CP Chemistry
Glencoe Chemistry: Matter & change

Term One:

Matter: Classification of Matter
Chemical & Physical Changes
Conservation of Mass

Scientific Method & Investigation

Dimensional Analysis
Scientific Notation
Significant figures
SI Unit Analysis

Atomic Structure
Atomic Theory: Dalton, Rutherford, Thomson, Bohr
Rutherfords Goil Foil Experiment
Subatomic particles & nuclear atom
How Atoms Differ: atomic number, mass number & isotopes, atomic mass

Nuclear Chemistry (Ch. 4.4 and Ch. 25. 1, 25.2, 25.3, 25.4)
Unstable Nuclei
Radioactive Decay
Types of Radiation
Nuclear Fission & Fusion

Electrons in Atoms
Electron configuration
Aufbau principle
Pauli exclusion principle
Electron Configuration Notation
Valence electrons

TERM TWO:

Periodicity
Periodic Law: Relationship of elements position on periodic table to the period and family group numbers
Classifying elements (Standard 3.3) (ch. 6.2)
Periodic Trends (standard 3.4) ionization energy, electronegativity, size)
Ch. 7 Identify the families (standard 3.1)

Chemical Bonding
Ch. 8 Ionic Bonding
Lewis Dot diagrams for Ionic Compounds
Forming Chemical Bonds: ions
Formulas for Ionic Compounds
Naming ionic compounds

Ch. 9 Covalent Compounds 9.1, 9.2, 9.3, 9.4, 9.5
Forming Covalent Bonds
Lewis Dot Structures for Covalent Compounds
Writing and Naming Covalent compounds
Molecular Shape (VSPR Model)
Electronegativity and Polarity

Ch. 10 Chemical Reactions
10.1 Reactions & Equations **(5.1)**

10.2 Classifying chemical Reactions **(5.2)**
10.3 Reactions in Aqueous solutions **(optional:** not in frameworks)

Ch. 11 The Mole
11.1 Measuring Matter **(5.3)**
11.2 Mass and the Mole **(5.3)**
11.3 Moles of Compounds **(5.3**)
11.4 Empirical and Molecular Formulas **(5.4)**
11.5 The formula for a Hydrate **(5.4)**

TERM THREE

Ch. 12 Stoichiometry
12.1 Mole-Mass Relationships in chemical Reactions **(5.5)**
12.2 Mass-Mass Relationships and Stoichiometric Calculations **(5.5)**
12.3 Limiting Reactants **(5.5)**
12.4 Percent Yield **(5.6)**

Ch. 13 States of Matter
13.1 Gases **(6.3, 1.3)**
13.2 Forces of Attraction **(6.3)**
13.3 Liquids & Solids **(6.3)**
13.4 Phase Changes **(6.3, 1.3**)

Ch. 14 Gases
14.1 The Gas Laws **(6.1)**
14.2 Combined Gas Law & Avogadro's Principle **(6.1)**
14.3 Ideal Gas Law **(6.2)**
14.4 Gas Stoichiometry **(6.2)**

TERM FOUR

Ch. 16 Energy & Chemical Change
16.1 Energy (The Nature of Energy Pages 489491) **(6.4)**
16.4 What is entropy (Page 514-516) **(6.5)**
17.1 Endothermic & Exothermic process (Teacher generated) **(6.4)**
(CD – ROM Animation: exothermic and Endothermic Reactions

Ch 15 Solutions
15.1 What are solutions (7.1, 7.3)
15.2 Solution concentration (7.2)
15.3 Colligative Properties of solutions (7.4)

Ch. 17 Reaction Rates
17.1 A Model for Reaction Rates (7.5)
17.2 Factors Affecting Reaction Rates (7.5)

Ch. 18 Chemical Equilibrium
18.1 Equilibrium: A State of Dynamic Balance (7.6)
18.2 Factors Affecting Chemical Equilibrium (7.6)

Ch. 19 Acids and Bases
19.1 Acids & Bases: an introduction (8.1)
19.2 Strengths of Acids and Bases (8.2)
19.3 What is pH? (8.2)
19.4 Buffered Solutions: Page 622-625 (8.3)

Ch. 20 Oxidation & Reduction
20..1 Oxidation and Reduction (8.4)

1. Properties of Matter
Broad Concept: Physical and chemical properties reflect the nature of the interactions between molecules or atoms and can be used to classify and describe matter.

1.1 Identify and explain physical properties (such as density, melting point, boiling point, conductivity, and malleability) and chemical properties (such as the ability to form new substances). Distinguish between chemical and physical changes.

- **Concepts:** Physical properties of Matter, chemical properties of matter, observing properties of matter, states of matter, physical changes, chemical changes, conservation of mass

Activities:
- Chapter 3 Matter & Change
- *ChemLab* 78-79 or "Evidence of Chemical Change Lab"
- Demo: *Discovery Lab* 55
- 3.1 Note – Taking worksheets
- 3.1 Study Guide
- 3.2 Note – Taking worksheets
- 3.2 Study Guide

Assessment 82 #37 & #39 or teacher designed assessment

1.2 Explain the difference between pure substances (elements and compounds) and mixtures. Differentiate between heterogeneous and homogeneous mixtures.

- **Concepts:** mixtures, separating mixtures, pure substances, Law of Definite Proportions and Law of Multiple Proportions.

Activities

- 3.3 Note – Taking worksheets
- 3.3 Study Guide

1.3 Describe the three normal states of matter (solid, liquid, gas) in terms of energy, particle motion, and phase transitions.

Concepts: endothermic, exothermic, boiling, freezing, sublimation, deposition, melting, condensing

II. Scientific Inquiry Skills Standards
Scientific literacy can be achieved by supporting students to inquire about chemical phenomena. Engaging students in scientific inquiry allows them to develop conceptual understandings and scientific skills that are necessary to be informed decision-makers. The science curriculum should include substantial hands-on laboratory and field experiences, as appropriate, for students to develop and use these skills in a Chemistry course.

SIS1. Make observations, raise questions, and formulate hypotheses.
Students will be able to:
- Observe the world around them from a scientific perspective.
- Pose questions and form hypotheses based on personal observations, scientific articles,
- experiments, and knowledge.
- Read, interpret, and examine the credibility and validity of scientific claims in different sources

of information, such as scientific articles, advertisements, or media stories.

SIS2. Design and conduct scientific investigations.
Students will be able to:
- Articulate and explain the major concepts being investigated and the purpose of an investigation.
- Select required materials, equipment, and conditions for conducting an experiment.
- Identify independent and dependent variables.
- Write procedures that are clear and replicable.
- Employ appropriate methods for accurately and consistently
    - making observations;
    - making and recording measurements at an
    - appropriate level of precision; and
    - collecting data or evidence in an organized way.
- Properly use instruments, equipment, and materials (such as scales, probeware, meter
- sticks, microscopes, computers, etc.) including: set-up, calibration (if required), technique, maintenance, and storage.
- Follow safety guidelines.

Concept: Lab Safety, Scientific Method

Activity:
- Review Lab Safety Contract
- "Think Tube" activity (formulate hypothesis, develop experiment, test hypothesis, peer review.)
    - These standards will be revisited throughout the entire course

SIS3. Analyze and interpret results of scientific investigations.
Students will be able to:
- Use mathematical operations to analyze and interpret data results.

Concepts:
Student Edition:
ChemLab 410-411, 550-551
Problem-Solving Lab 267, 288, 860
Teacher Wraparound Edition:
A 833; CJ 430; E 468; MC 192, 218

Text: Ch. 1.3 1.3 Study guide
1.3 Note taking w/s

2. Atomic Structure and Nuclear Chemistry
Broad Concept: Atomic models are used to explain atoms and help us understand the interaction of elements and compounds observed on a macroscopic scale. Nuclear chemistry deals with radioactivity, nuclear processes, and nuclear properties. Nuclear reactions produce tremendous amounts of energy and the formation of the elements.
2.1 Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom) and understand how these discoveries lead to the modern theory.
Student Edition:
89-97, 127-134
ChemLab 109 #6

Problem-Solving Lab 130
Teacher Wraparound Edition:
A 128; CJ 94; D 92-93; DI 94; E 97; R 97
2.2 Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.
Student Edition:
94-96
Chapter Assessment 112 #42
Chemistry Online 96
Teacher Wraparound Edition:
DI 95
2.3 Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.
Student Edition:
63-65, 75-77, 354-356
Chapter Assessment 83 #61-#69
Teacher Wraparound Edition:
CJ 76, 355; QD 64, 75
2.4 Write the electron configurations for the first twenty elements of the periodic table.
Student Edition:
135-139
Chapter Assessment 147 #78
Section Assessment 141 #25
Teacher Wraparound Edition:
A 139
2.5 Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power).
Student Edition:
106-107, 806-809
Section Assessment 107 #24
Teacher Wraparound Edition:
E 809
Chemistry High School Standards 3 *Chemistry: Matter and Change*
© 2005
STANDARDS PAGE REFERENCES
2.6 Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope, for example, C-14 is a powerful tool in determining the age of objects.
Student Edition:
106-107, 810-814, 817-820
Chapter Assessment 837 #69-#72
MiniLab 819
Teacher Wraparound Edition:
AC 818; CU 107, 819; D 810-811; E 814
2.7 Compare and contrast nuclear fission and nuclear fusion.
Student Edition:

822-823, 826
Chapter Study Guide 835
Section Assessment 826 #25
Teacher Wraparound Edition:
E 826; QD 822
3. Periodicity
Broad Concept: Repeating (periodic) patterns of physical and chemical properties occur among elements that define families with similar properties. The periodic table displays this repeating pattern, which is related to an atom's outermost electrons.
3.1 Explain the relationship of an element's position on the periodic table to its atomic number. Identify families (groups) and periods on the periodic table.
Student Edition:
70, 98-99, 154
Section Assessment 158 #2
Teacher Wraparound Edition:
A 156; CU 161
3.2 Use the periodic table to identify the three classes of elements: metals, nonmetals, and metalloids.
Student Edition:
154-158
Chapter Assessment 174 #31
ChemLab 170-171
Section Assessment 158 #2
Teacher Wraparound Edition:
A 158
3.3 Relate the position of an element on the periodic table to its electron configuration and compare its reactivity with other elements in the table.
Student Edition:
159-162
Chapter Assessment 174 #49
ChemLab 300-301
Problem-Solving Lab 288
Teacher Wraparound Edition:
A 161, 162; CD 159; CJ 161; D 166-167

3.4 Identify trends on the periodic table (ionization energy, electronegativity, and relative size of atoms and ions).
Student Edition:
163-169
Chapter Assessment 176 #82
ChemLab 170-171
MiniLab 164
Section Assessment 169 #19
Teacher Wraparound Edition:
A 164; CU 169; D 166-167; MC 167; R 169
4. Chemical Bonding
Broad Concept: Atoms bond with each other by transferring or sharing valence electrons to form compounds.

4.1 Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons.
Student Edition:
215-217, 221-225, 241-246
ChemLab 232-233
Teacher Wraparound Edition:
A 225, 227; CJ 217, 243; D 248-249; P 215
4.2 Draw Lewis dot structures for simple molecules and ionic compounds.
Student Edition:
243-245, 252-258
Chapter Assessment 273 #99 & #100
Section Assessment 247 #12
Teacher Wraparound Edition:
A 245; CD 254; CJ 254; CU 257; DI 255; R 257
4.3 Use electronegativity to explain the difference between polar and nonpolar covalent bonds.
Student Edition:
263-266
Chapter Assessment 273 #108-#113
Section Assessment 267 #65
Teacher Wraparound Edition:
A 265; CJ 263; IM 264
4.4 Use valence-shell electron-pair repulsion theory (VSEPR) to predict the electron geometry (linear, trigonal planar, and tetrahedral) of simple molecules.
Student Edition:
259-262
Chapter Assessment 273 #105 & #106; 274 #121
MiniLab 261
Section Assessment 262 #58 & #59
Teacher Wraparound Edition:
A 261, 262; CJ 261; MC 260

STANDARDS PAGE REFERENCES

4.5 Identify how hydrogen bonding in water affects a variety of physical, chemical, and biological phenomena (such as, surface tension, capillary action, density, and boiling point).
Student Edition:
395, 398-399, 404, 408
Chapter Assessment 415 #52; 416 #85
Teacher Wraparound Edition:
A 395; AC 394
4.6 Name and write the chemical formulas for simple ionic and molecular compounds, including those that contain the polyatomic ions: ammonium, carbonate, hydroxide, nitrate, phosphate, and sulfate.
Student Edition:

221-227, 248-251
Chapter Assessment 237 #74-#79; 273 #94-#98
Teacher Wraparound Edition:
A 227, 250, 251; CJ 250; P 226; R 227

5. Chemical Reactions and Stoichiometry

Broad Concept: In a chemical reaction, one or more reactants are transformed into one or more new products. Chemical equations represent the reaction and must be balanced. The conservation of atoms in a chemical reaction leads to the ability to calculate the amount of products formed and reactants used (stoichiometry).

5.1 Balance chemical equations by applying the laws of conservation of mass and constant composition (definite proportions).

Student Edition:
280-283, 354-356
Chapter Assessment 305 #75-#78
ChemLab 375 #2
Discovery Lab 489
Section Assessment 357 #7
Teacher Wraparound Edition:
A 282; CJ 355; CU 355; E 283

5.2 Classify chemical reactions as synthesis (combination), decomposition, single displacement, double displacement, and combustion.

Student Edition:
284-291
Chapter Assessment 305 #80-#84
ChemLab 300-301
Teacher Wraparound Edition:
A 291; CJ 287; P 290; RS 303

5.3 Use the mole concept to determine the number of particles and the molar mass of elements and compounds.

Student Edition:
309-327
Chapter Assessment 346-348 #89-#106 & #111-#135
Problem-Solving Lab 314
Teacher Wraparound Edition:
A 312, 317, 323; CJ 316, 326; E 319; MC 315

5.4 Determine percent compositions, empirical formulas, and molecular formulas.

Student Edition:
328-337
Chapter Assessment 348-349 #136-#150
MiniLab 329
Teacher Wraparound Edition:
A 329, 335, 337; D 332-333; QD 330

5.5 Calculate the mass-to-mass stoichiometry for a chemical reaction.

Student Edition:
361-363
Chapter Assessment 380 #69-#75

ChemLab 374-375
MiniLab 362
Teacher Wraparound Edition:
A 363; CJ 362; CU 363; R 363
5.6 Calculate percent yield in a chemical reaction.
Student Edition:
370-373
Chapter Assessment 381 #84-#90
ChemLab 374-375
Problem-Solving Lab 372
Section Assessment 373 #32
Teacher Wraparound Edition:
A 373; CU 373; DI 371; QD 371; R 373
6. States of Matter, Kinetic Molecular Theory, and Thermochemistry
Broad Concept: Gas particles move independently of each other and are far apart. Their behavior can be modeled by the kinetic molecular theory. In liquids and solids, unlike gases, the particles are close to each other. The driving forces of chemical reactions are energy and entropy. The reorganization of atoms in chemical reactions results in the release or absorption of heat energy.
6.1 Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and the number of particles in a gas sample (Avogadro's hypothesis). Use the combined gas law to determine changes in pressure, volume, and temperature.
Student Edition:
419-433
Chapter Assessment 448-449 #88-#96
MiniLab 439
Teacher Wraparound Edition:
A 430; BM 426; D 420-421; IM 426; QD 425; R 432
6.2 Perform calculations using the ideal gas law. Understand the molar volume at 273K and 1 atmosphere (STP).
Student Edition:
431, 434-438, 440-443
Chapter Assessment 449 #97-#100
ChemLab 444-445
Teacher Wraparound Edition:
A 435, 438, 439; CU 439, 442

6.3 Using the kinetic molecular theory, describe and contrast the properties of gases, liquids, and solids. Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.
Student Edition:
385-387, 396-408, 419-420
ChemLab 410-411
Section Assessment 409 #27
Teacher Wraparound Edition:

A 391, 406; CJ 397; IM 405; R 403
6.4 Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process.
Student Edition:
219, 247, 490, 498-500
Chapter Assessment 524 #54
Discovery Lab 453
Teacher Wraparound Edition:
CJ 64; P 499, 538
6.5 Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy).
Student Edition:
514-516
Chapter Assessment 524 #65, #70, & #71
Section Assessment 519 #42
Teacher Wraparound Edition:
E 514, 516, 519; QD 515; R 518
7. Solutions, Rates of Reaction, and Equilibrium
Broad Concept: Solids, liquids, and gases dissolve to form solutions. Rates of reaction and chemical equilibrium are dynamic processes that are significant in many systems (biological, ecological, and geological).
7.1 Describe the process by which solutes dissolve in solvents.
Student Edition:
453-457
Discovery Lab 453
Teacher Wraparound Edition:
DI 455; VL 455
7.2 Calculate concentration in terms of molarity. Use molarity to perform solution dilution and solution stoichiometry.
Student Edition:
464-468
Chapter Assessment 485 #76-#82
Section Assessment 470 #30
Teacher Wraparound Edition:
A 467; MC 465; R 470
7.3 Identify and explain the factors that affect the rate of dissolving, such as, temperature, concentration, surface area, pressure, and mixing.
Student Edition:
456
Chapter Assessment 484 #52

7.4 Compare and contrast qualitatively the properties of solutions and pure solvents (colligative properties such as boiling point and freezing point).
Student Edition:
471-475

Chapter Assessment 484 #56-#58
MiniLab 473
Section Assessment 475 #39
Teacher Wraparound Edition:
A 474; CU 474; IM 472
7.5 Identify the factors that affect the rate of a chemical reaction (temperature, mixing, concentration, particle size, surface area, and catalyst).
Student Edition:
536-541
ChemLab 550-551
Discovery Lab 529
How It Works 552
MiniLab 539
Teacher Wraparound Edition:
A 541, 542; CJ 538; D 536-537
7.6 Predict the shift in equilibrium when the system is subjected to a stress (LeChatelier's principle) and identify the factors that can cause a shift in equilibrium (concentration, pressure, volume, temperature).
Student Edition:
569-574
Chapter Assessment 591 #59-#64
Chemistry and Technology 588
ChemLab 586-587
MiniLab 573
Problem-Solving Lab 624
Section Assessment 574 #10-#13
Teacher Wraparound Edition:
A 571, 574; R 574
8. Acids and Bases and Oxidation-Reduction Reactions
Broad Concept: Acids and bases are important in numerous chemical processes that occur around us, from industrial procedures to biological ones, from the laboratory to the environment. Oxidation-reduction reactions occur when one substance transfers electrons to another substance
and constitutes a major class of chemical reactions.
8.1 Define the Arrhenius theory of acids and bases in terms of the presence of hydronium and hydroxide ions in water and the Bronsted-Lowry theory of acids and bases in terms of proton donor and acceptor.
Student Edition:
597-599
Chapter Assessment 630 #51; 632 #102
Section Assessment 601 #8
Teacher Wraparound Edition:
A 599; DI 599; R 600

8.2 Relate hydrogen ion concentrations to the pH scale, and to acidic, basic, and neutral solutions. Compare and contrast the strength

of various common acids and bases such as vinegar, baking soda, soap, and citrus juice.
Student Edition:
602-616
Chapter Assessment 632 #107
MiniLab 604
Section Assessment 616 #24
Teacher Wraparound Edition:
CJ 605, 611; CU 615; P 614
8.3 Explain how a buffer works. **Student Edition:**
622-625
Chapter Assessment 632 #106
Problem-Solving Lab 624
Teacher Wraparound Edition:
A 624, 625; D 622-623
8.4 Describe oxidation and reduction reactions and give some every day examples, such as, fuel burning, corrosion. Assign oxidation numbers in a reaction.
Student Edition:
635-643
ChemLab 654-655
How It Works 656
MiniLab 638
Problem-Solving Lab 647
Teacher Wraparound Edition:
A 639, 655; CU 642; QD 637; R 643
Chemistry High School Standards 10 *Chemistry: Matter and Change*
© 2005
STANDARDS PAGE REFERENCES

Concepts & applications

Codes used for Teacher Wraparound Edition pages are the initial caps of headings on that page.
STANDARDS PAGE REFERENCES
I. Content Standards
1. Properties of Matter
Broad Concept: Physical and chemical properties reflect the nature of the interactions between molecules or atoms and can be used to classify and describe matter.
1.1 Identify and explain physical properties (such as density, melting point, boiling point, conductivity, and malleability) and chemical properties (such as the ability to form new substances). Distinguish between chemical and physical changes.
Student Edition:
34-37, 40-44, 86-94, 170-175, 261-281, 294-295
Chemistry and Technology 108-109
ChemLab 16-17, 100-101, 172-173, 206-207, 384-385

How It Works 710
Teacher Wraparound Edition:
CB 35; DE 84-85, 106-107; E 94
1.2 Explain the difference between pure substances (elements and compounds) and mixtures. Differentiate between heterogeneous and homogeneous mixtures.
Student Edition:
14-18, 21-24, 27-31, 451-454, 465-469
Chemistry and Technology 326-327
ChemLab 16-17, 328-329, 422-423
Everyday Chemistry 466
Teacher Wraparound Edition:
CD 121; D 14, 15; DE 28-29; E 33
Chemistry High School Standards

Chemistry CONCEPTS AND APPLICATIONS

© 2005

Massachusetts
Chemistry High School Standards 2 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
1.3 Describe the three normal states of matter (solid, liquid, gas) in terms of energy, particle motion, and phase transitions.
Student Edition:
34-35, 340-345, 348-349, 351-361, 372-375, 386, 392
ChemLab 362-363
Teacher Wraparound Edition:
A 341; CB 35, 372; CD 144; CM 34; DE 378-379; E 347; QD 391
2. Atomic Structure and Nuclear Chemistry
Broad Concept: Atomic models are used to explain atoms and help us understand the interaction of elements and compounds observed on a macroscopic scale. Nuclear chemistry deals with radioactivity, nuclear processes, and nuclear properties. Nuclear reactions produce tremendous amounts of energy and the formation of the elements.
2.1 Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom) and understand how these discoveries lead to the modern theory.
Student Edition:
54-55, 61-65, 230-231, 234-235, 238-242
MiniLAB 245
Physics Connection 232
Teacher Wraparound Edition:
CB 64, 238; CM 230; DE 60-61; QD 231
2.2 Describe Rutherford's "gold foil" experiment that led to the discovery of the nuclear atom.

Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.
Student Edition:
61-65, 69-70, 74-75, 77-79, 98-99, 230-235, 238-239, 243-251
Teacher Wraparound Edition:
CD 65; CM 70, 230, 246; DE 66-67; DI 75; EX 242; VL 61
2.3 Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.
Student Edition:
41-42, 53-55, 198-199, 396-398
ChemLab 56-57
Health Connection 58
Teacher Wraparound Edition:
CE 54; DE 36-37, 54-55; QD 198: TPK 179
2.4 Write the electron configurations for the first twenty elements of the periodic table.
Student Edition:
86-87, 98-99, 243-246
Chemistry Data Handbook 848
Teacher Wraparound Edition:
CD 246; CU 78; DI 98

2.5 Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power).
Student Edition:
747-750
How It Works 748
Teacher Wraparound Edition:
CD 747; CM 750; DE 50-51, 746-747; E 760
2.6 Describe the process of radioactive decay by using nuclear equations and explain the concept of half-life for an isotope, for example, C-14 is a powerful tool in determining the age of objects.
Student Edition:
747-750, 756-758, 768-773
Art Connection 759
Biology Connection 772
Chemistry and Technology 754-755
ChemLab 752-753
Everyday Chemistry 777
Teacher Wraparound Edition:
CD 747; CM 750; D 770; DE 50-51, 746-747; DI 759; UA 756
2.7 Compare and contrast nuclear fission and nuclear fusion.
Student Edition:
762-767

MiniLAB 763
Physics Connection 232
Teacher Wraparound Edition:
CB 778; CD 762; CM 764; D 765; R 767
3. Periodicity
Broad Concept: Repeating (periodic) patterns of physical and chemical properties occur among elements that define families with similar properties. The periodic table displays this repeating pattern, which is related to an atom's outermost electrons.
3.1 Explain the relationship of an element's position on the periodic table to its atomic number. Identify families (groups) and periods on the periodic table.
Student Edition:
66-68, 92-94, 95-98, 244-251, 261-265, 269-281
ChemLab 100-101, 266-267
MiniLAB 89, 97
Teacher Wraparound Edition:
DD 84-85; DE 270-271, 278-279

3.2 Use the periodic table to identify the three classes of elements: metals, nonmetals, and metalloids.
Student Edition:
92-93, 102-105, 106-107, 111-113, 258-259, 292
Chemistry and Technology 108-199
Everyday Chemistry 110
Teacher Wraparound Edition:
CB 105; DE 268-269; KC 95
3.3 Relate the position of an element on the periodic table to its electron configuration and compare its reactivity with other elements in the table.
Student Edition:
95-99, 244-246, 261-265, 269-283, 292-295, 602
ChemLab 100-101, 266-267
MiniLAB 97
Teacher Wraparound Edition:
DE 244-245, 248-249; KC 95
3.4 Identify trends on the periodic table (ionization energy, electronegativity, and relative size of atoms and ions).
Student Edition:
87-90, 92-94, 95-99, 102-105, 258-263, 283-285, 303-305
ChemLab 100-101
MiniLAB 97
Teacher Wraparound Edition:
DE 244-245, 270-271; E 263
4. Chemical Bonding
Broad Concept: Atoms bond with each other by transferring or sharing valence electrons to form compounds.
4.1 Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on

the number of valence electrons.
Student Edition:
130-135, 138-142, 154-169, 179-183
ChemLab 136-137, 172-173
Teacher Wraparound Edition:
CD 139; CJ 182; CON 134; DE 138-139, 142-143
4.2 Draw Lewis dot structures for simple molecules and ionic compounds.
Student Edition:
79, 133, 138-142, 156-157, 174-175, 308, 315-324, 439, 493, 629
MiniLAB 325
Teacher Wraparound Edition:
AP 159; CM 324; D 181; QD 147; R 314
Chemistry High School Standards 5 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
4.3 Use electronegativity to explain the difference between polar and nonpolar covalent bonds.
Student Edition:
303-306, 308-311
Teacher Wraparound Edition:
CB 310; CM 308; VL 302
4.4 Use valence-shell electron-pair repulsion theory (VSEPR) to predict the electron geometry (linear, trigonal planar, and tetrahedral) of simple molecules.
Student Edition:
318-325, 330-333
Teacher Wraparound Edition:
CB 318; CD 322; DE 318-319; UA 323
4.5 Identify how hydrogen bonding in water affects a variety of physical, chemical, and biological phenomena (such as, surface tension, capillary action, density, and boiling point).
Student Edition:
330-332, 356-361, 436-446, 454
Teacher Wraparound Edition:
CD 360; CJ 442, 443; CM 438; DI 439; UA 361; VL 437, 440, 445
4.6 Name and write the chemical formulas for simple ionic and molecular compounds, including those that contain the polyatomic ions: ammonium, carbonate, hydroxide, nitrate, phosphate, and sulfate.
Student Edition:
138, 154-169, 179-183
Teacher Wraparound Edition:
CB 165; CD 164; CE 159; DE 138-139, 156-157; EX 169; TPK 179
5. Chemical Reactions and Stoichiometry
Broad Concept: In a chemical reaction, one or more reactants are transformed into one or more new products. Chemical equations represent the reaction and must be balanced. The conservation of atoms in a chemical reaction leads to the ability to calculate the amount of

products formed and reactants used (stoichiometry).
5.1 Balance chemical equations by applying the laws of conservation of mass and constant composition (definite proportions).
Student Edition:
41-42, 53-54, 198-201
ChemLab 56-57
Health Connection 58
Teacher Wraparound Edition:
D 44; DE 36-37, 54-55; QD 198; R 55
Chemistry High School Standards 6 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
5.2 Classify chemical reactions as synthesis (combination), decomposition, single displacement, double displacement, and combustion.
Student Edition:
203-209, 713
Chemistry and Technology 216-217, 424-425, 590-592
ChemLab 8-9, 206-207
How It Works 614
MiniLAB 557
Physics Connection 566
Teacher Wraparound Edition:
CD 204; CJ 202; D 563; QD 208; R 209
5.3 Use the mole concept to determine the number of particles and the molar mass of elements and compounds.
Student Edition:
404-409, 412-413, 414-415, 426-429
MiniLAB 408
Teacher Wraparound Edition:
AC 405; D 429; DE 415; R 413; TPK 407
5.4 Determine percent compositions, empirical formulas, and molecular formulas.
Student Edition:
412-413, 426-429
Teacher Wraparound Edition:
CE 428; DD 402-403; DE 406-407
5.5 Calculate the mass-to-mass stoichiometry for a chemical reaction.
Student Edition:
413, 414-416
Chemistry and Technology 424-425
ChemLab 542-543, 560-561
Everyday Chemistry 417
MiniLAB 420
Teacher Wraparound Edition:
CD 406, 415, 416, 427; DE 410-411; DI 586; R 558
5.6 Calculate percent yield in a chemical reaction.
Student Edition:
421
Chemistry and Technology 424-425

ChemLab 560-561
Teacher Wraparound Edition:
DD 478-479
Chemistry High School Standards 7 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
6. States of Matter, Kinetic Molecular Theory, and Thermochemistry
Broad Concept: Gas particles move independently of each other and are far apart. Their behavior can be modeled by the kinetic molecular theory. In liquids and solids, unlike gases, the particles are close to each other. The driving forces of chemical reactions are energy and entropy. The reorganization of atoms in chemical reactions results in the release or absorption of heat energy.
6.1 Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and the number of particles in a gas sample (Avogadro's hypothesis). Use the combined gas law to determine changes in pressure, volume, and temperature.
Student Edition:
342-343, 382-383, 386-389, 391-398, 416
ChemLab 384-385
MiniLAB 420
Teacher Wraparound Edition:
CB 396; CD 394; CU 398; DE 386-387; DI 383
6.2 Perform calculations using the ideal gas law. Understand the molar volume at 273K and 1 atmosphere (STP).
Student Edition:
416-418, 419
MiniLAB 420
Teacher Wraparound Edition:
R 419; VL 416
6.3 Using the kinetic molecular theory, describe and contrast the properties of gases, liquids, and solids. Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.
Student Edition:
342-347, 352-358, 364-365, 372-374
ChemLab 362-363
Teacher Wraparound Edition:
CB 372; CM 346; DE 356; E 347; QD 351, 352; R 364
6.4 Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process.
Student Edition:
42-43, 195-196, 218, 708-709, 711-714
How It Works 710
MiniLAB 726
Teacher Wraparound Edition:
CB 708; CD 54; CM 720; D 195, 709, 713; DE 42-43; UA 714

6.5 Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy).
Student Edition:
716-718, 730-732, 736-737
Teacher Wraparound Edition:
CD 717; QD 716; R 718
Chemistry High School Standards 8 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
7. Solutions, Rates of Reaction, and Equilibrium
Broad Concept: Solids, liquids, and gases dissolve to form solutions. Rates of reaction and chemical equilibrium are dynamic processes that are significant in many systems (biological, ecological, and geological).
7.1 Describe the process by which solutes dissolve in solvents.
Student Edition:
23-24, 451-454
Everyday Chemistry 455
Teacher Wraparound Edition:
CD 453
7.2 Calculate concentration in terms of molarity. Use molarity to perform solution dilution and solution stoichiometry.
Student Edition:
460-464, 502, 540-544, 546
ChemLab 542-543
Teacher Wraparound Edition:
CB 502; CD 461, 541; CJ 460; DE 518-519; DI 503
7.3 Identify and explain the factors that affect the rate of dissolving, such as, temperature, concentration, surface area, pressure, and mixing.
Student Edition:
218-220
MiniLAB 712
Teacher Wraparound Edition:
DE 218-219, 454-455; QD 459
Note: Many of the factors that affect chemical reaction rates also affect the rates of dissolving of solutes in solvents.
7.4 Compare and contrast qualitatively the properties of solutions and pure solvents (colligative properties such as boiling point and freezing point).
Student Edition:
464-465, 469
Everyday Chemistry 466
Teacher Wraparound Edition:
CB 464; CJ 465; E 467
7.5 Identify the factors that affect the rate of a chemical reaction (temperature, mixing, concentration, particle size, surface area, and catalyst).
Student Edition:
218-223, 713-714

Chemistry and Technology 216-217
Everyday Chemistry 715
Teacher Wraparound Edition:
CD 215; DE 218-219; QD 219, 222
Chemistry High School Standards 9 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
7.6 Predict the shift in equilibrium when the system is subjected to a stress (LeChatelier's principle) and identify the factors that can cause a shift in equilibrium (concentration, pressure, volume, temperature).
Student Edition:
214-215, 356-358, 459-460, 467
Chemistry and Technology 216-217
How It Works 468
Teacher Wraparound Edition:
CJ 459; D 360; DE 214-215, 532-533; QD 211
8. Acids and Bases and Oxidation-Reduction Reactions
Broad Concept: Acids and bases are important in numerous chemical processes that occur around us, from industrial procedures to biological ones, from the laboratory to the environment. Oxidation-reduction reactions occur when one substance transfers electrons to another substance
and constitutes a major class of chemical reactions.
8.1 Define the Arrhenius theory of acids and bases in terms of the presence of hydronium and hydroxide ions in water and the Bronsted-Lowry theory of acids and bases in terms of proton donor and acceptor.
Student Edition:
483-485, 488-492, 496, 526-527
Teacher Wraparound Edition:
CB 485, 526; CD 486; R 489
8.2 Relate hydrogen ion concentrations to the pH scale, and to acidic, basic, and neutral solutions. Compare and contrast the strength of various common acids and bases such as vinegar, baking soda, soap, and citrus juice.
Student Edition:
497-500, 502-508
Biology Connection 487
ChemLab 504-505
Everyday Chemistry 501
Launch Lab 479
Teacher Wraparound Edition:
CB 502; CD 486; D 508; DE 506-507; R 500
8.3 Explain how a buffer works. **Student Edition:**
531-533
MiniLAB 532
Teacher Wraparound Edition:
CB 531; D 535; DE 532-533; QD 533
Chemistry High School Standards 10 *Chemistry: Concepts and Applications*
© 2005
STANDARDS PAGE REFERENCES
8.4 Describe oxidation and reduction reactions

and give some every day examples, such as, fuel burning, corrosion. Assign oxidation numbers in a reaction.

Student Edition:

554-559, 563-565, 567-568, 570-572, 574-576, 584-589, 599-613

Chemistry and Technology 573, 590-592

ChemLab 560-561

How It Works 569, 614

Launch Lab 553

MiniLAB 557

Physics Connection 566

Teacher Wraparound Edition:

CB 555; DD 552-553; DE 558-559, 564-565, 574-575

II. Scientific Inquiry Skills Standards

Scientific literacy can be achieved by supporting students to inquire about chemical phenomena. Engaging students in scientific inquiry allows them to develop conceptual understandings and scientific skills that are necessary to be informed decision-makers. The science curriculum should include substantial hands-on laboratory and field experiences, as appropriate, for students to develop and use these skills in a Chemistry course.

SIS1. Make observations, raise questions, and formulate hypotheses.

Students will be able to:

- Observe the world around them from a scientific perspective.
- Pose questions and form hypotheses based on personal observations, scientific articles, experiments, and knowledge.
- Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories.

Student Edition:

4-7, 14-15, 24-29, 59, 69-70, 94, 690

Chemistry and Society 32, 146, 495

Chemistry and Technology 573, 728-729

ChemLab 8-9, 16-17, 56-57

History Connection 58, 307

Teacher Wraparound Edition:

CB 14, 64, 91; D 90; DE 6-7, 70-71; IS 18, 35, 246; QD 4

SIS2. Design and conduct scientific investigations.

Students will be able to:

- Articulate and explain the major concepts being investigated and the purpose of an investigation.
- Select required materials, equipment, and conditions for conducting an experiment.
- Identify independent and dependent variables.
- Write procedures that are clear and replicable.
- Employ appropriate methods for accurately and consistently:

- making observations;
- making and recording measurements at an appropriate level of precision; and
- collecting data or evidence in an organized way.

- Properly use instruments, equipment, and materials (such as scales, probeware, meter sticks, microscopes, computers, etc.) including: set-up, calibration (if required), technique, maintenance, and storage.
- Follow safety guidelines.

Student Edition:
20, 36-37, 59
Art Connection 759
Biology Connection 632, 772
Chemistry Skill Handbook 791-794
ChemLab 8-9, 56-57, 136-137, 362-363, 384-385, 456-457, 650-652, 674-675
Safety Handbook 839-840
Teacher Wraparound Edition:
CD 11; DE 40-41

Chemistry High School Standards 12 *Chemistry: Concepts and Applications* © 2005

STANDARDS PAGE REFERENCES

SIS3. Analyze and interpret results of scientific investigations.

Students will be able to:

- Present relationships between variables in appropriate forms.
- Represent data and relationships between variables in charts and graphs.
  - Use appropriate technology (such as graphing software, etc.) and other tools.
- Use mathematical operations to analyze and interpret data results.
- Identify reasons for inconsistent results, such as sources of error or uncontrolled conditions, and assess the reliability of data.
- Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis.
- State questions raised by an experiment that may require further investigation.

Student Edition:
10-11, 59, 86-94
Art Connection 759
Biology Connection 772
Chemistry and Society 32, 146
Chemistry and Technology 424-425
Chemistry Skill Handbook 788-795, 804-808
ChemLab 38-39, 56-57, 136-137, 236-237, 328-329, 362-363, 384-385, 422-423, 504-505, 542-543, 650-652, 722-723
Teacher Wraparound Edition:
CD 11; DE 6-7

SIS4. Communicate and apply the results of scientific investigations.

Students will be able to:

- Develop descriptions and explanations of scientific concepts that an investigation focused on.
- Review information, explain statistical analysis, and summarize data collected and analyzed from an investigation.
- Explain diagrams and charts that represent relationships of variables.
- Construct a reasoned argument and respond appropriately to critical comments and questions.
- Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology (such as presentation software, etc.) and other tools to present findings.
- Use and refine scientific models that simulate physical processes or phenomena.

Student Edition:

10-11, 36-37, 382-383, 391-392, 404-409, 414-421, 426-429, 539-541

Chemistry Skill Handbook 804-808

ChemLab 38-39, 56-57, 384-385, 422-423, 542-543

Teacher Wraparound Edition:

CD 11; DE 36-37, 54-55; DI 383