IDAHO
Science Standards – Grades 9-12
Chemistry: Concepts and Applications © 2005

STANDARDS	PAGE REFERENCES
648. UNIFYING CONCEPTS OF SCIENCE.	
01. Understand systems, order, and organization.	
a. Know the scientific meaning and application of the concepts of system, order, and organization.	SE: 14-18, 55, 88-94, 238-239, 243-251, 342-347, 601-602, 719-720, 734-737 *Chemistry and Technology* 354-355
02. Understand concepts and processes of evidence, models, and explanation.	
a. Know that observations and data are evidence on which to base scientific explanations.	SE: 61-65, 86-94, 243-250, 302-312, 342-347 *ChemLab* 56-57, 206-207, 328-329, 422-423, 650-651
b. Use models to explain how things work.	SE: 10-11, 65, 77-79, 230-235, 302-303 *ChemLab* 752-753 *MiniLab* 262, 325
c. Develop scientific explanations based on scientific knowledge, logic, and analysis.	SE: 20-24, 230-242 *Everyday Chemistry* 275, 455, 594, 777 *How It Works* 197, 569
03. Understand constancy, change, and measurement.	
a. Identify constancy in some concepts in science that do not change with time such as the speed of light.	SE: 41-42, 55, 198, 382-383, 404-406, 711-712, 719-720, 756 *Launch Lab* 403
b. Recognize that change occurs in and among systems and change can be measured.	SE: 40-44, 74-75, 138-142, 190-196, 601-602 *ChemLab* 206-207, 362-363, 606-607 *Launch Lab* 189 TWE: CJ 714
c. Measure in both the metric and customary system.	SE: 349-350, 378-380, 788-791 TWE: MIN 64 QD 211 UA 67, 93
04. Understand the theory that evolution is a process that relates to the gradual changes in the universe and of equilibrium as a physical state.	
a. Know that the present arises from materials and forms of the past.	SE: 690 *Chemistry and Technology* 754-755 *Earth Science Connection* 524 *Everyday Chemistry* 571, 777 *MiniLab* 775 TWE: CUL 631 DI 645
b. Understand evolution as a series of changes, some gradual and some sporadic, that account for present form and function of objects, organisms, and natural or mechanical systems.	SE: 613-615, 732 *Earth Science Connection* 727 TWE: BA 146 BC 632 CJ 736 DI 730

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c. Know that equilibrium is a physical state in which forces and changes occur in opposite and offsetting directions.	SE: 211, 214-215, 356-358 *Chemistry and Technology* 216-217 TWE: DD 434-435 DIN 220
05. Understand concepts of form and function.	
a. Know that form refers to function and function refers to form.	SE: 640-647, 648-649, 672-673, 690 *Biology Connection* 632 *Everyday Chemistry* 110, 417, 685 *Health Connection* 693 *How It Works* 519
649. CONCEPTS OF SCIENTIFIC INQUIRY.	
01. Understand scientific inquiry and develop critical thinking skills.	
a. Identify questions and concepts that guide scientific investigations.	SE: 59, 86-94, 143-145, 692-700 *Chemistry and Society* 32, 146 *ChemLab* 8-9 *History Connection* 58
b. Design and conduct scientific investigations.	SE: *ChemLab* 56-57, 136-137, 206-207, 328-329, 422-423, 542-543, 650-652, 722-723
c. Use technology and mathematics to improve investigations and communication.	SE: 799-800 *Chemistry and Technology* 240-241, 326-327, 573, 754-755 *ChemLab* 384-385, 542-543, 722-723
d. Formulate and revise scientific explanations and models using logic and evidence.	SE: 10-11, 65, 77-79, 86-94 *ChemLab* 136-137, 752-753 *Everyday Chemistry* 76, 417 TWE: IS 246
e. Recognize and analyze alternative explanations and models.	SE: 65, 77-79 *Art Connection* 759 *Biology Connection* 772 *Earth Science Connection* 727 TWE: AC 309 DE 6-7 IS 128, 246
f. Communicate and defend a scientific argument.	SE: 86-95, 143-147, 238-242 *Everyday Chemistry* 248-249, 275 *History Connection* 271 *How It Works* 519 *Literature Connection* 26
g. Know the differences among observations, hypotheses, and theories.	SE: 53-59, 86-94, 230-233, 342-345, 396-398, 719-720 *ChemLab* 136-137, 384-385
650. CONCEPTS OF PHYSICAL SCIENCE.	
01. Understand the structure of atoms.	
a. Know the function and location of protons, neutrons, and electrons.	SE: 61-65, 74-79, 98-99, 130-142, 230-235, 243-251, 744-749, 762-767
b. Understand the processes of fission and fusion.	SE: 762-767 TWE: AC 65 CB 761

STANDARDS	PAGE REFERENCES
c. Know the characteristics of isotopes.	SE: 62, 66-68, 749-750, 756-760, 768-774 *Chemistry and Technology* 754-755 *ChemLab* 752-753 *How It Works* 748
d. Know the basic electrical properties of matter.	SE: 585-588, 599-605 *ChemLab* 172-173, 606-607 *Health Connection* 610 *How It Works* 612, 614 TWE: DD 582-583
02. Understand the structure and function of matter and molecules and their interactions.	
a. Know how atoms interact with one another by transferring or sharing electrons.	SE: 130-135, 138-142, 156-165, 174-175, 243-251, 258-263, 302-314 *ChemLab* 136-137
b. Know how bonds between atoms are created when electrons are shared or transferred to form molecules or ionic substances.	SE: 130-142, 156-165, 174-175, 243-251, 258-263, 302-314 *ChemLab* 172-173, 266-267
c. Know how the physical properties of compounds reflect the nature of the interactions among its molecules.	SE: 330-333, 342-347, 438-444, 690 *Chemistry and Technology* 354-355 *MiniLab* 357 TWE: CB 372 DE 360-361
d. Know how solids, liquids, and gases differ in the energy that bonds them together.	SE: 342-345, 348-350, 356-361, 364-365, 438-444 *ChemLab* 362-363
03. Understand chemical reactions.	
a. Know that chemical reactions may release or consume energy.	SE: 42-43, 585-588, 599-605, 708-714, 719-720 *ChemLab* 722-723 *How It Works* 614 *Physics Connection* 566
b. Know that chemical reactions can occur in time periods that vary from very fast to very slow and that catalysts can affect the rate of a chemical reaction.	SE: 218-223, 676-677, 713-714 *ChemLab* 674-675 *Everyday Chemistry* 715 TWE: DE 730-731
c. Identify chemical reactions that are occurring all around us.	SE: *Everyday Chemistry* 194, 275, 657, 715 *How It Works* 167, 197, 569, 614
04. Understand concepts of motion and forces.	
a. Know that gravitational force and electrical force are universal forces.	SE: 61-65, 69-70, 134, 361 *How It Works* 410
b. Know that objects change their motion only when a net force is applied.	SE: 69-70 *Everyday Chemistry* 417
c. Understand that moving electrical charges produce magnetic forces, and moving magnets produce electrical forces.	SE: *Chemistry and Technology* 728-729 *How It Works* 410
05. Understand that the total energy in the universe is constant.	
a. Understand that energy can be transferred but it can neither be destroyed nor created.	SE: 711-712, 719-720, 726, 730-731, 736-737 *ChemLab* 362-363 TWE: CB 708 CD 54

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b. Know that energy can be classified as either potential energy, kinetic energy, or energy contained by a field.	SE: 348-351, 392, 601, 721-724, 736-737 *ChemLab* 362-363
c. Know that heat is evidenced by random motion and the vibrations of atoms, molecules, and ions.	SE: 348-353, 356-365, 391-392, 711 *Everyday Chemistry* 320 TWE: TPK 444 VL 445
d. Know that energy is transferred by various types of waves and by electrons flowing through matter.	SE: 70-72, 103-105, 111-112, 313-314, 599-605 TWE: IS 76 VL 121
653. MATTER, ENERGY, AND ORGANIZATION IN LIVING SYSTEMS.	
01. Understand the relationship between matter, energy, and organization to trace matter as it cycles and energy as it flows through living systems and between living systems and the environment.	
a. Know that all matter tends toward more disorganized states.	SE: 716-718, 730-731, 736-737
b. Know that living systems require a continuous input of energy to maintain their chemical and physical organization.	SE: 736-737 *ChemLab* 722-723
c. Know that the energy for life is primarily derived from the sun through photosynthesis.	SE: 43, 734-737
d. Understand cellular respiration and the synthesis of macromolecules.	SE: 690, 694-700, 734-735
e. Know that chemical bonds of food molecules contain energy, which is released when the bonds are broken.	SE: 721, 736-737 *ChemLab* 722-723 TWE: DE 726-727
f. Know that cells usually store energy as Adenosine Triphosphate (ATP).	SE: 694-697, 734-735
g. Know that the distribution and abundance of organisms and populations in ecosystems are limited by the availability of matter and energy.	TWE: CJ 736
h. Trace how matter cycles and energy flows through different levels of organization of living systems' cells, organs, organisms, communities, and between living systems and the physical environment.	SE: 55, 734-737 *Everyday Chemistry* 571
02. Understand the individual behavior of organisms and their interactions in populations and communities as influenced by physiological and environmental factors.	
a. Know that multi-cellular animals have nervous systems that generate behavior.	SE: *How It Works* 519 TWE: IS 611
b. Know that the nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules.	SE: *Biology Connection* 632 *How It Works* 519
c. Know that organisms have behavioral responses to internal changes and to external stimuli, and that broad patterns of behavior have evolved to ensure reproductive success.	SE: *Earth Science Connection* 727 *Health Connection* 610 TWE: QD 737
d. Know that behaviors often have an adaptive logic when viewed in terms of natural selection.	TWE: BC 632

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655. TECHNOLOGY.	
01. Understand the relationship between science and technology and develop the abilities of technological design and application.	
a. Know the ways that science advances technology and technology advances science.	SE: *Biology Connection* 203, 772 *Chemistry and Technology* 216-217, 240-241, 326-327, 590-592, 754-755 *Physics Connection* 566
b. Recognize that science and technology are pursued for different purposes and that scientific inquiry is driven by the desire to understand the natural world and technological design is driven by the need to meet human needs and solve human problems.	SE: 4-7, 77-79, 230-242 *Chemistry and Technology* 288-291, 590-592, 728-729 *ChemLab* 8-9, 206-207
c. Know that critical thinking, creativity, imagination, and a good knowledge base are all required in the work of science and engineering.	SE: *Chemistry and Society* 32, 146, 495, 537 *Chemistry and Technology* 108-109, 216-217, 573, 728-729
d. Know the elements of technological design, which include the following: - Identify a problem or design an opportunity; - Propose designs and choose between alternative solutions; - Implement a proposed solution; - Evaluate the solution and its consequences; - Communicate the problem, process, and solution.	SE: *Chemistry and Technology* 216-217, 326-327, 354-355, 424-425 *ChemLab* 136-137, 422-423, 722-723
e. Use available technology to assist in solving problems.	SE: *Chemistry and Society* 60, 447, 495, 659 *How It Works* 284, 410, 468, 612, 748
656. PERSONAL AND SOCIAL PERSPECTIVES.	
01. Understand common environmental quality issues, both natural and human induced.	
a. Identify issues, including but not limited to: - Water quality; - Air quality; - Hazardous waste; - Forest health.	SE: *Chemistry and Society* 60, 447, 495, 659 *Everyday Chemistry* 777 *History Connection* 271 *MiniLab* 452, 775
02. Understand the causes and effects of population change.	
a. Understand the impact of technological development and the growth of human population on the living and nonliving environment.	SE: *Chemistry and Society* 659 *History Connection* 271
b. Understand the impact of population change on natural resources and community infrastructure.	SE: 637-639 *Chemistry and Society* 659
03. Understand the importance of natural resources and the need to manage and conserve them.	
a. Understand the differences between renewable and nonrenewable resources.	SE: 637-639 *Chemistry and Society* 60, 659 *Chemistry and Technology* 216-217, 288-291, 590-592 TWE: E 661

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b. Understand the differences between preservation and conservation.	SE: 589, 725, 732 *Chemistry and Society* 60, 447, 495 TWE: CJ 638
c. Understand the role and effect of management of natural resources.	SE: 725, 732 *Chemistry and Society* 146, 447, 495, 659 *Chemistry and Technology* 728-729
01. Understand different uses of technology in science and how they affect our standard of living.	
a. Identify examples of technologies used in scientific fields, including but not limited to: - Weather forecasting; - Food production; - Environmental cleanup; - Advances in medicine; - Communications; - The space program.	SE: *Biology Connection* 203, 772 *Chemistry and Technology* 240-241, 390, 754-755 *How It Works* 410, 614 *Physics Connection* 566
657. HISTORY OF SCIENCE.	
01. Understand the significance of major scientific milestones.	
a. Understand the social and economic impact of historical scientific events.	SE: 53-55, 63-65, 86-94, 198, 762-765 *History Connection* 58 TWE: CUL 14 IS 144, 246
b. Understand the contributions of notable scientists.	SE: 88-91, 690 *ChemLab* 8-9 *History Connection* 58, 307 *Physics Connection* 232 TWE: AC 235 CUL 216
658. INTERDISCIPLINARY CONCEPTS.	
01. Understand that interpersonal relationships are important in scientific endeavors.	
a. Know the importance of working in interdisciplinary teams to solve scientific problems.	SE: 762 *Chemistry and Society* 32, 146, 537 *Chemistry and Technology* 216-217 TWE: AC 65 CUL 14
02. Understand technical communication.	
a. Read for information.	SE: *History Connection* 307 *Literature Connection* 26, 96 TWE: AC 102, 351, 467, 698 DIN 75
b. Write and articulate technical information.	SE: *Chemistry Skill Handbook* 804-808 *ChemLab* 136-137, 422-423, 542-543, 722-723 TWE: CJ 5, 10 DIN 75

Codes Used for TWE Pages

AC	Across the Curriculum
BA	Background
BC	Biology Connection
CB	Content Background
CD	Concept Development
CJ	Chemistry Journal
CUL	Cultural Diversity
DD	Discovery Demo
DE	Demonstration
DI	Discussion
DIN	Differentiated Instruction
E	Extension
IS	Integrating the Sciences
MIN	Meeting Individual Needs
QD	Quick Demo
TPK	Tying to Previous Knowledge
UA	Using an Analogy
VL	Visual Learning