 <i>ChemLab</i> 18-19, 202-203, 268-269, 300-301, 550-551 TWE: A 109, 218, 395, 533

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1.12.9 interpret and communicate findings through speaking, writing, and drawing in a form suited to the purpose and audience, using developmentally appropriate methods including technology tools and telecommunications. (SFS 3.1) (SFS 4.1)	
The student will demonstrate the ability to summarize data (measurements/observations). (CLG 1.5.1)	SE: <i>Problem-Solving Lab</i> 191, 860 <i>Discovery Lab</i> 117, 151, 179 <i>MiniLab</i> 15 TWE: CJ 430 MIN 599 TS 172 E 200
The student will explain scientific concepts and processes through drawing, writing, and/or oral communication. (CLG 1.5.2)	SE: <i>Problem-Solving Lab</i> 130, 790 <i>Chapter Assessment</i> 114, 208 <i>Section Assessment</i> 541 TWE: E 103, 422 A 455, 504 CJ 496
The student will use tables, charts, and graphs to display data in making arguments and claims in both oral and written presentations. (CLG 2.8.3), (CLG 5.6.4)	SE: 43-45 <i>MiniLab</i> 164 <i>ChemLab</i> 550-551, 796-797 <i>Problem-Solving Lab</i> 503 TWE: E 200, 468 MC 167 P 226 A 317
<i>The student will use computers and/or graphing calculators to produce the visual materials (tables, graphs, and spreadsheets) that will be used for communicating results. (CLG 1.5.3)</i>	SE: <i>ChemLab</i> 480-481, 796-797, 832-833, 862-863 TWE: A 539, 790 E 777 MC 167 MIN 371
The student will communicate conclusions derived through a synthesis of ideas. (CLG 1.5.9)	SE: 87-97 <i>Problem-Solving Lab</i> 860 <i>ChemLab</i> 587 TWE: CJ 64 EX 97 A 95, 791
Critical Thinking	
1.12.10 analyze similarities and differences of objects, materials, concepts, and actions.	
The student will describe similarities and differences when explaining concepts and/or principles. (CLG 1.5.8)	SE: <i>Testing Your Knowledge</i> 234 <i>Discovery Lab</i> 151, 211 <i>ChemLab</i> 109 <i>Section Assessment</i> 134 TWE: A 68, 229, 786 MIN 599 IM 198

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1.12.11 construct various classification systems and infer degree of divergence and/or kinship of various objects, materials, concepts, actions, and organisms.	
The student will use, explain, and/or construct various classification systems. (CLG 1.5.7)	SE: 58-59, 66-67, 155-162, 284-291, 595-601 <i>Problem-Solving Lab</i> 757 TWE: A 66, 69, 158 CU 505
1.12.12 critique scientific information in order to detect bias and analyze the source of the bias. (SFS 2.2)	
The student will critique arguments that are based on faulty, misleading data or on the incomplete use of numbers. (CLG 1.1.3)	SE: 36-42 <i>Section Assessment</i> 91, 568 <i>Chapter Assessment</i> 802 TWE: EX 37 DI 39 MIN 41 R 702 CJ 781 A 854
The student will recognize data that are biased. (CLG 1.1.4), (CLG 2.8.2), (CLG 5.6.2)	TWE: A 824
The student will explain the factors that produce biased data. (CLG 1.1.5)	TWE: A 824
1.12.13 analyze the adequacy of the supporting evidence used to form conclusions, devise a plan, or solve a practical problem. (SFS 2.2)	
The student will determine the sources of error that limits the accuracy or precision of experimental results. (CLG 1.4.7)	SE: <i>Problem-Solving Lab</i> 155, 372 <i>ChemLab</i> 47, 109, 481, 729, 833 TWE: A 504, 863 AC 33
1.12.14 provide supporting evidence when forming conclusions, devising a plan or solving a practical problem. (SFS 2.2)	
The student will defend the need for verifiable data. (CLG 1.2.8)	SE: 25-26 <i>Section Assessment</i> 13 <i>Problem-Solving Lab</i> 191 TWE: CDEV 26 D 28-29
1.12.15 analyze and extend patterns.	
1.12.16 analyze conclusions and modify ideas based on new information from developmentally appropriate readings, data, and the ideas of others.	
The student will modify or affirm scientific ideas according to accumulated evidence. (CLG 1.1.2)	SE: 87-97 <i>Problem-Solving Lab</i> 860 <i>ChemLab</i> 654-655 TWE: CJ 784 A 95 P 133 EX 196
1.12.17 describe to others how scientific information was used.	

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Applications of Science	
1.12.18 apply scientific principles and/or concepts to understand a new situation.	
1.12.19 The student will apply skills, processes, and concepts of biology, chemistry, physics, and earth/space science to societal issues. (CLG 1.7.1)	SE: <i>Chemistry and Society</i> 20, 80 <i>Chemistry and Technology</i> 344, 690 <i>How It Works</i> 552 TWE: EX 196, 373 P 290 CDEV 189 CJ 435
<i>The student will describe the role of science in the development of literature, art, and music.</i> (CLG 1.7.3)	SE: <i>How It Works</i> 656 TWE: CDIV 224, 581, 678 AC 200 EX 541
<i>The student will apply chemistry to the concepts of biology, earth/space science, and environmental science.</i> (CLG 4.6.1)	SE: 774-795, 840-861 <i>Problem-Solving Lab</i> 624 <i>Earth Science Connection</i> 281, 600 <i>Astronomy Connection</i> 152 TWE: P 213 EX 181, 675 A 391
<i>The student will apply physics to the concepts of biology, earth/space science, and environmental science.</i> (CLG 5.7.1)	SE: <i>Physics Connection</i> 131, 808 <i>Astronomy Connection</i> 26 TWE: MIN 124, 389 QD 4 A 390
<i>The student will investigate the role of chemistry in areas of human endeavor and achievement.</i> (CLG 4.6.3)	SE: 7 <i>Problem-Solving Lab</i> 647 <i>Earth Science Connection</i> 408 <i>How It Works</i> 376, 552 <i>Everyday Chemistry</i> 412 <i>History Connection</i> 190 TWE: CJ 100 A 687 EX 17
<i>The student will investigate the role of physics in all areas of human endeavor and achievement.</i> (CLG 5.7.3)	SE: <i>How It Works</i> 48, 144, 172, 270 <i>History Connection</i> 684 TWE: CJ 105 P 120 TS 144, 172 CB 254
1.12.20 defend a position on a scientific issue and take into account the different types of risks and benefits in formulating a plan of action. (SFS 2.3)	
<i>The student will investigate an issue such as climatic changes or electric power generation.</i> (CLG 2.8.1)	SE: <i>Chemistry and Society</i> 20, 80, 110 <i>Everyday Chemistry</i> 730 <i>Earth Science Connection</i> 457 TWE: CJ 474, 502, 684 EX 196 TS 730

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<i>The student will investigate a social issue related to physics such as alternate energy source, fiber optics in telecommunications, nuclear power, microwave technology, effect of power lines, etc. (CLG 5.6.1)</i>	SE: <i>Chemistry and Technology</i> 690 <i>Everyday Chemistry</i> 730 <i>Problem-Solving Lab</i> 679 <i>Earth Science Connection</i> 517 TWE: P 675 CJ 825 A 492 CDEV 189 MIN 824
1.12.21 The student will recognize that real problems have more than one solution and decisions to accept one solution over another are made on the basis of many issues. (CLG 1.1.1), (CLG 2.8.5), (CLG 5.6.3) (SFS 2.3)	
The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science. (CLG 2.8.4)	SE: 14, 92-97, 117-118, 128-129, 152-153, 806 <i>Problem-Solving Lab</i> 8 TWE: CJ 764 CDIV 99 E 93
Technology	
1.12.22 design, construct, and use models (e.g., math, computer, physical) to make predictions about actual events.	
<i>The student will use models and computer simulations to extend his/her understanding of scientific concepts. (CLG 1.4.8)</i>	SE: <i>MiniLab</i> 102, 261, 401 <i>ChemLab</i> 862-863 <i>Problem-Solving Lab</i> 8 TWE: BM 123, 426, 779 A 549, 790
1.12.23 demonstrate and explain how using existing tools extend knowledge and identify the limitations, which drive the need for new technologies (i.e., create improvements in observing, estimating, measuring, computing, collecting, and communicating scientific data and information).	
The student will explain how development of scientific knowledge leads to the creation of new technology and how technological advances allow for additional scientific accomplishments. (CLG 1.7.6)	SE: 17, 91 <i>How It Works</i> 48 <i>Chemistry and Society</i> 110 <i>Chemistry and Technology</i> 768 <i>Problem-Solving Lab</i> 96 TWE: EX 6, 91 E 103 A 829
1.12.24 explain that when designing a device, process, or system (e.g., manufacturing, marketing, operating, maintaining, replacing, and disposing of) risk analysis and technology assessment determines how it will be employed.	
1.12.26 explain that science and technology have strongly influenced the course of history and cite how human inventiveness has brought new risks as well as improvements to human existence.	
The student will identify and evaluate the impact of scientific ideas and/or advancements in technology on society. (CLG 1.7.2)	SE: 761-764 <i>Chemistry and Society</i> 20, 110, 482 <i>Chemistry and Technology</i> 344, 690, 768 TWE: EX 17 VL 763 A 679

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History of Science	
1.12.27 describe how various cultures from ancient times to the present have made contributions that led to current scientific ideas and technological invention.	
1.12.28 explain that scientific careers differ from one another in what is studied, techniques used, where studied, and outcomes sought but they share a common purpose and philosophy and are part of the same scientific enterprise.	
The student will investigate career possibilities in the various areas of science. (CLG 1.7.5)	SE: Careers Using Chemistry 9, 56, 160, 329, 354, 403, 421, 548 TWE: A 230, 401
4.0 Chemistry - Students will use scientific skills and processes to explain the composition, structure, and interactions of matter in order to support the predictability of structure and energy transformations.	
Structure of Matter	
4.12.1 use observation of the properties of matter to predict its structure and changes to its structure.	
The student will select and use appropriate devices to measure directly or indirectly the length, mass, volume, or temperature of a substance (centigram balances, graduated cylinders & pipettes, metric rulers, thermometers & temperature probes). (CLG 4.1.1)	SE: 25-30 MiniLab 28 ChemLab 46-47, 444-445, 520-521 TWE: A 405, 411, 439, 497 D 28-29
The student will gather and interpret data related to physical and chemical properties of matter such as density and percent composition (constructing data tables, graphing linear relationship, appropriate technology to analyze data). (CLG 4.1.2)	SE: 27-29, 328-331 MiniLab 329, 439 ChemLab 46-47, 170-171 TWE: A 162, 164 EX 401 MIN 61
The student will distinguish among metallic, ionic, and covalent solids in terms of observable properties (solubility, melting point, boiling point, conductivity). (CLG 4.2.4)	SE: 217-218, 228-231, 266 Problem-Solving Lab 267 ChemLab 232-233 TWE: RT 231, 266 QD 216 MIN 228 A 266
The student will illustrate the structure of the atom and describe the characteristics of the particles found there (protons, neutrons, & electrons; nucleus). (CLG 4.2.1)	SE: 92-97, 100-101 TWE: A 97, 101 IM 100
Physical or Chemical Changes	
4.12.3 explain how the number and arrangement of electrons can be used to predict when an atom will transfer or share electrons to form a bond and explain how the resulting materials are different from the original materials (i.e., organic, biochemical, and inorganic examples).	
The student will demonstrate that the arrangement and number of electrons determine the properties of an element and that these properties repeat in a periodic manner illustrated by their arrangement in the periodic table (atomic number, mass number, valence electrons, chemical properties/families). (CLG 4.2.2)	SE: 154-158, 159-162, 163-169 ChemLab 170-171 Problem-Solving Lab 288 TWE: CJ 161 D 166-167 MC 167 CU 169 A 171

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The student will explain how atoms interact with other atoms through the transfer and sharing of electrons in the formation of chemical bonds (characteristics of a neutral atom, formation of ions, ionic bonding, covalent bonding). (CLG 4.2.3)	SE: 211-214, 215-220, 228-229, 241-247 <i>ChemLab</i> 232-233 TWE: D 248-249 P 215 VL 228 CJ 243 A 247
The student will summarize that the properties of a molecule are determined by the number and types of atoms it contains and how these compounds are arranged (determine the types and numbers of atoms represented by a given formula, polar and nonpolar molecules). (CLG 4.2.5)	SE: 55-58, 217-218, 264-266, 717-721, 775-780 TWE: CJ 76 P 720 BM 718 QD 57 A 265
The student will explain why organic compounds have such diverse properties and give examples of how they have had an impact on society (unique characteristics of carbon, fuels and plastics). (CLG 4.2.6)	SE: 725-727, 737-760, 761-764 <i>MiniLab</i> 786 <i>Chemistry and Technology</i> 768 TWE: A 740 EX 701 CDIV 752 CJ 756 VL 763
Classification of Matter	
The student will illustrate that substances can be represented by formulas (know that symbols are used to represent elements; identify the atomic mass of the element; write formulas for compounds given the name of the compound; name binary compounds given the formula; calculate the molecular weight of a compound given the periodic table). (CLG 4.4.1)	SE: 98-104, 221-227, 248-251, 328-337 <i>ChemLab</i> 342-343 TWE: P 226 A 227, 250, 335 RT 251
The student will show that chemical reactions can be represented by symbolic or word equations that specify all reactants and products involved. (CLG 4.4.2)	SE: 278-280 <i>Chapter Assessment</i> 304-306 TWE: P 279
The student will use the law of conservation of mass and energy to balance simple equations (use appropriate coefficients to balance a given symbolic equation). (CLG 4.4.3)	SE: 280-283 <i>Chapter Assessment</i> 304-306 TWE: A 282, 283 R 283 P 279
The student will classify chemical reactions into general types based on the nature of the observed changes (synthesis and decomposition, combustion, single and double displacement). (CLG 4.4.4)	SE: 284-291 <i>Chapter Assessment</i> 304-306 TWE: A 291 R 291 P 290

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The student will demonstrate that adjusting quantities of reactants will affect the amounts of products formed (use the coefficients of a balanced equation to predict amounts of reactants and products). (CLG 4.4.5)	SE: 358-363, 364-369 <i>MiniLab</i> 362 <i>ChemLab</i> 374-375 TWE: R 363 A 360, 367 CJ 362 P 364 D 366-367
The student will describe a neutralization reaction (properties of acids and bases, characteristics of weak and strong acids and bases, characteristics of salts, indicators, pH scale). (CLG 4.4.6)	SE: 595-601, 602-607, 608-616, 617-625 <i>ChemLab</i> 626-627 <i>Chapter Assessment</i> 630-632 TWE: A 612, 618 R 600 D 622-623
4.12.5 explain that all matter has structure and the structure serves as the basis for the properties of and the changes in matter.	
The student will demonstrate how matter may be identified and classified in various ways based upon common properties (states of matter; elements, compounds, mixtures, solutions; metals/nonmetals). (CLG 4.1.3)	SE: 55-60, 66-67, 70-74, 154-158 <i>ChemLab</i> 268-269 <i>Problem-Solving Lab</i> 155 TWE: A 77, 158 P 57 CU 76
Conservation of Matter and Energy	
4.12.6 analyze the interrelationship of mass and energy associated with chemical, physical, and nuclear changes (i.e., endothermic, exothermic, kinetic molecular theory, rate of change, and gas laws).	
The student will illustrate that heat energy in a material consists of the ordered and disordered motions of its colliding particles (phase changes). (CLG 4.3.1)	SE: 404-408, 496-500, 502-504 <i>Problem-Solving Lab</i> 533 <i>ChemLab</i> 410-411 <i>MiniLab</i> 505 TWE: A 406 IM 405 EX 505
The student will explain why the interactions among particles involve a change in the energy system (exothermic change, endothermic change, specific heat). (CLG 4.3.2)	SE: 404-408, 492-495, 496-500 <i>ChemLab</i> 410-411 TWE: IM 405 A 406 P 499 CU 408 D 492-493
The student will conclude that the conservation of mass and energy holds true for all systems, and that the total amount of energy in any closed system remains constant (total amount of energy in any closed system remains constant). (CLG 4.3.3)	SE: 63-65 <i>Chapter Assessment</i> 83 TWE: CJ 64 A 360, 363 QD 64

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The student will describe the observed changes in pressure, in volume, or temperature of a sample of gas in terms of the behavior of particles (matter is made of small particles; particles are in constant motion; the collisions among particles are elastic collisions). (CLG 4.3.4)	SE: 419-427, 428-430, 434-439 <i>ChemLab</i> 444-445 TWE: BM 435 IM 426 D 420-421 P 422 QD 425 MIN 130
5.0 Physics - Students will use scientific skills and processes to explain the interactions of matter and energy and the energy transformations that occur.	
Mechanics	
5.12.1 use algebra and geometry to apply the concepts of energy, force (i.e., Newton's Law , gravitation, friction), and momentum to explain the behavior of objects (i.e., linear and rotational motion , projectiles, collisions).	
The student will use analytical techniques appropriate to the study of physics (symbolically representing vector quantities, using signs to represent directions, selecting and using appropriate equipment for measuring and investigating, using appropriate units and applying dimensional analysis, manipulating equations). (CLG 5.1.1)	SE: 25-30, 31-35, 36-42, 43-45 <i>ChemLab</i> 480-481 TWE: A 35 CJ 26 R 40 CU 45 MIN 128
The student will use algebraic and geometric concepts to describe an object's motion (direction, position, distance/displacement, speed/velocity, motion with a constant acceleration, one and two dimensional motion, frames of reference). (CLG 5.1.2)	SE: <i>Problem-Solving Lab</i> 44
The student will analyze and explain how changes in an object's motion are described by Newton's Laws (balanced/unbalanced forces, inertia, acceleration, force, and mass, action/reaction). (CLG 5.1.3)	SE: <i>Physics Connection</i> 563
The student will analyze the behavior of forces (recognize the four forces of nature, comparison of relative magnitude, inverse square nature of gravitational and electromagnetic forces, relation to work and energy). (CLG 5.1.4)	SE: 242, 266, 388-389, 393-395 <i>Physics Connection</i> 563 <i>Problem-Solving Lab</i> 267 TWE: A 394 VL 242 CB 389 CU 394
The student will analyze systems with regard to the conservation laws of momentum and energy (conservation of momentum, conservation of energy). (CLG 5.1.5)	TWE: CJ 64
5.12.2 explain the relationship between the universal law of gravitation and the force of gravity on an object at the surface of the Earth.	

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Thermodynamics	
5.12.7 analyze and apply the concepts of thermodynamics (i.e., laws, heat energy transfer, equilibrium).	
The student will relate thermodynamics to the balance of energy in a system (heat transfer, thermal equilibrium, entropy). (CLG 5.3.1)	SE: 498-500, 501-505, 506-512, 513-519 <i>ChemLab</i> 520-521 TWE: E 516 AC 509 CJ 511 P 499 CU 500
Electricity & Magnetism	
5.12.10 analyze electric fields and their effect on charges and electric circuits (i.e., series, parallel, and complex), magnets and magnetic fields , and explain how electricity and magnetism affect one another (i.e., motors and generators).	
The student will describe the types of electric charges and the forces that exist between them (magnitude, sign, Coulomb's Law). (CLG 5.2.1)	SE: 92-97, 242 <i>Discovery Lab</i> 87 TWE: QD 92, 118, 811 VL 242
The student will describe the sources and effects of electric and magnetic fields (static charge, moving charges, simple circuits, permanent magnets). (CLG 5.2.2)	SE: 663-666, 683-687 <i>ChemLab</i> 688-689 TWE: D 92-93, 670-671 IM 664 QD 668 A 671 E 103
The student will describe how different kinds of materials respond to electric and magnetic fields (conductors, insulators, semiconductors, magnetic materials). (CLG 5.2.3)	SE: 199, 683-687 <i>Discovery Lab</i> 179 <i>How It Works</i> 204 TWE: QD 199, 216 VL 228 EX 400 MIN 683
The student will explain the principle of electromagnetic induction and its applications (motors, generators). (CLG 5.2.4)	SE: 28 <i>ChemLab</i> 46-47, 342-343 <i>How it Works</i> 48 (The function of an electronic balance is based on electromagnetic induction. The transducer and receiver in ultrasonic medical devices use electromagnetic induction to convert mechanical sound waves to electrical signals to display on a screen.)
Wave Interactions	
5.12.14 use energy transformations and physical effects to explain the interactions of waves and physical effects (i.e., Doppler effect and interference patterns).	
The student will describe and demonstrate how waves can be used to transmit energy (physical, electromagnetic). (CLG 5.4.1)	SE: 118-120 <i>How It Works</i> 270 TWE: P 120

CONTENT STANDARDS	PAGE REFERENCES
The student will compare the propagation of mechanical waves (longitudinal, transverse). (CLG 5.4.2)	SE: 118-119, 129 <i>How it Works</i> 48 TWE: QD 120 (Longitudinal mechanical waves produced by a spring toy demonstrate the relationship of wavelength, frequency and energy of waves. Mechanical waves produced by musical instruments led de Broglie to consider the wave nature of electrons. Ultrasound medical devices use sound waves to probe the body.)
The student will describe and mathematically calculate wave characteristics (wavelength, frequency/period, velocity, amplitude). (CLG 5.4.3)	SE: 118-121 <i>Section Assessment</i> 126 TWE: QD 120
The student will describe and demonstrate the general behavior of waves (reflection, refraction, diffraction, superposition, interference, Doppler effect). (CLG 5.4.4)	SE: <i>How It Works</i> 48 TWE: QD 119
Nuclear Energy	
5.12.19 describe developments in modern physics (i.e., nuclear fission, photoelectric effect, wave-particles duality, energy of light) and their applications (e.g., <i>nuclear power, MRI</i>). (i.e., <i>semiconductors</i>).	
The student will cite evidence of the quantum nature of matter and its applications (energy of light waves, photoelectric effect, wave/particle duality, applications). (CLG 5.5.1)	SE: 122-126, 127-130 <i>Problem-Solving Lab</i> 130 TWE: A 122, 128 BM 123 RT 126
The student will explain the processes associated with atomic energy and its applications (atomic energy, radioactive decay, fission, fusion). (CLG 5.5.2)	SE: 105-107, 810-814, 815-820, 821-826, 827-831 TWE: CJ 105 D 810-811 RT 813 QD 817 A 831

Codes Used for TWE Pages

A	Assessment
AC	Applying Chemistry
BM	Building a Model
CB	Content Background
CDEV	Concept Development
CDIV	Cultural Diversity
CJ	Chemistry Journal
CU	Check for Understanding
D	Demonstration
DI	Discussion
E	Enrichment
EX	Extension
IM	Identifying Misconceptions
MC	Math in Chemistry
MIN	Meeting Individual Needs
P	Portfolio
QD	Quick Demo
R	Reinforcement
RT	Reteach
TS	Teaching Strategies
VL	Visual Learning