



Alignment Document

State of Arizona And Aventa Learning Chemistry

Chemistry

2005-2007 Benchmark Blueprint

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
1	Inquiry Process		
1.1	Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate		
1.1.PO 1	Evaluate scientific information for relevance to a given problem.		
1.1.PO 2	Develop questions from observations that transition into testable hypotheses.	Measurement	Scientific Method
		Organic Chemistry	Lab: Make Slime (polymers)
1.1.PO 3	Formulate a testable hypothesis.	Measurement	Scientific Method
1.1.PO 4	Predict the outcome of an investigation based on prior evidence, probability, and/or modeling (not guessing or inferring).	Equilibrium	Le Chatelier's Principle
1.2	Design and conduct controlled investigations.		
1.2.PO 1	Demonstrate safe and ethical procedures (e.g., use and care of technology, materials, organisms) and behavior in all science inquiry.		
1.2.PO 2	Identify the resources needed to conduct an investigation.		
1.2.PO 3	Design an appropriate protocol (written plan of action) for testing a hypothesis:		
1.2.PO 3.a	Identify dependent and independent variables in a controlled investigation.		

1.2.PO 3.b	Determine an appropriate method for data collection (e.g., using balances, thermometers, microscopes, spectrophotometer, using qualitative changes).		
1.2.PO 3.c	Determine an appropriate method for recording data (e.g., notes, sketches, photographs, videos, journals (logs), charts, computers/calculators).		
1.2.PO 4	Conduct a scientific investigation that is based on a research design.		
1.2.PO 5	Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.	Organic Chemistry	Lab: Make Slime (polymers)
1.3	Evaluate experimental design, analyze data to explain results and to propose further investigations. Design models.		
1.3.PO 1	Interpret data that show a variety of possible relationships between variables, including:		
1.3.PO 1.a	positive relationship		
1.3.PO 1.b	negative relationship		
1.3.PO 1.c	no relationship		
1.3.PO 2	Evaluate whether investigational data support or do not support the proposed hypothesis.	Measurement	Scientific Method
		Solutions	Lab: make solution of kool-aid
1.3.PO 3	Critique reports of scientific studies (e.g., published papers, student reports).		
1.3.PO 4	Evaluate the design of an investigation to identify possible sources of procedural error, including:		
1.3.PO 4.a	sample size		
1.3.PO 4.b	trials		
1.3.PO 4.c	controls		
1.3.PO 4.d	analyses		
1.3.PO 5	Design models (conceptual or physical) of the following to represent "real world" scenarios:		
1.3.PO 5.a	carbon cycle		
1.3.PO 5.b	water cycle		



1.3.PO 5.c	phase change		
1.3.PO 5.d	collisions		
1.3.PO 6	Use descriptive statistics to analyze data, including:		
1.3.PO 6.a	mean		
1.3.PO 6.b	frequency		
1.3.PO 6.c	range		
1.3.PO 7	Propose further investigations based on the findings of a conducted investigation.		
1.4	Communicate results of investigations.		
1.4.PO 1	For a specific investigation, choose an appropriate method for communicating the results.	Solutions	Lab: make solution of kool-aid
1.4.PO 2	Produce graphs that communicate data.	Gases	Temperature
1.4.PO 3	Communicate results clearly and logically.		
1.4.PO 4	Support conclusions with logical scientific arguments.		
2	History and Nature of Science		
2.1	Identify individual, cultural, and technological contributions to scientific knowledge.		
2.1.PO 1	Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.		
2.1.PO 2	Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.		
2.1.PO 3	Analyze how specific changes in science have affected society.		
2.1.PO 4	Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.		
2.2	Understand how scientists evaluate and extend scientific knowledge.		
2.2.PO 1	Specify the requirements of a valid, scientific explanation (theory), including that it be:		
2.2.PO 1.a	logical		
2.2.PO 1.b	subject to peer review		
2.2.PO 1.c	public		



2.2.PO 1.d	respectful of rules of evidence		
2.2.PO 2	Explain the process by which accepted ideas are challenged or extended by scientific innovation.		
2.2.PO 3	Distinguish between pure and applied science.		
2.2.PO 4	Describe how scientists continue to investigate and critically analyze aspects of theories.		
3	Science in Personal and Social Perspectives		
3.1	Describe the interactions between human populations, natural hazards, and the environment.		
3.1.PO 1	Evaluate how the processes of natural ecosystems affect, and are affected by, humans.		
3.1.PO 2	Describe the environmental effects of the following natural and/or human-caused hazards:		
3.1.PO 2.a	flooding		
3.1.PO 2.b	drought		
3.1.PO 2.c	earthquakes		
3.1.PO 2.d	fires		
3.1.PO 2.e	pollution		
3.1.PO 2.f	extreme weather		
3.1.PO 3	Assess how human activities (e.g., clear cutting, water management, tree thinning) can affect the potential for hazards.		
3.1.PO 4	Evaluate the following factors that affect the quality of the environment:		
3.1.PO 4.a	urban development		
3.1.PO 4.b	smoke		
3.1.PO 4.c	volcanic dust		
3.1.PO 5	Evaluate the effectiveness of conservation practices and preservation techniques on environmental quality and biodiversity.		
3.2	Develop viable solutions to a need or problem.		
3.2.PO 1	Analyze the costs, benefits, and risks of various ways of dealing with the following needs or problems:		
3.2.PO 1.a	various forms of alternative energy		



3.2.PO 1.b	storage of nuclear waste		
3.2.PO 1.c	abandoned mines		
3.2.PO 1.d	greenhouse gases		
3.2.PO 1.e	hazardous wastes		
3.2.PO 2	Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology.		
3.2.PO 3	Support a position on a science or technology issue.		
3.2.PO 4	Analyze the use of renewable and nonrenewable resources in Arizona:		
3.2.PO 4.a	water		
3.2.PO 4.b	land		
3.2.PO 4.c	soil		
3.2.PO 4.d	minerals		
3.2.PO 4.e	air		
3.2.PO 5	Evaluate methods used to manage natural resources (e.g., reintroduction of wildlife, fire ecology).		
3.3	Analyze factors that affect human populations.		
3.3.PO 1	Analyze social factors that limit the growth of a human population, including:		
3.3.PO 1.a	affluence		
3.3.PO 1.b	education		
3.3.PO 1.c	access to health care		
3.3.PO 1.d	cultural influences		
3.3.PO 2	Describe biotic (living) and abiotic (nonliving) factors that affect human populations.		
3.3.PO 3	Predict the effect of a change in a specific factor on a human population.		
5	Physical Science		
5.1	Understand physical, chemical, and atomic properties of matter.		
5.1.PO 1	Describe substances based on their physical properties.	Solutions	Lab: make solution of kool-aid
5.1.PO 2	Describe substances based on their chemical properties.		

5.1.PO 3	Predict properties of elements and compounds using trends of the periodic table (e.g., metals, non-metals, bonding - ionic/covalent).	Atoms	Regions of the Periodic Table
		Atoms	Lab: Periodic Table (P/P only)
		Atoms	Trends in the Periodic Table
		Atoms	The Elements
		Atoms	The Periodic Table
		Atoms	Valence Electrons
		Bonding	Lab: Bonding (P/P only)
		Bonding	Ionic Bonding
		Bonding	Covalent Bonding
		Bonding	Metallic Bonding
5.1.PO 4	Separate mixtures of substances based on their physical properties.	Solutions	Lab: make solution of kool-aid
5.1.PO 5	Describe the properties of electric charge and the conservation of electric charge.		
5.1.PO 6	Describe the following features and components of the atom:	Atoms	The Atom
5.1.PO 6.a	protons	Atoms	The Atom
5.1.PO 6.b	neutrons	Atoms	The Atom
5.1.PO 6.c	electrons	Atoms	The Atom
5.1.PO 6.d	mass	Matter	Molar Mass
5.1.PO 6.e	number and type of particles	Nuclear Chemistry	Radioactive Isotopes
5.1.PO 6.f	structure	Nuclear Chemistry	Inside the Atom
5.1.PO 6.g	organization	Nuclear Chemistry	Inside the Atom
5.1.PO 7	Describe the historical development of models of the atom.	Atoms	The Atom
5.1.PO 8	Explain the details of atomic structure (e.g., electron configuration, energy levels, isotopes).	Nuclear Chemistry	Inside the Atom
5.2	Analyze relationships between forces and motion.		
5.2.PO 1	Determine the rate of change of a quantity (e.g., rate of erosion, rate of reaction, rate of growth, velocity).	Rates	Definition of Reaction Rates
5.2.PO 2	Analyze the relationships among position, velocity, acceleration, and time:		
5.2.PO 2.a	graphically		
5.2.PO 2.b	mathematically		

5.2.PO 3	Explain how Newton's 1st Law applies to objects at rest or moving at constant velocity.		
5.2.PO 4	Using Newton's 2nd Law of Motion, analyze the relationships among the net force acting on a body, the mass of the body, and the resulting acceleration:		
5.2.PO 4.a	graphically		
5.2.PO 4.b	mathematically		
5.2.PO 5	Use Newton's 3rd Law to explain forces as interactions between bodies (e.g., a table pushing up on a vase that is pushing down on it; an athlete pushing on a basketball as the ball pushes back on her).		
5.2.PO 6	Analyze the two-dimensional motion of objects by using vectors and their components.		
5.2.PO 7	Give an example that shows the independence of the horizontal and vertical components of projectile motion.		
5.2.PO 8	Analyze the general relationships among force, acceleration, and motion for an object undergoing uniform circular motion.		
5.2.PO 9	Represent the force conditions required to maintain static equilibrium.		
5.2.PO 10	Describe the nature and magnitude of frictional forces.		
5.2.PO 11	Using the Law of Universal Gravitation, predict how the gravitational force will change when the distance between two masses changes or the mass of one of them changes.		
5.2.PO 12	Using Coulomb's Law, predict how the electrical force will change when the distance between two point charges changes or the charge of one of them changes.		
5.2.PO 13	Analyze the impulse required to produce a change in momentum.		

5.2.PO 14	Quantify interactions between objects to show that the total momentum is conserved in both collision and recoil situations.		
5.3	Understand ways that energy is conserved, stored, and transferred.		
5.3.PO 1	Describe the following ways in which energy is stored in a system:		
5.3.PO 1.a	mechanical		
5.3.PO 1.b	electrical		
5.3.PO 1.c	chemical	Matter	Classifying Chemical Reactions
5.3.PO 1.d	nuclear	Nuclear Chemistry	Fission and Fusion
5.3.PO 2	Describe various ways in which energy is transferred from one system to another (e.g., mechanical contact, thermal conduction, electromagnetic radiation.)		
5.3.PO 3	Recognize that energy is conserved in a closed system.		
5.3.PO 4	Calculate quantitative relationships associated with the conservation of energy.	Thermodynamics	Solving problems involving heat flow.
5.3.PO 5	Analyze the relationship between energy transfer and disorder in the universe (2nd Law of Thermodynamics).		
5.3.PO 6	Distinguish between heat and temperature.	Rates	Temperature
		Thermodynamics	Heat Flow
5.3.PO 7	Explain how molecular motion is related to temperature and phase changes.	Measurement	Temperature
		Thermodynamics	Heat Flow
		Rates	Temperature
5.4	Investigate relationships between reactants and products in chemical reactions.		
5.4.PO 1	Apply the law of conservation of matter to changes in a system.	Matter	Lab: Conservation of mass (P/P only)

5.4.PO 2	Identify the indicators of chemical change, including formation of a precipitate, evolution of a gas, color change, absorption or release of heat energy.	Thermodynamics	Lab: Calc heat of fusion using calorimeter
		Thermodynamics	Heat Flow
		Thermodynamics	Heat Flow and Physical Changes
		Organic Chemistry	Lab: Make Slime (polymers)
5.4.PO 3	Represent a chemical reaction by using a balanced equation.	Matter	Equation Balancing
		Matter	Classifying Chemical Reactions
5.4.PO 4	Distinguish among the types of bonds (i.e., ionic, covalent, metallic, hydrogen bonding).	Bonding	Lab: Bonding (P/P only)
		Bonding	Covalent Bonding
5.4.PO 5	Describe the mole concept and its relationship to Avogadro's number.	Matter	The Mole
5.4.PO 6	Solve problems involving such quantities as moles, mass, molecules, volume of a gas, and molarity using the mole concept and Avogadro's number.	Solutions	Lab: make solution of kool-aid
		Solutions	Concentration
		Matter	Molar Mass
		Matter	Atoms, Molecules, and Moles
5.4.PO 7	Predict the properties (e.g., melting point, boiling point, conductivity) of substances based upon bond type.	Bonding	Lab: Bonding (P/P only)
5.4.PO 8	Quantify the relationships between reactants and products in chemical reactions (e.g., stoichiometry, equilibrium, energy transfers).	Equilibrium	Le Chatelier's Principle
		Matter	Stoichiometry
5.4.PO 9	Predict the products of a chemical reaction using types of reactions (e.g., synthesis, decomposition, replacement, combustion).	Matter	Classifying Chemical Reactions
5.4.PO 10	Explain the energy transfers within chemical reactions using the law of conservation of energy.	Matter	Classifying Chemical Reactions

5.4.PO 11	Predict the effect of various factors (e.g., temperature, concentration, pressure, catalyst) on the equilibrium state and on the rates of chemical reaction.	Rates	Concentration
		Rates	Lab: Factors affecting Rate of Reaction
		Rates	Temperature
		Rates	Pressure
		Rates	Definition of Reaction Rates
		Rates	Catalyst
		Equilibrium	Temperature
		Equilibrium	Definition of Chemical Equilibrium
		Equilibrium	Pressure
		Equilibrium	Le Chatelier's Principle
		Equilibrium	Lab: Le Chatelier's Principle (P/P only)
		Equilibrium	Concentration
5.4.PO 12	Compare the nature, behavior, concentration, and strengths of acids and bases.	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
		Acids & Bases	The pH Scale
		Equilibrium	Concentration
		Solutions	Lab: make solution of kool-aid
5.4.PO 13	Determine the transfer of electrons in oxidation/reduction reactions.		
5.5	Understand the interactions of energy and matter.		
5.5.PO 1	Describe various ways in which matter and energy interact (e.g., photosynthesis, phase change).	Nuclear Chemistry	Fission and Fusion
		Thermodynamics	Solving problems involving heat flow.
5.5.PO 2	Describe the following characteristics of waves:		
5.5.PO 2.a	wavelength		
5.5.PO 2.b	frequency		
5.5.PO 2.c	period		



5.5.PO 2.d	amplitude		
5.5.PO 3	Quantify the relationships among the frequency, wavelength, and the speed of light.		
5.5.PO 4	Describe the basic assumptions of kinetic molecular theory.		
5.5.PO 5	Apply kinetic molecular theory to the behavior of matter (e.g., gas laws).		
5.5.PO 6	Analyze calorimetric measurements in simple systems and the energy involved in changes of state.	Thermodynamics	Solving problems involving heat flow.
5.5.PO 7	Explain the relationship between the wavelength of light absorbed or released by an atom or molecule and the transfer of a discrete amount of energy.	Nuclear Chemistry	Inside the Atom
5.5.PO 8	Describe the relationship among electric potential, current, and resistance in an ohmic system.		
5.5.PO 9	Quantify the relationships among electric potential, current, and resistance in an ohmic system.		