AVENTA LEARNING

Alignment Document

State of West Virginia
And
Aventa Learning Chemistry

Chemistry
2005-2007 Benchmark Blueprint

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
AC	Advanced Chemistry		
AC.1	Students will: demonstrate an understanding of the history of science and the evolvement of scientific knowledge, demonstrate an understanding of science as a human endeavor encompassing the contributions of diverse cultures and scientists, and demonstrate an understanding of the nature of science.		
AC.1.1	formulate scientific explanations based on the student's observational and experimental evidence, accounting for variability in experimental results.	Solutions	Lab: make solution of kool-aid
AC.1.2	recognize that science has practical and theoretical limitations.		
AC.1.3	recognize that science is based on a set of observations in a testable framework that demonstrate basic laws that are consistent.	Organic Chemistry	Lab: Make Slime (polymers)
AC.1.4	conclude that science is a blend of creativity, logic and mathematics.		
AC.1.5	trace the development of key historical concepts and principles describing their impact on modern thought and life by identifying the scientist's contributions.		
AC.1.6	integrate the history of science with cultural history to demonstrate that scientists work within their historical surroundings and are affected by them.		

AC.2	Students will: demonstrate the abilities necessary to do scientific inquiry; demonstrate understanding about scientific inquiry; and demonstrate the ability to think and act as scientists by engaging in active inquiries, investigations and hands-on activities a minimum of 50% of the instructional time.		
AC.2.1	model and exhibit the skills, attitudes and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, ethical practice, fairness, creativity).		
AC.2.2	demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review).		
AC.2.3	apply scientific approaches to seek solutions for personal and societal issues.	Measurement	Scientific Method
AC.2.4	properly and safely manipulate equipment, materials, chemicals, organisms and models.	Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
AC.2.5	conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations).		
AC.2.6	use appropriate technology solutions (e.g., computer, CBL, probe interfaces, software) to measure and collect data; interpret data; analyze and/or report data, interact with simulations; conduct research; and to present and communicate conclusions.		
AC.2.7	demonstrate science processes within a problem solving setting (e.g., observing, measuring, calculating, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, considering alternatives, applying).		

AC.2.8	design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide investigations; design investigations; identify independent and dependent variables in experimental investigations; manipulate variables to extend experimental activities; use technology and mathematics to improve investigations and communications; formulate and revise scientific explanations and models using logic and evidence; recognize alternative explanations; communicate and defend a scientific argument.).		
AC.3	Students will: demonstrate an understanding of interdependent themes present in the natural and designed world (e.g., systems, order and organization; evidence, models and explanation; constancy, change and measurement; equilibrium and evolution; form and function); demonstrate the ability to identify, construct, test, analyze and evaluate systems, models, and changes; and demonstrate the ability to draw conclusions about and predict changes in natural and designed systems.		
AC.3.1	analyze systems to understand the natural and designed world; use systems analysis to make predictions about behaviors in systems; recognize order in units of matter, objects or events.	Equilibrium	Le Chatelier's Principle
AC.3.2	apply evidence from models to make predictions about interactions and changes in systems.	Equilibrium	Le Chatelier's Principle
		Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
AC.3.3	measure changes in systems using graphs and equations relating these to rate, scale, patterns, trends and cycles.	Gases	Temperature
AC.3.4	understand that different characteristics, properties or relationships within a system might change as its dimensions are increased or decreased (e.g., scale up, scale down).		

AC.4	Students will: demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives; demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences; and apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.		
0	Properties of Matter		
AC.4.1	review the classification of matter using the periodic table; the use the kinetic molecular theory to explain physical states of matter; physical and chemical properties; and physical and chemical changes.	Atoms	Trends in the Periodic Table
		Atoms	The Elements
		Atoms	The Periodic Table
		Atoms	Valence Electrons
		Atoms	Regions of the Periodic Table
		Atoms	Lab: Periodic Table (P/P only)
		Solutions	Lab: make solution of kool-aid
		Organic Chemistry	Lab: Make Slime (polymers)
0	Atomic Structure		
AC.4.2	review Bohr model of the atom and calculation of subatomic particles - protons, neutrons, and electrons.	Nuclear Chemistry	Inside the Atom
AC.4.3	research and evaluate the contributions of Dalton, Planck, Bohr, Einstein, and de Broglie, Heisenberg, and Schrodinger to the evolution of the atomic theory.	Atoms	The Atom
		Atoms	Electrons in Atoms
AC.4.4	identify four types of electron clouds (s, p, d, f) and describe the quantum number (n, l, m, s) for electrons.	Atoms	Electrons in Atoms
AC.4.5	write electron configurations and associate electron configuration of elements with element location on periodic table.	Atoms	Electrons in Atoms

AC.4.6	write electron dot structures for representative elements.	Bonding	Lab: Bonding (P/P only)
		Bonding	Lewis Dot Structures
0	Bonding		
AC.4.7	predict the formulas of ionic compounds and molecular compounds.	Bonding	Ionic Bonding
AC.4.8	analyze the periodic table to predict trends in atomic size, ionic size, electronegativity, ionization energy and electron affinity.	Atoms	Trends in the Periodic Table
AC.4.9	using the periodic table, predict the type of bonding that occurs between atoms and differentiate among properties of ionic, covalent and metallic bonds.	Bonding	Ionic Bonding
		Bonding	Covalent Bonding
		Bonding	Metallic Bonding
		Bonding	Lab: Bonding (P/P only)
AC.4.10	construct models to explain the structure and geometry of organic and inorganic molecules and the lattice structures of crystals.	Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
AC.4.11	recognize simple organic functional groups and name simple organic compounds.	Organic Chemistry	Bonding
0	Stoichiometry		
AC.4.12	predict the products and write balanced equations for the general types of chemical reactions.	Matter	Equation Balancing
		Matter	Classifying Chemical Reactions
AC.4.13	use dimensional analysis to perform unit conversions and to verify experimental calculations.		
AC.4.14	use the Avogadro constant to define the mole and to calculate molecular and molar mass as well as a molar volume.	Solutions	Concentration
		Matter	Molar Mass
		Matter	Atoms, Molecules, and Moles
AC.4.15	perform calculations using the combined and ideal gas laws.	Gases	Gas Laws
		Gases	Lab: Observe gas laws by changing P, V, T

AC.4.16	use molar mass to calculate the molarity of solutions, percentage composition, empirical formulas and formulas of hydrates.	Solutions	The Dissolution Process
		Solutions	Concentration
		Solutions	Lab: make solution of kool-aid
		Matter	Molar Mass
		Matter	Atoms, Molecules, and Moles
AC.4.17	experimentally determine the empirical formulas of hydrates.	Solutions	The Dissolution Process
AC.4.18	perform stoichiometric calculations including mass-mass, mass-volume, volume-volume including problems to determine theoretical yield and to identify the limiting reactant.	Matter	Lab: Conservation of mass (P/P only)
		Matter	Molar Mass
		Matter	Atoms, Molecules, and Moles
		Matter	Stoichiometry
0	Equilibrium		
AC.4.19	experimentally determine the factors that influence the rate of reaction.	Rates	Temperature
		Rates	Pressure
		Rates	Definition of Reaction Rates
		Rates	Catalyst
		Rates	Concentration
		Rates	Lab: Factors affecting Rate of Reaction
		Equilibrium	Definition of Chemical Equilibrium
		Equilibrium	Pressure
		Equilibrium	Le Chatelier's Principle
		Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Concentration
		Equilibrium	Temperature
AC.4.20	apply LeChatelier's principle to explain the effect of changes in concentration, pressure, volume, and temperature on an equilibrium system.	Thermodynamics	Heat Flow
		Equilibrium	Temperature
		Equilibrium	Pressure
		Equilibrium	Le Chatelier's Principle

		Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Concentration
		Solutions	Lab: make solution of kool-aid
		Rates	Temperature
0	Solution Chemistry		
AC.4.21	review colligative properties.		
AC.4.22	name and define acids and bases using Arrhenius, Bronsted-Lowry and Lewis definitions.	Acids & Bases	Properties of Acids and Bases
AC.4.23	predict the products upon adding water to both acidic and basic anhydrides.	Acids & Bases	The pH Scale
		Acids & Bases	Properties of Acids and Bases
		Acids & Bases	Lab: Test household acids/bases
		Acids & Bases	Definition of Acids and Bases
		Acids & Bases	Acid and Base Strength
AC.4.24	write and balance net ionic equations.	Matter	Equation Balancing
AC.4.25	solve problems using the solubility product constants.	Solutions	Solubility
AC.4.26	calculate the pH and/or pOH for various solutions and relate to the pH scale.	Acids & Bases	The pH Scale
		Acids & Bases	Lab: Test household acids/bases
AC.4.27	conduct titrations and perform calculations for both acid-base and oxidation-reduction reactions.	Acids & Bases	The pH Scale
		Acids & Bases	Properties of Acids and Bases
		Acids & Bases	Lab: Test household acids/bases
		Acids & Bases	Definition of Acids and Bases
		Acids & Bases	Acid and Base Strength
0	Electrochemistry		
AC.4.28	define oxidation and reduction in terms of electron transfer within reactions.		
AC.4.29	construct electrolytic cells, write and balance the half-cell reactions and calculate cell voltage.		

0	Reaction Dynamics		
AC.4.30	calculate the enthalpy change in reactions using the heat of formation.	Thermodynamics	Solving Problems Involving Heat Flow
AC.4.31	evaluate the factors driving chemical reactions including enthalpy and entropy and their interrelationship.	Matter	Classifying Chemical Reactions
0	Nuclear Chemistry		
AC.4.32	write balanced nuclear equations and make predications using half-life values.	Matter	Equation Balancing
AC.4.33	list the biological effects of radiation and the units used to measure radiation.		
AC.4.34	compare and contrast fusion and fission reactions.	Nuclear Chemistry	Fission and Fusion
AC.4.35	research the application of nuclear technology.	Nuclear Chemistry	Fission and Fusion
AC.5	Students will: demonstrate an understanding of the interdependence between science and technology; demonstrate the ability to distinguish between natural and man-made objects; demonstrate abilities of technological design; and demonstrate the ability to utilize technology to gather data and communicate designs, results and conclusions.		
AC.5.1	summarize technological advances in chemistry.		
AC.5.2	investigate and analyze the interdependence of science and technology.		
AC.5.3	apply scientific skills and technological tools to design solutions that address personal and societal needs.		
AC.5.4	describe the scientific concepts underlying technological innovations.		
AC.5.5	use appropriate technology solutions to measure and gather data; interpret data; analyze data; and to present and communicate conclusions.		

AC.6	Students will: demonstrate the ability to evaluate personal and societal benefits when examining health, population, resource and environmental issues; demonstrate the ability to evaluate the impact of different points of view on health, population, resource and environmental practices; predict the long-term societal impact of specific health, population, resource and environmental practices; and demonstrate an understanding of public policy decisions as related to health, population, resource and environmental issues.		
AC.6.1	research current environmental issues pertaining to chemistry.		
AC.6.2	describe the impact of cultural, technological and economic influences on the evolving nature of scientific thought and knowledge.		
AC.6.3	explore occupational opportunities in science and technology including the academic preparation necessary.		
AC.6.4	engage in decision making activities and actions to resolve science-technology-society issues.		
CTC	Chemistry-Technical Conceptual		
CTC.1	Students will: demonstrate an understanding of the history of science and the evolvement of scientific knowledge, demonstrate an understanding of science as a human endeavor encompassing the contributions of diverse cultures and scientists, and demonstrate an understanding of the nature of science.		
CTC.1.1	formulate scientific explanations based on the student's observational and experimental evidence, accounting for variability in experimental results.	Solutions	Lab: make solution of kool-aid
CTC.1.2	recognize that science has practical and theoretical limitations.		
CTC.1.3	recognize that science is based on a set of observations in a testable framework that demonstrate basic laws that are consistent.	Organic Chemistry	Lab: Make Slime (polymers)

CTC.1.4	conclude that science is a blend of creativity, logic and mathematics.		
CTC.1.5	trace the development of key historical concepts and principles describing their impact on modern thought and life by identifying the scientist's contributions.		
CTC.1.6	integrate the history of science with cultural history to demonstrate that scientists work within their historical surroundings and are affected by them.		
CTC.2	Students will: demonstrate the abilities necessary to do scientific inquiry; demonstrate understanding about scientific inquiry; and demonstrate the ability to think and act as scientists by engaging in active inquiries, investigations and hands-on activities a minimum of 50% of the instructional time.		
CTC.2.1	model and exhibit the skills, attitudes and/or values of scientific inquiry (e.g., curiosity, logic, objectivity, openness, skepticism, appreciation, diligence, integrity, ethical practice, fairness, creativity).		
CTC.2.2	demonstrate ethical practices for science (e.g., established research protocol, accurate record keeping, replication of results and peer review).		
CTC.2.3	apply scientific approaches to seek solutions for personal and societal issues.		
CTC.2.4	properly and safely manipulate equipment, materials, chemicals, organisms and models.	Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
CTC.2.5	conduct explorations in a variety of environments (e.g., laboratories, museums, libraries, parks and other outdoors locations).		
CTC.2.6	use appropriate technology solutions (e.g., computer, CBL, probe interfaces, software) to measure and collect data; interpret data; analyze and/or report data; interact with simulations; conduct research; and to present and communicate conclusions.		

CTC.2.7	demonstrate science processes within a problem solving setting (e.g., observing, measuring, calculating, communicating, comparing, ordering, categorizing, classifying, relating, hypothesizing, predicting, inferring, considering alternatives, and applying).		
CTC.2.8	design, conduct, evaluate and revise experiments (e.g., identify questions and concepts that guide investigations; design investigations; identify independent and dependent variables in experimental investigations; manipulate variables to extend experimental activities; use technology and mathematics to improve investigations and communications; formulate and revise scientific explanations and models using logic and evidence; recognize alternative explanations; communicate and defend a scientific argument).		
CTC.3	Students will: demonstrate an understanding of interdependent themes present in the natural and designed world (e.g., systems, order and organization; evidence, models and explanation; constancy, change and measurement; equilibrium and evolution; form and function); demonstrate the ability to identify, construct, test, analyze and evaluate systems, models, and changes; and demonstrate the ability to draw conclusions about and predict changes in natural and designed systems.		
CTC.3.1	analyze systems to understand the natural and designed world; use systems analysis to make predictions about behaviors in systems; recognize order in units of matter, objects or events.	Equilibrium	Le Chatelier's Principle
CTC.3.2	apply evidence from models to make predictions about interactions and changes in systems.	Equilibrium	Le Chatelier's Principle
		Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
CTC.3.3	measure changes in systems using graphs and equations relating these to rate, scale, patterns, trends and cycles.	Gases	Temperature

CTC.3.4	understand that different characteristics, properties or relationships within a system might change as its dimensions are increased or decreased (e.g., scale up, scale down).		
CTC.4	Students will: demonstrate knowledge, understanding and applications of scientific facts, concepts, principles, theories and models as delineated in the objectives; demonstrate an understanding of the interrelationships among physics, chemistry, biology and the earth and space sciences; and apply knowledge, understanding and skills of science subject matter/concepts to daily life experiences.		
CTC.4.1	review the classification of matter and the properties of metals and nonmetals.	Atoms	Regions of the Periodic Table
CTC.4.2	identify sources and uses of elements.		
CTC.4.3	use the kinetic molecular theory to explain physical states of matter.	Bonding	States of Matter
CTC.4.4	perform calculations using the gas laws.	Gases	Gas Laws
		Gases	Lab: Observe gas laws by changing P, V, T
CTC.4.5	apply the principle of distillation to the separation of liquids (e.g., petroleum or water purification).		
CTC.4.6	review the parts of the atom.	Nuclear Chemistry	Inside the Atom
CTC.4.7	review the relationship of an element's group and period position with its properties.		
CTC.4.8	compare atomic and ionic electronic structures.	Bonding	Ionic Bonding
CTC.4.9	review formula writing and ionic and covalent bonding.	Bonding	Covalent Bonding
		Bonding	Lab: Bonding (P/P only)
		Bonding	Ionic Bonding
CTC.4.10	recognize the impact of water's unusual physical properties.	Solutions	Lab: make solution of kool-aid
CTC.4.11	predict solute solubility based on molecular polarity.	Solutions	Definitions
		Solutions	The Dissolution Process
		Solutions	Factors that Affect the Dissolution Process
		Solutions	Solubility

CTC.4.12	review balancing equations.	Matter	Equation Balancing
CTC.4.13	use dimensional analysis to perform unit conversions and to verify experimental calculations.		
CTC.4.14	relate the mole concept to chemical formulas.	Bonding	Ionic Bonding
		Matter	The Mole
CTC.4.15	use moles to measure chemical quantities.	Matter	Stoichiometry
		Matter	The Mole
		Matter	Lab: Conservation of mass (P/P only)
		Matter	Molar Mass
		Matter	Atoms, Molecules, and Moles
CTC.4.16	determine the percent composition by mass of the elements in a compound.	Bonding	Ionic Bonding
		Solutions	Concentration
CTC.4.17	make connections between resource conservation and the Law of Conservation of Matter.	Matter	Lab: Conservation of mass (P/P only)
CTC.4.18	illustrate the concept of a limiting reagent.		
CTC.4.19	review solution properties (e.g., solubility, conductivity, density, pH and colligative).	Solutions	Factors that Affect the Dissolution Process
		Solutions	Concentration
		Solutions	Definitions
		Solutions	The Dissolution Process
CTC.4.20	define solutions in terms of saturation.	Solutions	Solubility
CTC.4.21	perform solutions concentration calculations (e.g., molarity, ppm).	Equilibrium	Concentration
		Solutions	Lab: make solution of kool-aid
CTC.4.22	compare and contrast the properties of strong and weak acids and bases.	Acids & Bases	Acid and Base Strength
		Acids & Bases	The pH Scale
		Acids & Bases	Properties of Acids and Bases
		Acids & Bases	Lab: Test household acids/bases
		Acids & Bases	Definition of Acids and Bases
CTC.4.23	perform an acid-base neutralization reaction.		

CTC.4.24	construct electrolytic cells to observe the reduction of ions into free metals and write the half reactions that occur.		
CTC.4.25	predict reactions of metals with aqueous solutions using the Metal Activity Series.	Solutions	Factors that Affect the Dissolution Process
		Solutions	Concentration
		Solutions	Definitions
		Solutions	Lab: make solution of kool-aid
		Solutions	The Dissolution Process
		Bonding	Metallic Bonding
CTC.4.26	review temperature and heat.	Thermodynamics	Lab: Calc heat of fusion using calorimeter
		Thermodynamics	Heat Flow
		Thermodynamics	Heat Flow and Physical Changes
		Rates	Temperature
CTC.4.27	measure the flow of energy into or out of chemical reactions.	Matter	Classifying Chemical Reactions
CTC.4.28	predict the effect of temperature and catalysts on reaction rates.	Rates	Catalyst
		Rates	Temperature
		Thermodynamics	Heat Flow
CTC.4.29	apply LeChatelier's Principle in determining equilibrium.	Equilibrium	Temperature
		Equilibrium	Pressure
		Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Le Chatelier's Principle
0	Carbon and Petroleum		
CTC.4.30	draw and construct models for the first ten alkanes.	Nuclear Chemistry	Lab: Construct a Bohr Model of C-13 atom
CTC.4.31	relate the properties of organic compounds to their functional groups (e.g., alcohol and esters).		
CTC.4.32	demonstrate the formation of polymers from smaller molecules.	Organic Chemistry	Bonding
		Organic Chemistry	Lab: Make Slime (polymers)
		Organic Chemistry	Polymers
CTC.4.33	compare and contrast the use of petroleum as either a source of energy or as a fundamental ingredient of synthetic materials.		

CTC.4.34	review nuclear fusion and fission, isotopes and half-lives.	Atoms	The Atom
		Nuclear Chemistry	Fission and Fusion
		Nuclear Chemistry	Radioactive Isotopes
CTC.4.35	compare the penetrating energies of nuclear radiation.	Nuclear Chemistry	Fission and Fusion
CTC.4.36	balance simple nuclear equations.		
CTC.4.37	explain practical applications of nuclear technology (e.g., radioactive dating, radioisotopes in medicine).	Nuclear Chemistry	Radioactive Decay
CTC.5	Students will: demonstrate an understanding of the interdependence between science and technology; demonstrate the ability to distinguish between natural and man-made objects; demonstrate abilities of technological design; and demonstrate the ability to utilize technology to gather data and communicate designs, results and conclusions.		
CTC.5.1	summarize technological advances in chemistry.		
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