AVENTA LEARNING

Alignment Document

State of California
And
Aventa Learning Chemistry

Chemistry
2005-2007 Benchmark Blueprint

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
0	Chemistry		
AM	Atomic and Molecular Structure		
AM.1	The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept:		
AM.1.a	Students know how to relate the position of an element in the periodic table to its atomic number and atomic mass.	Atoms	Lab: Periodic Table (P/P only)
		Atoms	Trends in the Periodic Table
		Nuclear Chemistry	Radioactive Isotopes
		Atoms	The Elements
AM.1.b	Students know how to use the periodic table to identify metals, semimetals, non-metals, and halogens.	Atoms	Regions of the Periodic Table
			The Elements
AM.1.c	Students know how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms.	Atoms	Regions of the Periodic Table
			The Elements

AM.1.d	Students know how to use the periodic table to determine the number of electrons available for bonding.	Atoms	Valence Electrons
		Atoms	Trends in the Periodic Table
		Atoms	The Elements
AM.1.e	Students know the nucleus of the atom is much smaller than the atom yet contains most of its mass.	Atoms	The Atom
AM.1.f	Students know how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators.		
AM.1.g	Students know how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table.	Atoms	The Elements
		Atoms	Valence Electrons
AM.1.h	Students know the experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect.	Atoms	The Atom
AM.1.i	Students know the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom.	Atoms	The Atom
AM.1.j	Students know that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship (E = hv).	Atoms	Electrons in atoms
CB	Chemical Bonds		
CB.2	Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules. As a basis for understanding this concept:		

CB.2.a	Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.	Bonding	Ionic Bonding
		Bonding	Metallic Bonding
		Bonding	Covalent Bonding
		Bonding	Lab: Bonding (P/P only)
CB.2.b	Students know chemical bonds between atoms in molecules such as H2, CH4, NH3, H2CCH2, N2, Cl2, and many large biological molecules are covalent.	Bonding	Covalent Bonding
CB.2.c	Students know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.	Bonding	Ionic Bonding
CB.2.d	Students know the atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form.	Bonding	States of Matter
CB.2.e	Students know how to draw Lewis dot structures.	Bonding	Lab: Bonding (P/P only)
		Bonding	Lewis Dot Structures
CB.2.f	Students know how to predict the shape of simple molecules and their polarity from Lewis dot structures.	Bonding	Lewis Dot Structures
		Bonding	Lab: Bonding (P/P only)
CB.2.g	Students know how electronegativity and ionization energy relate to bond formation.		
CB.2.h	Students know how to identify solids and liquids held together by Van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/melting point temperatures.		
CM	Conservation of Matter and Stoichiometry		
CM.3	The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept:		
CM.3.a	Students know how to describe chemical reactions by writing balanced equations.	Matter	Equation Balancing
		Matter	Classifying Chemical Reactions

CM.3.b	Students know the quantity one mole is set by defining one mole of carbon 12 atoms to have a mass of exactly 12 grams.	Matter	The Mole
CM.3.c	Students know one mole equals 6.02 x 10 to the 23rd power particles (atoms or molecules).	Matter	The Mole
CM.3.d	Students know how to determine the molar mass of a molecule from its chemical formula and a table of atomic masses and how to convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.	Matter	Molar Mass
		Matter	Atoms, Molecules, and Moles
CM.3.e	Students know how to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products and the relevant atomic masses.	Matter	Stoichiometry
		Matter	Molar Mass
CM.3.f	Students know how to calculate percent yield in a chemical reaction.		
CM.3.g	Students know how to identify reactions that involve oxidation and reduction and how to balance oxidation-reduction reactions.		
G	Gases and Their Properties		
G.4	The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept:		
G.4.a	Students know the random motion of molecules and their collisions with a surface create the observable pressure on that surface.		
G.4.b	Students know the random motion of molecules explains the diffusion of gases.	Gases	Pressure
G.4.c	Students know how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.	Gases	Pressure
		Gases	Lab: Observe gas laws by changing P, V, T
		Gases	Gas Laws
G.4.d	Students know the values and meanings of standard temperature and pressure (STP).	Gases	Pressure

G.4.e	Students know how to convert between the Celsius and Kelvin temperature scales.	Measurement	Temperature
G.4.f	Students know there is no temperature lower than 0 Kelvin.	Measurement	Temperature
G.4.g	Students know the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.		
G.4.h	Students know how to solve problems by using the ideal gas law in the form PV = nRT.	Gases	Gas Laws
G.4.i	Students know how to apply Dalton's law of partial pressures to describe the composition of gases and Graham's law to predict diffusion of gases.		
AB	Acids and Bases		
AB.5	Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept:		
AB.5.a	Students know the observable properties of acids, bases, and salt solutions.	Acids & Bases	Deinition of Acids and Bases
		Acids & Bases	Properties of Acids and Bases
		Acids & Bases	Acid and Base Strength
AB.5.b	Students know acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.	Acids & Bases	Deinition of Acids and Bases
		Acids & Bases	Properties of Acids and Bases
AB.5.c	Students know strong acids and bases fully dissociate and weak acids and bases partially dissociate.	Acids & Bases	Properties of Acids and Bases
		Acids & Bases	Acid and Base Strength
		Acids & Bases	The pH Scale
AB.5.d	Students know how to use the pH scale to characterize acid and base solutions.	Acids & Bases	The pH Scale
		Acids & Bases	Lab: Test household acids/bases
AB.5.e	Students know the Arrhenius, Bronsted-Lowry, and Lewis acid-base definitions.	Acids & Bases	Properties of Acids and Bases
AB.5.f	Students know how to calculate pH from the hydrogen-ion concentration.	Acids & Bases	The pH Scale
AB.5.g	Students know buffers stabilize pH in acid-base reactions.		

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S	Solutions		
S.6	Solutions are homogenous mixtures of two or more substances. As a basis for understanding this concept:		
S.6.a	Students know the definitions of solute and solvent.	Solutions	Definitions
S.6.b	Students know how to describe the dissolving process at the molecular level by using the concept of random molecular motion.	Solutions	The Dissolution Process
S.6.c	Students know temperature, pressure, and surface area affect the dissolving process.	Solutions	Factors that Affect the Dissoltion Process
S.6.d	Students know how to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million, and percent composition.	Solutions	Lab: make solution of kool-aid
		Solutions	Concentration
S.6.e	Students know the relationship between the molality of a solute in a solution and the solution's depressed freezing point or elevated boiling point.		
S.6.f	Students know how molecules in a solution are separated or purified by the methods of chromatography and distillation.		
CT	Chemical Thermodynamics		
CT.7	Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept:		
CT.7.a	Students know how to describe temperature and heat flow in terms of the motion of molecules (or atoms).	Rates	Temperature
		Thermodynamics	Heat Flow
CT.7.b	Students know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.	Equilibrium	Temperature
		Thermodynamics	Chemical Processes
CT.7.c	Students know energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts.	Thermodynamics	Heat Flow and Physiical Changes
		Thermodynamics	Solving Problmes Involving Heat Flow
		Thermodynamics	Lab: Calc heat of fusion using calorimeter

CT.7.d	Students know how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change.	Thermodynamics	Solving Problmes Involving Heat Flow
CT.7.e	Students know how to apply Hess's law to calculate enthalpy change in a reaction.		
CT.7.f	Students know how to use the Gibbs free energy equation to determine whether a reaction would be spontaneous.		
RR	Reaction Rates		
RR.8	Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. As a basis for understanding this concept:		
RR.8.a	Students know the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.	Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Le Chatelier's Principle
		Equilibrium	Deinition of Chemical Equilibrium
		Rates	Definition of Reaction Rates
		Rates	Lab: Factors affecting Rate of Reaction
		Rates	Temperature
		Rates	Concentration
RR.8.b	Students know how reaction rates depend on such factors as concentration, temperature, and pressure.	Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Pressure
		Equilibrium	Temperature
		Equilibrium	Concentration
		Equilibrium	Le Chatelier's Principle
		Rates	Definition of Reaction Rates
		Rates	Lab: Factors affecting Rate of Reaction
		Rates	Temperature
		Rates	Concentration
		Rates	Pressure
RR.8.c	Students know the role a catalyst plays in increasing the reaction rate.	Rates	Catalyst
		Rates	Lab: Factors affecting Rate of Reaction

RR.8.d	Students know the definition and role of activation energy in a chemical reaction.		
EQ	Chemical Equilibrium		
EQ.9	Chemical equilibrium is a dynamic process at the molecular level. As a basis for understanding this concept:		
EQ.9.a	Students know how to use LeChatelier's principle to predict the effect of changes in concentration, temperature, and pressure.	Equilibrium	Concentration
		Equilibrium	Le Chatelier's Principle
		Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Pressure
		Equilibrium	Temperature
EQ.9.b	Students know equilibrium is established when forward and reverse reaction rates are equal.	Equilibrium	Deinition of Chemical Equilibrium
		Equilibrium	Temperature
		Equilibrium	Concentration
		Equilibrium	Le Chatelier's Principle
		Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Pressure
EQ.9.c	Students know how to write and calculate an equilibrium constant expression for a reaction.	Equilibrium	Le Chatelier's Principle
OC	Organic Chemistry and Biochemistry		
OC.10	The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. As a basis for understanding this concept:		
OC.10.a	Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.	Organic Chemistry	Bonding
		Organic Chemistry	Amino Acids
		Organic Chemistry	Polymers

OC.10.b	Students know the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.	Organic Chemistry	Polymers
		Organic Chemistry	Bonding
OC.10.c	Students know amino acids are the building blocks of proteins.	Organic Chemistry	Amino Acids
OC.10.d	Students know the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds, and simple molecules that contain a benzene ring.		
OC.10.e	Students know how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids.		
OC.10.f	Students know the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins.	Organic Chemistry	Amino Acids
NP	Nuclear Processes		
NP.11	Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and human-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept:		
NP.11.a	Students know protons and neutrons in the nucleus are held together by nuclear forces that overcome the electromagnetic repulsion between the protons.		
NP.11.b	Students know the energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions. The change in mass (calculated by $E = mc^2$) is small but significant in nuclear reactions.	Nuclear Chemistry	Fission and Fusion
NP.11.c	Students know some naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.	Nuclear Chemistry	Radioactive Decay

NP.11.d	Students know the three most common forms of radioactive decay (alpha, beta, and gamma) and know how the nucleus changes in each type of decay.	Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
		Nuclear Chemistry	Radioactive Decay
NP.11.e	Students know alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.	Nuclear Chemistry	Radioactive Decay
NP.11.f	Students know how to calculate the amount of a radioactive substance remaining after an integral number of half lives have passed.		
NP.11.g	Students know protons and neutrons have substructures and consist of particles called quarks.		
0	Investigation and Experimentation		
I	Investigation and Experimentation		
I.1	Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations.		
I.1.a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.		
I.1.b	Identify and communicate sources of unavoidable experimental error.	Measurement	Uncertainty
I.1.c	Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	Measurement	Uncertainty
I.1.d	Formulate explanations by using logic and evidence.		
I.1.e	Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.		
I.1.f	Distinguish between hypothesis and theory as scientific terms.	Measurement	Scientific Method
I.1.g	Recognize the usefulness and limitations of models and theories as scientific representations of reality.	Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom

I.1.h	Read and interpret topographic and geologic maps.		
I.1.i	Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).		
I.1.j	Recognize the issues of statistical variability and the need for controlled tests.		
I.1.k	Recognize the cumulative nature of scientific evidence.		
I.1.l	Analyze situations and solve problems that require combining and applying concepts from more than one area of science.		
I.1.m	Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.		
I.1.n	Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).		