



Glencoe

UTAH
Science – Chemistry
***Chemistry: Concepts and Applications* © 2005**

OBJECTIVES	PAGE REFERENCES
Standard I: Students will understand that all matter in the universe has a common origin and is made of atoms, which have structure and can be systematically arranged on the periodic table.	
Objective 1: Recognize the origin and distribution of elements in the universe.	
a. Identify evidence supporting the assumption that matter in the universe has a common origin.	TWE: EX 767 IS 103
b. Recognize that all matter in the universe and on earth is composed of the same elements.	SE: 127 TWE: IS 103
c. Identify the distribution of elements in the universe.	SE: 127 TWE: EX 79 IS 103
d. Compare the occurrence of heavier elements on earth and in the universe.	SE: 669 TWE: IS 103
Objective 2: Relate the structure, behavior, and scale of an atom to the particles that compose it.	
a. Summarize the major experimental evidence that led to the development of various atomic models, both historical and current.	SE: 52-55, 61-65, 69-75, 77-79, 230-235, 238-242, 244-251, 761-767 <i>History Connection</i> 58
b. Evaluate the limitations of using models to describe atoms.	SE: 52-55, 66, 230-233 TWE: CJ 78 CM 70, 75 CUL 62 MIN 64 RE 59
c. Discriminate between the relative size, charge, and position of protons, neutrons, and electrons in the atom.	SE: 61-65, 69-70, 74-75, 77-79, 98-99, 231-235, 762-767 <i>Chemistry and Technology</i> 240-241 TWE: DE 66-67
d. Generalize the relationship of proton number to the element's identity.	SE: 66, 94 TWE: TPK 233
e. Relate the mass and number of atoms to the gram-sized quantities of matter in a mole.	SE: 396-398, 406-409, 414-416, 421 <i>Launch Lab</i> 403 TWE: CD 427
Objective 3: Correlate atomic structure and the physical and chemical properties of an element to the position of the element on the periodic table.	
a. Use the periodic table to correlate the number of protons, neutrons, and electrons in an atom.	SE: 66-68, 92-94, 98-99, 104-105, 746 TWE: DI 295 KC 95
b. Compare the number of protons and neutrons in isotopes of the same element.	SE: 62, 66-68, 746 TWE: CE 65 DIN 749 MIN 64

OBJECTIVES	PAGE REFERENCES
c. Identify similarities in chemical behavior of elements within a group.	SE: 87-88, 90-91, 258-265, 269-281 <i>ChemLab</i> 266-267 <i>MiniLab</i> 97 TWE: CB 290 DD 84-85 UA 305
d. Generalize trends in reactivity of elements within a group to trends in other groups.	SE: 87-88, 90-93, 104-105, 258-265, 269-281, 292-295 <i>MiniLab</i> 89, 97 TWE: DD 84-85 UA 305
e. Compare the properties of elements (e.g., metal, nonmetallic, metalloid) based on their position in the periodic table.	SE: 92-93, 104-105, 258-265, 269-281, 285-287 <i>ChemLab</i> 100-101 <i>Everyday Chemistry</i> 110 <i>MiniLab</i> 97 TWE: AC 107 CB 103
Standard II: Students will understand the relationship between energy changes in the atom specific to the movement of electrons between energy levels in an atom resulting in the emission or absorption of quantum energy. They will also understand that the emission of high-energy particles results from nuclear changes and that matter can be converted to energy during nuclear reactions.	
Objective 1: Evaluate quantum energy changes in the atom in terms of the energy contained in light emissions.	
a. Identify the relationship between wavelength and light energy.	SE: 70-72, 74-75, 233-235
b. Examine evidence from the lab indicating that energy is absorbed or released in discrete units when electrons move from one energy level to another.	SE: 74-75 <i>MiniLab</i> 77 TWE: DE 70-71
c. Correlate the energy in a photon to the color of light emitted.	SE: 72, 75 <i>Everyday Chemistry</i> 76 <i>MiniLab</i> 77 TWE: QD 235
d. After observing spectral emissions in the lab (e.g., flame test, spectrum tubes), identify unknown elements by comparison to known emission spectra.	SE: <i>MiniLab</i> 77, 234 TWE: DE 70-71
Objective 2: Evaluate how changes in the nucleus of an atom result in emission of radioactivity.	
a. Recognize that radioactive particles and wavelike radiations are products of the decay of an unstable nucleus.	SE: 295, 747-750, 769-770 <i>Everyday Chemistry</i> 777 <i>MiniLab</i> 775
b. Interpret graphical data relating half-life and age of a radioactive substance.	SE: 756-758, 760 <i>Art Connection</i> 759 <i>Chemistry and Technology</i> 754-755 <i>ChemLab</i> 752-753 TWE: DIN 759
c. Compare the mass, energy, and penetrating power of alpha, beta, and gamma radiation.	SE: 747-749, 774-776 TWE: CM 750

OBJECTIVES	PAGE REFERENCES
d. Compare the strong nuclear force to the amount of energy released in a nuclear reaction and contrast it to the amount of energy released in a chemical reaction.	SE: 195-196, 708-709, 761 <i>ChemLab</i> 722-723 TWE: AS 724
e. After researching, evaluate and report the effects of nuclear radiation on humans or other organisms.	SE: 774-776 <i>Everyday Chemistry</i> 777 TWE: CM 750 DI 258 EN 779 WC 760
Standard III: Students will understand chemical bonding and the relationship of the type of bonding to the chemical and physical properties of substances.	
Objective 1: Analyze the relationship between the valence (outermost) electrons of an atom and the type of bond formed between atoms.	
a. Determine the number of valence electrons in atoms using the periodic table.	SE: 98-99, 231-233, 238-242 <i>ChemLab</i> 236-237, 266-267 <i>MiniLab</i> 285 TWE: DI 295 KC 95
b. Predict the charge an atom will acquire when it forms an ion by gaining or losing electrons.	SE: 98-99, 132-134, 138-142, 156-158, 162-165 TWE: CB 131 DI 295 KC 95
c. Predict bond types based on the behavior of valence (outermost) electrons.	SE: 132-135, 138-142, 154-157, 162-169, 243-247, 261-265, 305-311 <i>ChemLab</i> 136-137
d. Compare covalent, ionic, and metallic bonds with respect to electron behavior and relative bond strengths.	SE: 132-135, 138-140, 143-147, 302-311, 313-314, 330-333 <i>ChemLab</i> 136-137, 172-173
Objective 2: Explain that the properties of a compound may be different from those of the elements or compounds from which it is formed.	
a. Use a chemical formula to represent the names of elements and numbers of atoms in a compound and recognize that the formula is unique to the specific compound.	SE: 154-160, 162-165, 180-183, 623-628, 640, 671 TWE: EX 179
b. Compare the physical properties of a compound to the elements that form it.	SE: 34-37, 102-107, 120-127 <i>ChemLab</i> 100-101, 136-137 TWE: DE 138-139 DI 129
c. Compare the chemical properties of a compound to the elements that form it.	SE: 40-44, 120-127 <i>ChemLab</i> 100-101, 136-137 TWE: DE 138-139 DI 129
d. Explain that combining elements in different proportions results in the formation of different compounds with different properties.	SE: 162-165, 180-181 TWE: CE 54 DE 192-193 DI 295

OBJECTIVES	PAGE REFERENCES
Objective 3: Relate the properties of simple compounds to the type of bonding, shape of molecules, and intermolecular forces.	
a. Generalize, from investigations, the physical properties (e.g., malleability, conductivity, solubility) of substances with different bond types.	SE: 143-147, 170-171, 313-314 <i>ChemLab</i> 172-173 TWE: CJ 182
b. Given a model, describe the shape and resulting polarity of water, ammonia, and methane molecules.	SE: 315-325, 330-331, 436-438, 628-629 TWE: EX 333 RET 332
c. Identify how intermolecular forces of hydrogen bonds in water affect a variety of physical, chemical, and biological phenomena (e.g., surface tension, capillary action, boiling point).	SE: 330, 332-333, 360-361, 451-454 <i>Chemistry and Technology</i> 326-327 <i>ChemLab</i> 328-329, 362-363 TWE: QD 331
Standard IV: Students will understand that in chemical reactions matter and energy change forms, but the amounts of matter and energy do not change.	
Objective 1: Identify evidence of chemical reactions and demonstrate how chemical equations are used to describe them.	
a. Generalize evidences of chemical reactions.	SE: 190-191, 554-559 <i>Chemistry and Technology</i> 573 <i>ChemLab</i> 136-137, 206-207 <i>Everyday Chemistry</i> 76, 221, 275 <i>How It Works</i> 197, 545
b. Compare the properties of reactants to the properties of products in a chemical reaction.	SE: 40-44, 120-127 <i>ChemLab</i> 100-101, 136-137, 206-207 TWE: DE 138-139 DI 129
c. Use a chemical equation to describe a simple chemical reaction.	SE: 193-196, 198-199, 203-205, 208, 210-215, 486, 517-523, 555-559 <i>Chemistry and Technology</i> 484 <i>ChemLab</i> 206-207
d. Recognize that the number of atoms in a chemical reaction does not change.	SE: 41-42, 53, 198-199, 396-398 TWE: CE 193 DI 44 EX 200 RE 55
e. Determine the molar proportions of the reactants and products in a balanced chemical reaction.	SE: 396-398, 404-409, 414-416, 421 <i>Chemistry and Technology</i> 424-425 TWE: CM 198
f. Investigate everyday chemical reactions that occur in a student's home (e.g., baking, rusting, bleaching, cleaning).	SE: 190-191 <i>ChemLab</i> 8-9 <i>Everyday Chemistry</i> 194, 275, 657, 715 <i>How It Works</i> 710
Objective 2: Analyze evidence for the laws of conservation of mass and conservation of energy in chemical reactions.	
a. Using data from quantitative analysis, identify evidence that supports the conservation of mass in a chemical reaction.	SE: 41-42, 53, 55, 198 <i>ChemLab</i> 56-57 TWE: CD 54 CM 59 DI 44

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b. Use molar relationships in a balanced chemical reaction to predict the mass of product produced in a simple chemical reaction that goes to completion.	SE: 396-398, 404-409, 414-415, 421 <i>Chemistry and Technology</i> 424-425 <i>ChemLab</i> 422-423 TWE: CD 416
c. Report evidence of energy transformations in a chemical reaction.	SE: 42-43, 191, 195, 215, 708-714 <i>ChemLab</i> 362-363, 722-723 <i>How It Works</i> 197 <i>MiniLab</i> 196 TWE: DE 734-735
d. After observing or measuring, classify evidence of temperature change in a chemical reaction as endothermic or exothermic.	SE: 708-709 <i>ChemLab</i> 722-723 <i>MiniLab</i> 196, 712 TWE: DD 706-707 DE 726-727, 734-735
e. Using either a constructed or a diagrammed electrochemical cell, describe how electrical energy can be produced in a chemical reaction (e.g., half reaction, electron transfer).	SE: 599-605, 608-609, 611-613 <i>ChemLab</i> 606-607 <i>Health Connection</i> 610 <i>How It Works</i> 614 <i>Launch Lab</i> 583
f. Using collected data, report the loss or gain of heat energy in a chemical reaction.	SE: 711-712, 731 <i>ChemLab</i> 722-723 <i>MiniLab</i> 196, 726 TWE: DD 706-707
Standard V: Students will understand that many factors influence chemical reactions and some reactions can achieve a state of dynamic equilibrium.	
Objective 1: Evaluate factors specific to collisions (e.g., temperature, particle size, concentration, and catalysts) that affect the rate of chemical reaction.	
a. Design and conduct an investigation of the factors affecting reaction rate and use the findings to generalize the results to other reactions.	SE: 218-219 <i>Chemistry and Technology</i> 424-425 <i>Everyday Chemistry</i> 715 <i>How It Works</i> 359 <i>MiniLab</i> 220 TWE: CD 215 DE 730-731 DI 360 EX 223
b. Use information from graphs to draw warranted conclusions about reaction rates.	SE: 713-714
c. Correlate frequency and energy of collisions to reaction rate.	SE: 218-219, 348-349 <i>Chemistry and Technology</i> 216-217 TWE: CD 215
d. Identify that catalysts are effective in increasing reaction rates.	SE: 222, 714, 730 <i>Chemistry and Technology</i> 216-217, 424-425 <i>Everyday Chemistry</i> 715 TWE: EX 223

OBJECTIVES	PAGE REFERENCES
Objective 2: Recognize that certain reactions do not convert all reactants to products, but achieve a state of dynamic equilibrium that can be changed.	
a. Explain the concept of dynamic equilibrium.	SE: 210-211, 214-215 <i>Chemistry and Technology</i> 216-217 TWE: DE 212-213 DIN 220
b. Given an equation, identify the effect of adding either product or reactant to a shift in equilibrium.	SE: 215 <i>Chemistry and Technology</i> 216-217, 424-425 TWE: DD 434-435
c. Indicate the effect of a temperature change on the equilibrium, using an equation showing a heat term.	SE: 215 <i>Chemistry and Technology</i> 216-217
Standard VI: Students will understand the properties that describe solutions in terms of concentration, solutes, solvents, and the behavior of acids and bases.	
Objective 1: Describe factors affecting the process of dissolving and evaluate the effects that changes in concentration have on solutions.	
a. Use the terms solute and solvent in describing a solution.	SE: 21-23, 451-453 <i>ChemLab</i> 456-457 TWE: CD 458 DE 454-455
b. Sketch a solution at the particle level.	SE: 451-454 <i>Everyday Chemistry</i> 455
c. Describe the relative amount of solute particles in concentrated and dilute solutions and express concentration in terms of molarity and molality.	SE: 458, 460-462
d. Design and conduct an experiment to determine the factors (e.g., agitation, particle size, temperature) affecting the relative rate of dissolution.	SE: 451-454 TWE: QD 459
e. Relate the concept of parts per million (PPM) to relevant environmental issues found through research.	SE: 493, 771 <i>Biology Connection</i> 280 <i>Chemistry and Society</i> 495 <i>History Connection</i> 271 TWE: DI 508
Objective 2: Summarize the quantitative and qualitative effects of colligative properties on a solution when a solute is added.	
a. Identify the colligative properties of a solution.	SE: 464-465, 467 <i>Everyday Chemistry</i> 466 <i>How It Works</i> 468
b. Measure change in boiling and/or freezing point of a solvent when a solute is added.	SE: 464-465, 467 <i>Everyday Chemistry</i> 466
c. Describe how colligative properties affect the behavior of solutions in everyday applications (e.g., road salt, cold packs, antifreeze).	SE: 464-465, 467 <i>Everyday Chemistry</i> 466 <i>How It Works</i> 468, 710
Objective 3: Differentiate between acids and bases in terms of hydrogen ion concentration.	
a. Relate hydrogen ion concentration to pH values and to the terms acidic, basic or neutral.	SE: 483-486, 488-492, 502-503, 506-508 <i>ChemLab</i> 504-505 <i>Everyday Chemistry</i> 501

OBJECTIVES	PAGE REFERENCES
b. Using an indicator, measure the pH of common household solutions and standard laboratory solutions, and identify them as acids or bases.	SE: 481, 506-508 <i>ChemLab</i> 504-505, 542-543 <i>How It Works</i> 545 <i>Launch Lab</i> 479 <i>MiniLab</i> 482, 518
c. Determine the concentration of an acid or a base using a simple acid-base titration.	SE: 539-541 <i>ChemLab</i> 542-543 TWE: AC 544 EX 546
d. Research and report on the uses of acids and bases in industry, agriculture, medicine, mining, manufacturing, or construction.	SE: 494 <i>Biology Connection</i> 487 <i>Chemistry and Technology</i> 484 <i>Everyday Chemistry</i> 501 <i>MiniLab</i> 503 TWE: AC 544 CD 486 CUL 216 IS 483
e. Evaluate mechanisms by which pollutants modify the pH of various environments (e.g., aquatic, atmospheric, soil).	SE: 493-494, 535 <i>Chemistry and Society</i> 495 TWE: IS 536

Codes Used for TWE Pages

AC	Applying Chemistry
AS	Assessment
CB	Content Background
CD	Concept Development
CE	Correcting Errors
CJ	Chemistry Journal
CM	Correcting Misconceptions
CUL	Cultural Diversity
DD	Discovery Demo
DE	Demonstration
DI	Discussion
DIN	Differentiated Instruction
EN	Enrichment
EX	Extension
IS	Integrating the Sciences
KC	Key Concepts
MIN	Meeting Individual Needs
QD	Quick Demo
RE	Reinforcement
RET	Reteach
TPK	Tying to Previous Knowledge
UA	Using an Analogy
WC	Writing About Chemistry