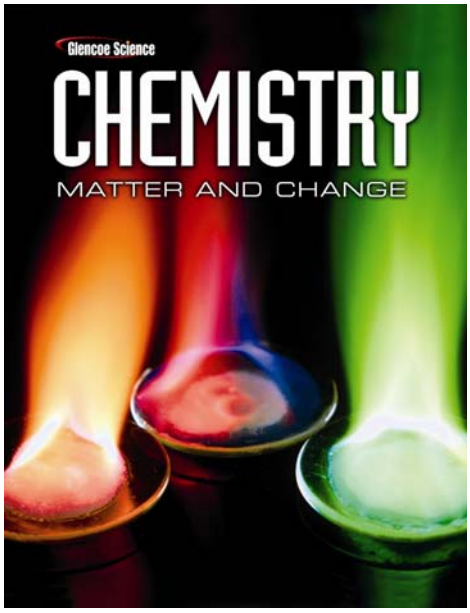
Glencoe

Core Learning Goals: Science
Chemistry

Maryland



CHEMISTRY

MATTER AND CHANGE

STANDARDS	PAGE REFERENCES
Goal 1: Skills And Processes **The student will demonstrate ways of thinking and acting inherent in the practice of science. The student will use the language and instruments of science to collect, organize, interpret, calculate, and communicate information.**	
EXPECTATION **1.1** The student will explain why curiosity, honesty, openness, and skepticism are highly regarded in science.	
INDICATOR 1.1.1 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.	**Student Edition:** *How It Works* 549 *In the Field* 505, 849 **Teacher Wraparound Edition:** A 539; CP 729; E 880, 881, 883; TS 505, 549
INDICATOR 1.1.2 The student will modify or affirm scientific ideas according to accumulated evidence.	**Student Edition:** *ChemLab* 60, 92, 390, 584, 816 *Data Analysis Lab* 21 **Teacher Wraparound Edition:** A 413; AC 449; CJ 417; DI 450

Codes used for Teacher Wraparound Edition pages are the initial caps of headings on that page.

STANDARDS	PAGE REFERENCES
INDICATOR 1.1.3 The student will critique arguments that are based on faulty, misleading data or on the incomplete use of numbers.	**Student Edition:** 47-54 *ChemLab* 126, 584, 670, 698 **Teacher Wraparound Edition:** CJ 89; MI 47
INDICATOR 1.1.4 The student will recognize data that are biased.	**Student Edition:** *ChemLab* 126, 584, 670, 698
INDICATOR 1.1.5 The student will explain factors that produce biased data (incomplete data, using data inappropriately, conflicts of interest, etc.).	**Student Edition:** 12-15 *ChemLab* 126, 584, 670, 698 **Teacher Wraparound Edition:** TS 849
EXPECTATION **1.2** The student will pose scientific questions and suggest investigative approaches to provide answers to questions.	
INDICATOR 1.2.1 The student will identify meaningful, answerable scientific questions.	**Student Edition:** *ChemLab* 164, 230, 310, 432, 584, 776 *Launch Lab* 401, 679 **Teacher Wraparound Edition:** MI 12
INDICATOR 1.2.2 The student will pose meaningful, answerable scientific questions. (NTB)	**Student Edition:** *ChemLab* 24, 196, 230, 310, 584, 776 *Launch Lab* 401, 707 *Writing in Chemistry* 505 **Teacher Wraparound Edition:** MI 12
INDICATOR 1.2.3 The student will formulate a working hypothesis.	**Student Edition:** *ChemLab* 92, 432, 584, 698 *Launch Lab* 401, 707 *MiniLab* 648 **Teacher Wraparound Edition:** A 413; DI 415; QD 70

STANDARDS	PAGE REFERENCES
INDICATOR 1.2.4 The student will test a working hypothesis. (NTB)	**Student Edition:** *ChemLab* 92, 164, 584, 698, 850 *Launch Lab* 401, 707 **Teacher Wraparound Edition:** A 413; CJ 81; DI 415
INDICATOR 1.2.5 The student will select appropriate instruments and materials to conduct an investigation.	**Student Edition:** *ChemLab* 230, 698, 816 *Data Analysis Lab* 478 **Teacher Wraparound Edition:** A 405, 427, 574, 660; DI 407, 415
INDICATOR 1.2.6 The student will identify appropriate methods for conducting an investigation (independent and dependent variables, proper controls, repeat trials, appropriate sample size, etc.).	**Student Edition:** *ChemLab* 432, 466, 816 *Data Analysis Lab* 478 **Teacher Wraparound Edition:** A 405, 427, 574, 660; E 14, 16
INDICATOR 1.2.7 The student will use relationships discovered in the lab to explain phenomena observed outside the laboratory.	**Student Edition:** *ChemLab* 24, 892 *MiniLab* 457, 502, 683 **Teacher Wraparound Edition:** A 500; CJ 375; CP 305, 656, 658
INDICATOR 1.2.8 The student will defend the need for verifiable data.	**Student Edition:** 12-15 *ChemLab* 60 *Launch Lab* 401 **Teacher Wraparound Edition:** AC 42
EXPECTATION **1.3** The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.	
INDICATOR 1.3.1 The student will develop and demonstrate skills in using lab and field equipment to perform investigative techniques. (NTB)	**Student Edition:** *ChemLab* 164, 670, 734, 892 *Data Analysis Lab* 478 **Teacher Wraparound Edition:** A 458, 524, 662, 713; CJ 664

STANDARDS	PAGE REFERENCES
INDICATOR 1.3.2 The student will recognize safe laboratory procedures.	**Student Edition:** 18-19 *ChemLab* 196, 550, 892 *Data Analysis Lab* 478 **Teacher Wraparound Edition:** A 13, 405; CD 19; CP 19; QD 803
INDICATOR 1.3.3 The student will demonstrate safe handling of the chemicals and materials of science. (NTB)	**Student Edition:** *ChemLab* 196, 230, 550, 584, 892 **Teacher Wraparound Edition:** A 13, 713; DI 225; QD 179, 803
INDICATOR 1.3.4 The student will learn the use of new instruments and equipment by following instructions in a manual or from oral direction. (NTB)	**Student Edition:** *ChemLab* 734, 892 **Teacher Wraparound Edition:** A 458; CJ 523
EXPECTATION **1.4** The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.	
INDICATOR 1.4.1 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).	**Student Edition:** 55-58 *ChemLab* 60, 584, 850 *Data Analysis Lab* 408 *Problem-Solving Lab* 531 **Teacher Wraparound Edition:** A 215; DI 327; MC 191, 214
INDICATOR 1.4.2 The student will analyze data to make predictions, decisions, or draw conclusions.	**Student Edition:** *ChemLab* 60, 698 *Data Analysis Lab* 269, 408 *Problem-Solving Lab* 566 **Teacher Wraparound Edition:** A 215; CJ 664; CP 448; TS 505; VL 192
INDICATOR 1.4.3 The student will use experimental data from various investigators to validate results.	**Student Edition:** *ChemLab* 60, 92, 126, 390, 584, 816 **Teacher Wraparound Edition:** A 13; CP 448, 517

STANDARDS	PAGE REFERENCES
INDICATOR 1.4.4 The student will determine the relationships between quantities and develop the mathematical model that describes these relationships.	**Student Edition:** *ChemLab* 60, 356, 390, 584 *Data Analysis Lab* 408 *Problem-Solving Lab* 326 **Teacher Wraparound Edition:** DI 327; MC 191, 214; QD 221
INDICATOR 1.4.5 The student will check graphs to determine that they do not misrepresent results.	**Student Edition:** 55-58 *ChemLab* 60 *Problem-Solving Lab* 531 **Teacher Wraparound Edition:** R 58
INDICATOR 1.4.6 The student will describe trends revealed by data.	**Student Edition:** *ChemLab* 584 *Problem-Solving Lab* 180, 294, 566, 890 **Teacher Wraparound Edition:** CP 448; DI 327; MC 191, 214; QD 221
INDICATOR 1.4.7 The student will determine the sources of error that limit the accuracy or precision of experimental results.	**Student Edition:** 47-54 *ChemLab* 126, 356, 466, 506, 816, 850 **Teacher Wraparound Edition:** CP 49; DI 52; IM 51
INDICATOR 1.4.8 The student will use models and computer simulations to extend his/her understanding of scientific concepts. (NTB)	**Student Edition:** *ChemLab* 126, 272 *MiniLab* 423, 873 *Problem-Solving Lab* 842 **Teacher Wraparound Edition:** BM 142, 157, 448, 766, 882
INDICATOR 1.4.9 The student will use analyzed data to confirm, modify, or reject a hypothesis.	**Student Edition:** *ChemLab* 506, 850, 892 *Launch Lab* 707 *MiniLab* 571 **Teacher Wraparound Edition:** A 413; DI 415

STANDARDS	PAGE REFERENCES
EXPECTATION **1.5** The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.	
INDICATOR 1.5.1 The student will demonstrate the ability to summarize data (measurements/observations).	**Student Edition:** *ChemLab* 698, 850, 892 *Launch Lab* 3 *MiniLab* 242 *Writing in Chemistry* 125 **Teacher Wraparound Edition:** A 848; CJ 413; CP 448; E 427
INDICATOR 1.5.2 The student will explain scientific concepts and processes through drawing, writing, and/or oral communication.	**Student Edition:** *Chapter Assessment* 437 #109, 589 #98 *Writing in Chemistry* 465, 815 **Teacher Wraparound Edition:** A 569; CJ 120, 712; CP 267, 729; DI 745
INDICATOR 1.5.3 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. (NTB)	**Student Edition:** *ChemLab* 584, 850 *Problem-Solving Lab* 294, 531 **Teacher Wraparound Edition:** A 572; CP 729; DI 327; MC 191, 214, 483
INDICATOR 1.5.4 The student will use tables, graphs, and displays to support arguments and claims in both written and oral communication.	**Student Edition:** *Chapter Assessment* 897 #105 *ChemLab* 60, 850 *Problem-Solving Lab* 294 **Teacher Wraparound Edition:** CP 5; DI 327; MC 191, 214
INDICATOR 1.5.5 The student will create and/or interpret graphics. (scale drawings, photographs, digital images, field of view, etc.)	**Student Edition:** *ChemLab* 164 *Data Analysis Lab* 113, 269 *Problem-Solving Lab* 150 *Writing in Chemistry* 891 **Teacher Wraparound Edition:** A 90, 569, 881; CU 121; D 156-157

STANDARDS	PAGE REFERENCES
INDICATOR 1.5.6 The student will read a technical selection and interpret it appropriately.	**Student Edition:** *Writing in Chemistry* 59, 125, 163 **Teacher Wraparound Edition:** CJ 120; CP 110, 267; DI 871; E 107, 141, 649
INDICATOR 1.5.7 The student will use, explain, and/or construct various classification systems.	**Student Edition:** 177-186, 289-298, 476-479, 634-636 *ChemLab* 196 *Launch Lab* 633 **Teacher Wraparound Edition:** A 80, 179, 479; R 298
INDICATOR 1.5.8 The student will describe similarities and differences when explaining concepts and/or principles.	**Student Edition:** *ChemLab* 92, 356, 624 *MiniLab* 82 **Teacher Wraparound Edition:** CU 79; D 190-191; E 116; MI 765; QD 321, 750
INDICATOR 1.5.9 The student will communicate conclusions derived through a synthesis of ideas.	**Student Edition:** *MiniLab* 648 *Writing in Chemistry* 309, 465, 775, 815 **Teacher Wraparound Edition:** CP 82, 88, 110, 267, 729
EXPECTATION **1.6** The student will use mathematical processes.	
INDICATOR 1.6.1 The student will use ratio and proportion in appropriate situations to solve problems.	**Student Edition:** 371-372, 386-387, 444-448 *ChemLab* 390 *Math Handbook* 964 **Teacher Wraparound Edition:** CD 344; IM 219; MC 190, 458; VL 138
INDICATOR 1.6.2 The student will use computers and/or graphing calculators to perform calculations for tables, graphs, or spreadsheets. (NTB)	**Student Edition:** *ChemLab* 550, 734 *Problem-Solving Lab* 50, 531, 566 **Teacher Wraparound Edition:** A 329; DI 327, 386; MC 214, 483

STANDARDS	PAGE REFERENCES
INDICATOR 1.6.3 The student will express and/or compare small and large quantities using scientific notation and relative order of magnitude.	**Student Edition:** 40-43, 321-324, 614-619, 650-651 *Everyday Chemistry* 355 **Teacher Wraparound Edition:** A 41, 329, 654; MC 320; R 45
INDICATOR 1.6.4 The student will manipulate quantities and/or numerical values in algebraic equations.	**Student Edition:** 442-451, 454-456, 546-548 *ChemLab* 550 *Math Handbook* 954-956 **Teacher Wraparound Edition:** DI 449, 455, 602, 877; MC 458
INDICATOR 1.6.5 The student will judge the reasonableness of an answer.	**Student Edition:** 337, 370-371, 443, 446, 455, 461, 532, 540-541 **Teacher Wraparound Edition:** DI 445; R 119
EXPECTATION **1.7** The student will show that connections exist both within the various fields of science and among science and other disciplines including mathematics, social studies, language arts, fine arts, and technology.	
INDICATOR 1.7.1 The student will apply the skills, processes, and concepts of biology, chemistry, physics, or earth science to societal issues.	**Student Edition:** *Chemistry & Health* 389 *Everyday Chemistry* 229 *How It Works* 549, 775 *In the Field* 505 **Teacher Wraparound Edition:** CP 879; DI 724; TS 229, 505, 549
INDICATOR 1.7.2 The student will identify and evaluate the impact of scientific ideas and/or advancements in technology on society.	**Student Edition:** *Chemistry & Health* 163, 389 *Everyday Chemistry* 229 *How It Works* 775 *In the Field* 505 **Teacher Wraparound Edition:** CJ 290, 491; CP 788; DI 724; TS 549

STANDARDS	PAGE REFERENCES
INDICATOR 1.7.3 The student will describe the role of science in the development of literature, art, and music. (NTB)	**Student Edition:** *Careers in Chemistry* 682 *In the Field* 23 **Teacher Wraparound Edition:** AC 641; TS 23
INDICATOR 1.7.4 The student will recognize mathematics as an integral part of the scientific process. (NTB)	**Student Edition:** *ChemLab* 466, 550, 776 *Data Analysis Lab* 387 *Problem-Solving Lab* 50, 150 **Teacher Wraparound Edition:** A 546, 871; CJ 335; MC 214
INDICATOR 1.7.5 The student will investigate career possibilities in the various areas of science. (NTB)	**Student Edition:** *Careers in Chemistry* 185, 447 *Chemistry & Health* 59 *In the Field* 91, 505, 697, 849, 891 **Teacher Wraparound Edition:** A 421; E 582
INDICATOR 1.7.6 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.	**Student Edition:** *Chemistry & Health* 163 *Connection to Biology* 107 *Connection to Physics* 722-723 *How It Works* 271, 733 **Teacher Wraparound Edition:** CD 184; CJ 120; CP 110; DI 871; E 107

STANDARDS	PAGE REFERENCES
Goal 4: Concepts Of Chemistry **The student will demonstrate the ability to use scientific skills and processes (Core Learning Goal 1) to explain composition and interactions of matter in the world in which we live.**	
EXPECTATION **4.1** The student will explain that atoms have structure and this structure serves as the basis for the properties of elements and the bonds that they form.	
INDICATOR 4.1.1 The student will analyze the structure of the atom and describe the characteristics of the particles found there. **Assessment limits:** • subatomic particles (protons, neutrons, & electrons –not to include quantum mechanical details of electron configurations) • nucleus & electron cloud (definition; no orbitals included) • atomic number, mass number, and isotopes (definitions; calculate numbers of protons, neutrons, and electrons; notations) • atomic mass (qualitative concept of weighted average only; atomic mass unit) • neutral atom • historical development and/or experimental evidence for the existence and structure of the atom (Democritus, Dalton, Thomson, Rutherford, Bohr, electron cloud model)	**Student Edition:** 102-121 *ChemLab* 126 **Teacher Wraparound Edition:** A 114; CJ 110; D 106-107, 112-113; IM 117; R 121

INDICATOR 4.1.2 The student will demonstrate that the arrangement and number of electrons and the properties of elements repeat in a periodic manner illustrated by their arrangement in the periodic table. **Assessment limits:** • groups/families and periods/series (groups 1-18; Alkali Metals, Alkaline Earth Metals, Transition Metals, Halogens, Noble Gases; Periods 1-7; Lanthanide Series, Actinide Series) • For the following assessment limits, use only elements in groups 1,2, & 13-18. how trends behave (valence electrons; atomic radius; ionization energy; relative chemical reactivity; metallic/nonmetallic properties)	**Student Edition:** 177-194 *ChemLab* 196 *MiniLab* 193 *Problem-Solving Lab* 180, 294 **Teacher Wraparound Edition:** CJ 184, 189; D 190-191; MC 191; R 179

STANDARDS	PAGE REFERENCES
INDICATOR 4.1.3 The student will explain how atoms interact with other atoms through the transfer and sharing of electrons in the formation of chemical bonds. **Assessment limits:** • formation of ions (relate charge of ions to number of electrons gained or lost as determined by valence electrons / location of elements on Periodic Table; cation; anion) • bond (definition) • formation of ionic bond (definition; metal-nonmetal; based on valence electrons/location of elements on the Periodic Table) • formation of covalent bond (definition; nonmetal-nonmetal; based on valence electrons / location of elements on the Periodic Table; formation of single, double, and triple bonds) • bond polarity (concept only, no electronegativity calculations; common examples) • metallic bond (definition) • bond energy (compare ionic and covalent) • metallic, ionic, and molecular substances (melting point, boiling point, electrical conductivity)	**Student Edition:** 206-217, 225-228, 240-247, 267-270 *ChemLab* 230 **Teacher Wraparound Edition:** BM 243; CD 206; CJ 214, 241; VL 225

STANDARDS	PAGE REFERENCES
EXPECTATION **4.2** The student will explain how the properties of compounds are related to the arrangement and type of atoms they contain.	
INDICATOR 4.2.1 The student will explain how the properties of a molecule are determined by the atoms it contains and their arrangement. **Assessment limits:** • polar and nonpolar molecules ("like dissolves like" and why; not to include prediction of polarity from shape) • shapes of molecules (limited to linear, bent/angular, tetrahedral) • water (definition and explanation of shape and polarity of molecule, observed changes in density as phases change, use as a "universal" solvent; conceptual understanding of hydrogen bonding, high surface tension, high specific heat)	**Student Edition:** 261-264, 267-268, 413-414, 418-420 *ChemLab* 272 *Problem-Solving Lab* 531 **Teacher Wraparound Edition:** A 413; CJ 268; MC 262; QD 265
INDICATOR 4.2.2 The student will explain why organic compounds are so numerous and diverse. **Assessment limits:** • inorganic and organic compounds (define in terms of carbon content; do not include CO, CO2, or carbonates as organic compounds; definition of hydrocarbons) • ability of carbon to form chains and make rings (recognize, but not produce structural formulas)	**Student Edition:** 744-746, 750-755, 759, 765-769, 786-788, 792-795 **Teacher Wraparound Edition:** MI 744, 765; QD 767; VL 752

STANDARDS	PAGE REFERENCES
INDICATOR 4.2.3 The student will describe the properties of solutions and explain how they form. **Assessment limits:** • solute, solvent, and solubility • suspensions and colloids • alloys and gaseous solutions • concentration (relative: dilute, concentrated, unsaturated, saturated, supersaturated; molarity – conceptual only; interpretation of solubility curves) • dissociation/ionization (basic description; factors that influence rate: surface area of solute, temperature, agitation) • electrolytes (definition in terms of composition and properties)	**Student Edition:** 227-228, 299-300, 476-482, 489-499 *ChemLab* 506 **Teacher Wraparound Edition:** CJ 494; D 492-493; IM 477, 490; QD 484
INDICATOR 4.2.4 The student will differentiate among acids, bases, and salts based on their properties. **Assessment limits:** • Arrhenius definition (H+ and OH-) • ability of water to act as either an acid or a base • neutralization (definition) • salts (definition) • indicators (phenolphthalein) • function of buffers (conceptual only)	**Student Edition:** 634-639, 659-668 *ChemLab* 670 *Everyday Chemistry* 669 *Launch Lab* 633 **Teacher Wraparound Edition:** A 667; DI 663; MI 659; QD 635, 666

STANDARDS	PAGE REFERENCES
EXPECTATION **4.3** The student will apply the basic concepts of thermodynamics (thermochemistry) to phases of matter and phase and chemical changes.	
INDICATOR 4.3.1 The student will explain that thermal energy in a material consists of the ordered and disordered motions of its colliding particles. **Assessment limits:** • thermal energy (differentiate between thermal energy and temperature) • phase changes • heating / cooling (temperature vs. time) curve (interpret the different parts of the curve in terms of motion / kinetic energy and organization of the particles; changes in particle motion and organization between phase changes; identify melting/freezing and boiling point; not to include potential energy or calculations of Q)	**Student Edition:** 403, 425-429, 516-518 *ChemLab* 432 *Problem-Solving Lab* 531 **Teacher Wraparound Edition:** IM 426, 520; MI 425; R 429, 522
INDICATOR 4.3.2 The student will describe observed changes in pressure, volume, or temperature of a sample in terms of macroscopic changes and the behavior of particles. **Assessment limits:** • constant temperature (effect of pressure or volume change to sample of solid, liquid, or gas) • constant volume (effect of pressure or temperature change to sample of solid, liquid, or gas) • constant pressure (effect of temperature or volume change to sample of solid, liquid, or gas)	**Student Edition:** 415-420, 442-451 *ChemLab* 466 *Launch Lab* 441 **Teacher Wraparound Edition:** AC 419, 449; D 442-443; DI 415, 450; MI 442

STANDARDS	PAGE REFERENCES
INDICATOR 4.3.3 The student will explain why the interactions among particles involve a change in the energy system. **Assessment limits:** • exothermic change (bond formation; dissociation; thermal energy released; no predictions/calculations of ΔH) • endothermic change (bond breaking; dissociation; thermal energy absorbed; no predictions/calculations of ΔH)	**Student Edition:** 216-217, 247, 525-528 *ChemLab* 550 **Teacher Wraparound Edition:** CP 526; D 518-519; E 247
EXPECTATION **4.4** The student will explain how and why substances are represented by formulas.	
INDICATOR 4.4.1 The student will illustrate that substances can be represented by formulas. **Assessment limits:** • subscripts (determine the numbers of atoms represented by a given formula; describe the function of subscripts in a chemical formula) • use symbols to represent elements and polyatomic ions (limited to NH4+1,OH-1, NO3-1, NO2-1, ClO3-1,ClO2-1, HCO3-1, CO3-2, SO4-2, SO3-2, PO4-3, PO3-3; including diatomics – H2, O2, N2, Cl2, Br2, I2, F2; given periodic table and ion chart) • acids (binary naming system; ternary/oxyacid naming system limited to polyatomic ions given above) • write formulas for compounds (given Periodic Table, ion chart of polyatomic ions and transition metals, and compound name; Stock System/Roman Numerals for ionic compounds; prefixes (up through hexa) for molecular compounds; no hydrates) • name compounds (given formula, Periodic Table, and ion chart of polyatomic ions and transition metals; Stock System/Roman Numerals for ionic compounds; prefixes (up through hexa) for molecular compounds; no hydrates)	**Student Edition:** 85, 218-224, 248-252 *ChemLab* 230 **Teacher Wraparound Edition:** A 222, 250; CJ 251; IM 219; QD 221; R 252

STANDARDS	PAGE REFERENCES
INDICATOR 4.4.2 The student will show that chemical reactions can be represented by symbolic or word equations that specify all reactants and products involved. **Assessment limits:** • convert word equations to symbolic equations • convert symbolic equations to word equations	**Student Edition:** 283-285 *Chapter Assessment* 312 #65, #67-72, #75 **Teacher Wraparound Edition:** CP 283; CU 371
INDICATOR 4.4.3 The student will use mole relationships. **Assessment limits:** • mole and Avogadro's Number (definitions) • relationship between moles and mass • relationship between moles and particles • formula mass (calculate the formula mass of a compound given the periodic table; no hydrates) • mass percent composition (calculate the mass percent composition of a compound given the formula, formula mass, and periodic table; no hydrates)	**Student Edition:** 320-344 *Launch Lab* 319 *Problem-Solving Lab* 326 **Teacher Wraparound Edition:** A 324, 329, 336; CJ 326, 329, 343; E 332

STANDARDS	PAGE REFERENCES
EXPECTATION **4.5** The student will explain that matter undergoes transformations, resulting in products that are different from the reactants.	
INDICATOR 4.5.1 The student will describe the general types of chemical reactions. **Assessment limits:** • synthesis and decomposition (definition; identify type given balanced formula equation or written description) • combustion (definition; identify type given balanced formula equation or written description) • single displacement (definition; identify type given balanced formula equation or written description; apply activity series to determine if reaction will occur) • double displacement (definition; identify type given balanced formula equation or written description; apply solubility rules to predict if a precipitate will form)	**Student Edition:** 289-308 *Chapter Assessment* 313 #81-82 *ChemLab* 310 *MiniLab* 301 **Teacher Wraparound Edition:** CP 289, 296; CU 308; DI 300; QD 293; R 298
INDICATOR 4.5.2 The student will balance simple equations (not to include redox reactions). **Assessment limits:** • Law of Conservation of Mass (apply to reactions to account for the same number of atoms of each type appearing in both the reactants and products) • coefficients (define; use to balance symbolic equations; explain meaning in symbolic equations; differentiate between the use and meaning of coefficients and subscripts)	**Student Edition:** 285-288 *Chapter Assessment* 313 #84-88 *ChemLab* 310 *MiniLab* 301 **Teacher Wraparound Edition:** A 287; CU 371; IM 286; R 284

STANDARDS	PAGE REFERENCES
INDICATOR 4.5.3 The student will demonstrate that adjusting quantities of reactants may affect the amounts of products formed. **Assessment limits:** • use of coefficients in a balanced equation to predict amounts of reactants and products (at the molecular/mole level – no mass-mass calculations) • changing the amount of reactant(s) may change the amount of product(s) formed (no calculations)	**Student Edition:** 368-376 *Chapter Assessment* 393 #61-62 *ChemLab* 390 **Teacher Wraparound Edition:** DI 374; E 371; MI 373; QD 369
INDICATOR 4.5.4 The student will recognize that chemical reactions occur at different speeds. **Assessment limits:** • reaction rate (in order for atoms to react they must collide with sufficient energy; reaction rate increases as frequency of molecular collisions increases) • effects of surface area, temperature, and concentration on the frequency and energy of molecular collisions (no calculations or specific concentration units) • catalysts (definition; conceptual understanding of behavior)	**Student Edition:** 568-573 *ChemLab* 584 *Launch Lab* 559 *MiniLab* 571 **Teacher Wraparound Edition:** A 573, 574; D 568-569; DI 571; QD 569; R 573