



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 3-4 Reaction Review</b>			
<b>First 9 Weeks, Days to Teach: 5</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III Reactions A. Reaction types 1. Acid-base reactions 2. Precipitation reactions 3. Oxidation –reduction reactions B Stoichiometry 1. Ionic and molecular species present in chemical systems; net ionic equations 2. Balancing equations 3. Mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting reactants	Patterns of chemical reactivity Empirical formulas Molecular formula Stoichiometry Limiting Reactant	How can you predict products of single replacement, double replacement, combustion, decomposition or synthesis reactions?  How do you write net ionic equations?  How do you write empirical and molecular formula?  How is combustion analysis used to find empirical and molecular formula?  How do you solve mass-mass and mass-volume problems using the limiting reactant?
	AP Chemistry Connections:  III Reactions A. Reaction types 3. Oxidation –reduction reactions	Reducing agent Oxidizing agent	How do you write balanced net ionic equations for redox equations in acidic and basic conditions?



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 5 Thermochemistry</b>			
<b>First 9 Weeks, Days to Teach: 3</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III. Reactions E. Thermodynamics 1. State functions 2. First law: Change in enthalpy; heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry	enthalpy of formation state function specific heat heat capacity calorimetry	How do you use enthalpies of formation to calculate enthalpies of reaction?  What is Hess's Law?  How can Hess's Law be applied?  How can you draw energy diagrams?  How can you find and use specific heat values?  How can you find heat capacity?  How can calorimetry problems be solved?
	AP Chemistry Connections:  V. Laboratory Physical manipulations; Processes and procedures; Observations and data manipulation; Communication, group collaboration, and the laboratory report  **This AP Content area applies to all labs **	Hess's law	Can Hess's Law be demonstrated experimentally?



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 19 Chemical Thermodynamics</b>			
<b>First 9 Weeks, Days to Teach: 5</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III. Reactions E. Thermodynamics 1. State functions 2. First law: Change in enthalpy; heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry 3. Second law: Entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy and entropy changes 4. Relationship of change in free energy to equilibrium constants and electrode potentials	enthalpy of formation state function entropy Gibbs free energy	How can you predict signs of entropy change in chemical reactions? . How do you calculate and interpret the value of delta H using tables and standard values?  How do you calculate and interpret the value of delta S from tables of standard values?  How do you calculate and interpret the value of delta G from tables of standard values?  How do you determine spontaneity of reactions?  How do you relate free energy and temperature?  What is Boltzmann distribution?



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 10 Gases review</b>			
<b>First 9 Weeks, Days to Teach: 4 days</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  II States of Matter  A. Gases 1. Laws of ideal gases a. Equation of state for an ideal gas b. Partial pressures 2. Kinetic Molecular theory a. Interpretation of ideal gas laws on the basis of this theory b. Avogadro's hypothesis and the mole concept c. Dependence of kinetic energy of molecules on temperature d. Deviations from ideal gas laws	Boyle's Law Charles' Law Guy-Lussac's Law Henry's Law Dalton's Law of Partial Pressures Universal Gas Law Kinetic-Molecular Theory Graham's Law Molecular Effusion and Diffusion	What was Avogadro's hypothesis related to molar volume and gas stoichiometry?  How can you use gas laws to calculate volume, pressure and temperature changes?  How can you calculate effusion rates?  How can you calculate molar mass and density of gases?  How can you calculate partial pressures?  What is the kinetic molecular theory?  How do ideal gases differ from non-ideal gases? (van der Waal's equation)



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 11 Intermolecular Forces Review</b>			
<b>First 9 Weeks, Days to Teach: 4 days</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  I. Structure of Matter C. Chemical Bonding 1. Binding forces Types: Ionic, covalent, metallic, hydrogen bonding, van der Waals (including London dispersion forces)	Intermolecular Forces: London dispersion, dipole-dipole and hydrogen bonding	How can you compare intermolecular forces?  How can you predict relative boiling points, vapor pressure and volatility?
	AP Chemistry Connections:  II. States of Matter B. Liquids and solids 1. Liquids and solids from the kinetic-molecular viewpoint 2. Phase diagrams of one-component systems 3. Changes of state, including critical points and triple points 4. Structure of solids; lattice energies	Phase Changes Vapor Pressure Phase Diagrams Lattice Energy	What are the phase changes that can occur with energy added and energy removed?  What are the differences between a substance whose solid-liquid interface in its phase diagram has a negative slope and one with a positive slope?  How can you predict trends in lattice energy based on $E = kQ_1Q_2/d$ ? (section 8.2 of textbook)



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 13 Properties of Solutions First &amp; Second 9 Weeks, Days to Teach: 4 days</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  II. States of Matter C. Solutions 1. Types of solutions and factors affecting solubility 2. Methods of expressing concentration 3. Raoult's law and colligative properties of nonvolatile solutes; osmosis 4. Non-ideal behavior (qualitative aspects)	Colligative Properties van't Hoff factor Raoult's law	How can you predict solubility based on polarity of substance?  How do you calculate concentrations using molarity and molality & mole fractions?  How can you solve dilution problems?  How do you calculate freezing point and boiling point changes?  Why is the van't Hoff factor often less than the expected whole number?  How can you find molecular weight from freezing point depression or boiling point elevation?  How can you solve problems using Raoult's Law, using or finding vapor pressure?



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 14 Chemical Kinetics</b>			
<b>Second 9 Weeks, Days to Teach: 8 days</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  II. States of Matter D. Kinetics 1. Concept of rate of reaction 2. Use of experimental data and graphical analysis to determine reactant order, rate constants and reaction rate laws. 3. Effect of temperature change on rates 4. Energy of activation; the role of catalysts 5. The relationship between the rate-determining step and a mechanism	Reaction Rates Rate constant Reaction order Integrated rate law Half-life Arrhenius Equation Catalyst	What factors affect the rate of chemical reactions?  How can you compare the graphs and rate laws for first-order reactions and second-order reactions?  How can you find rate constant?  How can you find reaction order?  What are the units of the rate constant?  How can you solve half-life equations?  What is the effect of concentration with time?  What is activation energy, how is it shown graphically and what is the effect of a catalyst?  What is the Arrhenius equation?  How do you find k values given two temperatures?  How does one write the rate law for multistep mechanisms?

<b>Unit Name: Ch. 15 Chemical Equilibrium</b>			
<b>Second 9 Weeks, Days to Teach: 8</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III. Reactions C. Equilibrium 1. Concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants 2. Quantitative treatment a. Equilibrium constants for gaseous reactions: $K_p$ and $K_c$ b. Equilibrium constants for reactions in solution	Concept of Equilibrium The Equilibrium Constant Heterogeneous Equilibria Calculating Equilibrium Constants Applications of Equilibrium Constants LeChâtelier's Principle Free Energy and the Equilibrium constant (19.7)	How is $K_c$ found?  How is $K_c$ related to $K_p$ ?  How is $K$ related to $Q$ ?  How is the direction of the equation predicted by $K$ ?  How are equilibrium concentrations calculated?  What effect does changing concentration, temperature or volume have on an equilibrium reaction?  How is Gibbs free energy related to the equilibrium constant?  Calculate $K_c$ using $\Delta G$

<b>Unit Name: Ch. 16 Acid-Base Equilibria</b>			
<b>Third 9 Weeks, Days to Teach: 8</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III. Reactions C. Equilibrium 1. Concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants 2. Quantitative treatment a. Equilibrium constants for gaseous reactions: $K_p$ and $K_c$ b. Equilibrium constants for reactions in solution (1) Constants for acids and bases; $pK$ ; $pH$	Acids and Bases Brønsted-Lowry Acids & Bases The Autoionization of Water The pH Scale Strong Acids & Bases Weak Acids & Weak Bases Relationship between $K_a$ and $K_b$ Acid-Base Properties of Salt Solutions Acid-Base Behavior and Chemical Structure Lewis Acids and Bases Binary acid Polyprotic acid Oxyacid	What are relative strengths of acids and bases? (includes oxyacids)  How can you identify conjugate acids/bases and designate their relative strength?  What are the ion products of water?  How can you calculate $pOH$ and $pH$ ; measure $pH$ ?  How can you use $K_a$ to find $pH$ of weak acid or $K_b$ to find $pH$ of weak base?  How can you find $K_a$ or $K_b$ from concentrations and/or each other?  How can you classify salt solutions as acidic or basic or neutral?  How can you differentiate between polyprotic and monoprotic acids?  How can you classify acids as Lewis, Bronsted-Lowry, and/or Arrhenius acids?



**Science  
Advanced Placement  
Chemistry**

Unit Name: Ch. 17 Additional Aspects of Aqueous Equilibria		Third 9 Weeks, Days to Teach: 8	
Date Taught	AP Required Elements	Content/Vocabulary	Guiding Questions
	AP Chemistry Connections:  III. Reactions C. Equilibrium 1. Concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants 2. Quantitative treatment a. Equilibrium constants for gaseous reactions: $K_p$ and $K_c$ b. Equilibrium constants for reactions in solution (1) Constants for acids and bases; $pK$ ; $pH$ (2) Solubility product constants and their application to precipitation and the dissolution of slightly soluble compounds (3) Common ion effect; buffers; hydrolysis	The Common-Ion Effect Buffered Solutions Acid-Base Titrations Solubility Equilibria Solubility-Product constant Factors That Affect Solubility Amphoterism Precipitation and Separation of Ions	What is the common ion effect?  What makes a buffer solution?  How can you find the $pH$ of a buffer solution?  How can you find the $pH$ of a buffer solution when strong acids or bases are added?  How can you solve titration problems for all combinations of acids and bases?  How can you solve titration problems with polyprotic acids?  What is $K_{sp}$ ?  How is solubility related to $K_{sp}$ ?  How can you solve concentration problems given $K_{sp}$ or given concentrations? How are complex ions formed?  How can ions be selectively precipitated?  What is hydrolysis?  How can you describe solution formation, spontaneity and disorder?



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 20 Electrochemistry</b>			
<b>Fourth 9 Weeks, Days to Teach: 5</b>			
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III. Reactions A. Reaction Types 1. Oxidation-reduction reactions a. Oxidation number b. The role of the electron in oxidation-reduction c. Electrochemistry; electrolytic and galvanic cells; Faraday's laws; standard half-cell potentials; Nernst equation; prediction of the direction of redox reactions	Oxidation-Reduction Reactions Balancing Oxidation-Reduction Equations Voltaic Cells/Galvanic cells anode cathode salt bridge Cell EMF Spontaneity of Redox Reactions Effect of Concentration on Cell EMF Electrolysis	How do you balance redox reactions using half-reactions?  What is a voltaic cell and what are its components?  How can you calculate cell electromotive force using standard reduction potentials?  Given two reactions in a cell, which one will be oxidized?  What is an oxidizing agent?  How can you use the Nernst equation to relate cell concentration and EMF.?  How can you use cell potential to predict spontaneity of reaction?  What are the differences between electrolytic and galvanic cells?  In which direction do electrons flow in each type of cell (voltaic vs. electrolytic)?



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Review of Ch. 19 Thermodynamics, Ch. 6 Atomic Structure, Ch. 7 Periodic Trends</b>			<b>Fourth 9 Weeks, Days to Teach: 2-3</b>
<b>Date Taught</b>	<b>AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  III. Reactions E. Thermodynamics 1. State functions 2. First law: Change in enthalpy; heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry 3. Second law: Entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy and entropy changes 4. Relationship of change in free energy to equilibrium constants and electrode potentials	enthalpy of formation state function entropy Gibbs free energy	How can you predict sign of entropy change in chemical reactions?  How can you calculate and interpret the value of delta H, delta S and delta G using tables and standard values?  How can you determine spontaneity of reactions?  How can you relate free energy and temperature?  What is Boltzmann distribution?
	AP Chemistry Connections:  I. Structure of Matter A. Atomic theory and atomic structure. 1. Evidence for atomic theory 2. Atomic masses; determination by chemical and physical means	Wave Nature of Light Quantized Energy and Photons Bohr's Model of the Hydrogen Atom Wave Behavior of Atom Quantum Mechanics and Atomic Orbitals Representations of	How do wavelength, frequency, and speed of light relate?  What is a photon, and how does it relate to $e = hv$ ?  What are the three major rules for writing electron configurations?  What are the quantum numbers for any specified electron?



**Science  
Advanced Placement  
Chemistry**

	<p>4. Electron energy levels: Atomic spectra, quantum numbers, atomic orbitals</p>	<p>Orbitals Electron Configurations Electron Configurations and the Periodic Table The four quantum numbers</p>	<p>How can you identify each type of quantum number?  Which of a set of quantum numbers can exist?</p>
	<p>AP Chemistry Connections:  I. Structure of Matter A. Atomic theory and atomic structure. 3. Atomic number and mass number; isotopes 5. Periodic relationships including for example, atomic radii, ionization energies, electron affinities, oxidation states</p>	<p>Development of the Periodic Table Electron Shells and the sizes of Atoms Ionization Energy Electron Affinity Metals, nonmetals, and metalloids Group trends for active metals Group trends for selected nonmetals</p>	<p>How is the periodic table different now than from when it was originally developed?  How do electron configuration and atomic size relate?  What is the general trend for ionization energy?  What is the general trend for electron affinity?  Where are metals, nonmetals, and metalloids located on the periodic table?  What are the group trends for the active metals?  From a list, which element is most acidic or basic?  What are some trends for nonmetals?</p>



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Chapter 25 Organic Chemistry Chapter 8-9 Bonding and Molecular Structure Review</b>		<b>Fourth 9 Weeks, Days to Teach: 5 days</b>	
<b>Date Taught</b>	<b>TEKS and AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  I. Structure of Matter B. Chemical Bonding 1. Binding forces a. Types: ionic, covalent, metallic b. Relationships to states, structure, and properties of matter c. Polarity of bonds, electronegativities  2. Molecular models a. Lewis structures b. Valence bond, hybridization of orbitals, resonance, sigma and pi bonds c. VSEPR  3. Geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure	Ionic Bonding Sizes of Ions Covalent Bonding Bond Polarity and Electronegativity Drawing Lewis Structures Resonance Structures Exceptions to the octet rule Strengths of covalent bonds Molecular polarity Molecular Shapes The VSEPR Model Polarity of Polyatomic Molecules Covalent Bonding and Orbital Overlap Hybrid Orbitals Multiple bonds	How can you describe ionic and covalent compounds?  How can you compare the arrangement of atoms in molecules, crystals, polymers, and covalent compounds?  How can you classify bonding type according to electronegativity differences?  How can you draw Lewis structures?  How can you determine molecular polarity?  What are the names of hydrocarbons?  How do you predict molecular geometry and hybridization?  How does molecular geometry relate to polarity? What are sigma and pi bonds?  How can you relate bond energy and strength?  How can you draw isomers?



**Science  
Advanced Placement  
Chemistry**

	<p>AP Chemistry Connections:</p> <p>IV. Descriptive Chemistry C. Introduction to organic chemistry: hydrocarbons and functional groups (structure, nomenclature, chemical properties)</p>		
--	---	--	--



**Science  
Advanced Placement  
Chemistry**

<b>Unit Name: Ch. 21 Nuclear Chemistry Review and Ch. 24 Coordination Compounds</b>			<b>Fourth 9 Weeks, Days to Teach: 3 days</b>
<b>Date Taught</b>	<b>TEKS and AP Required Elements</b>	<b>Content/Vocabulary</b>	<b>Guiding Questions</b>
	AP Chemistry Connections:  I. Structure of Matter C. Nuclear Chemistry: Nuclear equations, half-lives, radioactivity and chemical applications.	Nuclear Transmutations Energy Changes in Nuclear Reactions Radioactivity Patterns of Nuclear Stability Rates of Radioactive Decay Nuclear Fission Nuclear Fusion	How do you balance nuclear equations?  What is the difference between alpha, beta and gamma radiation?  What is the difference between a nuclear reaction and a chemical reaction?  What is a half-life? How can you solve half-life problems?  How do you compare fission to fusion?
	AP Chemistry Connections:  I. Structure of Matter B. Chemical Bonding 3. Geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure	Coordination complex Coordination number Ligand	What are the charges, coordination numbers and geometries of selected coordination complexes?  How do you name and write formulas for complex ions?