

# COURSE: AP Chemistry (created July 2010)

Grade Level: 11<sup>th</sup>-12<sup>th</sup>

MAIN/ GENERAL TOPIC	SUB-TOPIC:	ESSENTIAL QUESTIONS:	WHAT THE STUDENTS WILL KNOW:	WHAT THE STUDENT WILL BE ABLE TO DO:	Assessments:	WHEN STUDENT DOES IT:
1) Matter and Measurement	Classification and Properties of Matter	What are the different classifications of matter? What chemical and physical properties are associated with each type of matter?		<ul style="list-style-type: none"> <li>Differentiate between phases at macroscopic and microscopic level</li> <li>Differentiate between a substance and a mixture, element and compound</li> <li>Distinguish between a chemical and physical property; between a chemical and physical change</li> <li>Describe the principles between various separation techniques: filtration, distillation, crystallization, chromatography</li> </ul>	HW 1.5, 1.15, 1.17, 1.19, 1.23, 1.25, 1.27, 1.33, 1.37, 1.39, 1.41, 1.47 Quiz	Sept
	Units of Measurement	What are the SI units and what do they measure?		<ul style="list-style-type: none"> <li>Identify the seven SI base units and the physical quantity they are used to describe</li> </ul>	HW Quiz	Sept
	Uncertainty in Measurement	What is the difference between precision and accuracy?		<ul style="list-style-type: none"> <li>Define the terms precision and accuracy as they relate to collected data</li> <li>Apply the rules of significant figures to calculations based upon experimental measurements</li> </ul>	HW Quiz	Sept
	Dimensional Analysis	How can you convert an amount in one unit to a different unit?		<ul style="list-style-type: none"> <li>Convert between Fahrenheit, Celsius, and Kelvin temperatures using the equations</li> <li>Use the equation: <math>density = mass/volume</math> to calculate one of these three quantities, given (or having calculated) the other two quantities</li> <li>Use dimensional analysis (the factor-label method) to convert lengths, volumes, masses, or other quantities from one unit to another</li> </ul>	HW Quiz	Sept

2) Atom, Molecules and Ions	Atomic Theory	What theories led to the discovery of the atom?		<ul style="list-style-type: none"> <li>Identify Dalton's four postulates of atomic theory</li> <li>Discuss the contributions of Thompson's Cathode-Ray Tube experiment, Millikan's Oil-Drop experiment, and Rutherford's Gold-Foil experiment to the evolution of atomic theory</li> <li>State the Laws of Conservation of Mass, Constant Composition, and Multiple Proportions and indicate how they provide evidence for the atomic theory</li> </ul>	HW 2.8, 2.10, 2.12, 2.18, 2.24, 2.30, 2.32 Quiz	Sept
	Atomic Structure	What subatomic particles make up the atom and where are they located?		<ul style="list-style-type: none"> <li>Identify and give the relative charges and masses of the three major subatomic particles</li> <li>Relate a nuclear (nuclide) symbol to the number of protons and neutrons in the nucleus</li> </ul>	HW Quiz	Sept
	Atomic Weight	How is atomic weight measured?		<ul style="list-style-type: none"> <li>Given the masses and percent abundance of the isotopes of an element, calculate its atomic mass. Given the atomic mass of an element and the masses of its two isotopes, calculate their percent abundance</li> <li>Calculate the mass of an element in grams or in atomic mass units, given the other quantity</li> </ul>	HW Quiz	Sept
	The Periodic Table	What information does the periodic table give us about the elements?		<ul style="list-style-type: none"> <li>Differentiate between an empirical formula and a molecular formula</li> <li>Classify a compound as ionic or molecular</li> <li>Given the formula of a species, determine the oxidation number of each atom</li> </ul>	HW 2.38, 2.46a&c, 2.48, 2.50, 2.54, 2.56 Quiz	Sept
	Molecules and Molecular Compounds	What types of elements make up molecular compounds?		<ul style="list-style-type: none"> <li>Given either the name or the formula of a molecular compound, give the other</li> </ul>	HW Quiz	Sept
	Ions and Ionic Compounds	What types of elements make up ionic compounds?		<ul style="list-style-type: none"> <li>Given either the name or the formula of an ionic compound, give the other</li> </ul>	HW Quiz	Sept
	Naming Inorganic Compounds	How do you determine the name of a compound from its formula?		<ul style="list-style-type: none"> <li>Given either the name or the formula of an acid, give the other</li> </ul>	HW 2.64ac&d, 2.66ac&d, 2.68, 2.70, 2.72, 2.91, 2.93, 2.96 Quiz	Sept

	Organic Compounds	What are some of the differences between inorganic and organic compounds?		<ul style="list-style-type: none"> <li>Given either the name or the formula of a simple alkane or alcohol, given the other</li> </ul>	HW Quiz	Sept
3) Stoichiometry: Calculations with Chemical Formulas and Equations	Balancing Chemical Equations	How does one balance a chemical equation? What information does a balanced equation give us?		<ul style="list-style-type: none"> <li>Write and balance simple chemical equations</li> </ul>	HW 3.6, 3.10, 3.12ac&e, 3.14cd&e, 3.16, 3.22ac&e, 3.24bd&f, 3.84b Quiz	Sept
	Patterns of Chemical Reactivity	What are the different types of chemical reactions?		<ul style="list-style-type: none"> <li>Identify the chemical reactions: combination, decomposition, and combustion</li> </ul>	HW Quiz	Sept
	Formula Weights	How can a formula weight be calculated from a chemical formula?		<ul style="list-style-type: none"> <li>Given the formula of a species calculate its formula or molecular weight and mole mass</li> <li>Relate the number of moles of a known formula to the number of grams or particles</li> </ul>	HW Quiz	Sept
	Avagadro's Number and the Mole	How is the mole concept used in chemistry?		<ul style="list-style-type: none"> <li>Relate the number of moles of a known formula to the number of grams or particles</li> </ul>	HW 3.3, 3.36, 3.44a, 3.48a, 3.50a, 3.52a, 3.54, 3.96 Quiz	Sept
	Empirical Formulas	How can one determine an empirical formula given analytical data?		<ul style="list-style-type: none"> <li>Determine the empirical formula of a compound given either the masses or the mass percents of the elements in the sample of the compound</li> <li>Given the simplest formula of a compound and its approximate molar mass, obtain its molecular formula</li> <li>Given a Periodic Table, write formulas for ionic compounds, including one containing transition metal ions and/or polyatomic ions</li> </ul>	HW Quiz	Sept
	Calculations Based on Chemical Equations	How can we use stoichiometry to predict the yield of a chemical reaction?		<ul style="list-style-type: none"> <li>Use a balanced equation to relate the number of moles or grams of reactants and products</li> <li>Given the number of moles or grams of each reactant, determine the limiting reactant and calculate the theoretical yield of product</li> <li>Relate the actual yield of product to the theoretical yield and percent yield</li> </ul>	HW 3.8, 3.56, 3.58b, 3.66c, 3.74, 3.80, 3.100 Quiz	Sept

4) Aqueous Reactions and Solution Stoichiometry	Electrolytes	What makes a substance an electrolyte?		<ul style="list-style-type: none"> <li>Classify a substance as an electrolyte or a nonelectrolyte</li> <li>Classify an electrolyte as strong or weak</li> </ul>	HW 4.2, 4.4, 4.6, 4.8, 4.10, 4.18, 4.20, 4.22, 4.24, 4.26 Quiz	Sept
	Precipitation Reactions and Net Ionic Equations			<ul style="list-style-type: none"> <li>Use the solubility guidelines (rules) to predict a precipitate in a solution reaction</li> <li>Identify any spectator ions in a solution reaction</li> </ul>	HW Quiz	Sept
	Acid Base and Oxidation-Reduction Reactions			<ul style="list-style-type: none"> <li>Identify a solution reaction as metathesis, acid-base, or redox</li> <li>For redox reactions, identify the species being oxidized and the species being reduced</li> <li>Given the formula of a species, determine the oxidation number of each atom</li> </ul>	HW 4.34, 4.38, 4.40a&b, 4.42, 4.44, 4.93b&e, 4.46, 4.48, 4.50, 4.52, 4.54c&d, 4.56cd&e, 4.96cd&e Quiz	Sept
	Molarity			<ul style="list-style-type: none"> <li>Given or having calculated two of the three quantities: molarity, number of moles of solute, and number of liters of solvent, determine the other quantity</li> <li>Describe how to prepare a solution to a desired molarity, starting either with a pure solute or a concentrated solution</li> </ul>	HW 4.60, 4.62, 4.64, 4.70, 4.74, 4.76 Quiz	Sept
	Titrations			<ul style="list-style-type: none"> <li>Given the volume of a known standard solution needed to reach an end-point, determine the concentration, number of mole, or mass of an unknown quantity of solute</li> </ul>	HW 4.78, 4.80b&d, 4.86, 4.102, 4.106 Quiz	Sept
5) Thermochemistry	The Nature of Energy			<ul style="list-style-type: none"> <li>Describe and calculate energy (the capacity to do work or to transfer heat) changes</li> <li>Relate the direction of heat flow in a reaction (exothermic or endothermic) to the sign of <math>\Delta H</math></li> </ul>	HW 5.3, 5.10, 5.20, 5.24, 5.26, 5.30 Quiz	Oct
	The First Law of Thermodynamics			<ul style="list-style-type: none"> <li>Use the First Law of Thermodynamics to calculate one of three quantities (<math>\Delta E</math>, <math>q</math>, or <math>w</math>) knowing the values of the other two quantities</li> </ul>	HW Quiz	Oct
	Enthalpy			<ul style="list-style-type: none"> <li>Knowing the value of <math>\Delta(PV)</math> for a reaction, relate <math>\Delta H</math> to <math>\Delta E</math></li> </ul>	HW 5.5, 5.32, 5.34, 5.38, 5.44 Quiz	Oct

	Enthalpy of Reaction			<ul style="list-style-type: none"> <li>Given a thermochemical equation, calculate:</li> <li><math>\Delta H</math> for a specific amount of reactant or product</li> <li>the amount of reactant or product required to produce a specified <math>\Delta H</math></li> </ul>	HW Quiz	Oct
	Calorimetry			<ul style="list-style-type: none"> <li>Use calorimetric data (temperature change, mass of water, specific heat of water, calorimeter constant) to determine the heat flow for a reaction</li> </ul>	HW 5.48, 5.52, 5.54, 5.58, 5.62, 5.64 Quiz	Oct
	Hess's Law			<ul style="list-style-type: none"> <li>Use Hess' Law to calculate <math>\Delta H</math> for:</li> <li>a stepwise reaction, knowing the value of <math>\Delta H</math> for each step</li> <li>a step in a reaction, knowing the <math>\Delta H</math> for every other step and the overall reaction</li> </ul>	HW Quiz	Oct
	Enthalpies of Formation			<ul style="list-style-type: none"> <li>Use the general relation: <math>\Delta H = \sum \Delta H_f \text{ products} - \sum \Delta H_f \text{ reactants}</math> to calculate:</li> <li><math>\Delta H</math> for a reaction, knowing the heats of formation of all species.</li> <li><math>\Delta H_f</math> for one species, knowing the heats of formation of all other species as well as the <math>\Delta H</math> for the reaction</li> </ul>	HW 5.7, 5.8, 5.68a&c, 5.72b&d, 5.78, 5.99 Quiz	Oct
6) Electronic Structure of Atoms	Wave and Particle Nature of Light			<ul style="list-style-type: none"> <li>Given one of the three quantities: <math>\lambda</math>, <math>\nu</math>, <math>\Delta E</math>, calculate the other two quantities</li> </ul>	HW 6.12, 6.14, 6.22, 6.26, 6.30, 6.76, 6.78, 6.82 Quiz	Oct
	Bohr's Model			<ul style="list-style-type: none"> <li>Use the Bohr theory to calculate the energy of an electron in a given principal energy level of the hydrogen atom, or the difference in energy between two levels</li> </ul>	HW 6.32, 6.36b&c, 6.40, 6.42, 6.44, 6.100 Quiz	Oct
	Quantum Mechanics and Atomic Orbitals			<ul style="list-style-type: none"> <li>Given the atomic number of an element (up to 36), write the electron configuration of its atom</li> </ul>	HW 6.7, 6.48, 6.54, 6.56, 6.89 Quiz	Oct
	Many Electron Atoms and Electron Configurations			<ul style="list-style-type: none"> <li>Given, or having derived, the electron configuration of an atom, draw its orbital structure</li> <li>Given, or having derived, the orbital diagram of an atom, write the four quantum numbers for each electron in the atom</li> </ul>	HW 6.60, 6.62a 6.64, 6.68bd&f, 6.74, 6.98 Quiz	Oct
7) Periodic Properties of the Elements	Periodic Table: Effective Nuclear Charge			<ul style="list-style-type: none"> <li>Determine an atom's effective nuclear charge</li> </ul>	HW 7.8, 7.12, 7.18, 7.20, 7.24, 7.28, 7.30a&d, 7.34 Quiz	Oct

	Atomic and Ionic Radii, Ionization Energies, Electron Affinities			<ul style="list-style-type: none"> <li>Compare the radii of monoatomic ions to those of corresponding atoms</li> <li>State the electron configuration of monoatomic ions, including those derived from transition elements</li> <li>Predict trends in the Periodic Table with respect to atomic radius, ionic radius, ionization energy, electron affinity, metallic character, and nonmetallic character</li> </ul>	HW 7.38, 7.42a&b, 7.44ac&e, 7.50, 7.104 Quiz	Oct
	Properties of Metals and Nonmetals			<ul style="list-style-type: none"> <li>Describe, with the aid of balanced equations, the reactions of the metals with nonmetals and metals with water.</li> <li>Describe, with the aid of balanced equations, the reactions of metals with oxygen to produce oxides, peroxides, or superoxides.</li> <li>Describe, with the aid of balanced equations, the reactions of metal oxides with water and nonmetal oxides with water.</li> <li>Describe several chemical and physical properties of alkali metals, alkaline earth metals, and halogens.</li> </ul>	HW 7.60, 7.64, 7.68, 7.70, 7.76, 7.78, 7.110 Quiz	Oct
8) Basic Concepts of Chemical Bonding	Lewis Symbols			<ul style="list-style-type: none"> <li>Write the Lewis symbols for neutral atoms and for monoatomic ions</li> <li>Write Lewis structures for binary ionic compounds, covalent compounds (molecules), polyatomic ions, and compounds containing polyatomic ion(s)</li> <li>Use formal charge to evaluate Lewis structures</li> </ul>	HW 8.1, 8.3, 8.8, 8.12, 8.16, 8.20, 8.26, 8.74 Quiz	Nov
	Ionic Bonding			<ul style="list-style-type: none"> <li>Discuss the lattice energy trends among ionic compounds (ie. LiCl, NaCl, and KCl, or NaF, NaCl, and NaBr, or KF, CaO, and ScN)</li> </ul>	HW Quiz	Nov
	Covalent Bonding, Electronegativity, and Bond Polarity			<ul style="list-style-type: none"> <li>Using only the Periodic Table, describe the electronegativity trends and compare the relative polarity of different bonds</li> <li>Compare bond distances and bond energies for polar versus nonpolar bonds as well as multiple versus single bonds</li> </ul>	HW 8.32, 8.34, 8.36a&b, 8.40, 8.42, 8.44, 8.79 Quiz	Nov

	Lewis Structures, Resonance Structures			<ul style="list-style-type: none"> <li>Predict whether a species is likely to show resonance, given or having derived its Lewis structure</li> </ul>	HW 8.46, 8.48, 8.50, 8.54, 8.56, 8.85, 8.86 8.6, 8.58, 8.60, 8.62, 8.64, 8.83 Quiz	Nov
	Bond Enthalpies			<ul style="list-style-type: none"> <li>Use a table of bond energies to calculate <math>\Delta H</math> for gas phase reactions</li> <li>Construct a Born-Haber cycle that can be used to determine the heat of formation (<math>\Delta H_f</math>) or the lattice energy (<math>\Delta H_{\text{lattice}}</math>) given the other</li> </ul>	HW 8.66a, 8.70, 8.72, 8.88a, 8.99, 8.103a&b Quiz	Nov
9) Molecular Geometry and Bonding theories	Molecular Shapes: the VSEPR model			<ul style="list-style-type: none"> <li>Given or having derived the Lewis structure of a molecule or polyatomic ion, apply VSEPR principles to deduce its geometry</li> </ul>	HW 9.1, 9.2, 9.12a, 9.14, 9.16ab&c, 9.18, 9.20, 9.22bc&d, 9.26 9.75 Quiz	Nov
	Polarity of Polyatomic Molecules			<ul style="list-style-type: none"> <li>Given or having derived the geometry of a molecule or polyatomic ion, predict whether it will be a dipole</li> </ul>	HW 9.4, 9.34, 9.36, 9.38, 9.81 Quiz	Nov
	Orbital overlaps: Hybrid Orbitals			<ul style="list-style-type: none"> <li>Starting with the Lewis structure of a molecule or polyatomic ion, give the hybridization of each atom</li> </ul>	HW 9.5, 9.7, 9.40, 9.44, 9.46, 9.48 Quiz	Nov
	Multiple Bonds			<ul style="list-style-type: none"> <li>Predict the number of sigma (<math>\sigma</math>) and pi (<math>\pi</math>) bonds in a species, knowing its Lewis structure</li> </ul>	HW 9.8, 9.50, 9.52, 9.54, 9.56, 9.58 Quiz	Nov
	Molecular Orbitals			<ul style="list-style-type: none"> <li>Predict the hybridization and geometry of a molecule in which a central atom is surrounded by 5 or 6 electron pairs</li> </ul>	HW 9.62, 9.66a, 9.68, 9.70 Quiz	Nov

10) Gases	The Gas Laws, Ideal-Gas Equation			<ul style="list-style-type: none"> <li>Determine the effect of a change in one or more of the variables (P, V, n, or T) on the value of one of these variables.</li> <li>Solve for one variable (P, V, n, or T), knowing the values of the other three variables.</li> <li>Calculate the density or molar mass of a gas, given the necessary data (molar mass, pressure, and temperature for density; density, pressure, and temperature for molar mass).</li> <li>Relate the volume of a gas involved in a reaction to the amount of another reactant or product</li> <li>Relate the volumes of gases (at the same temperature and pressure) in a reaction</li> </ul>	HW 10.2, 10.14, 10.18ab&c, 10.20a, 10.22, 10.24, 10.26, 10.89 Quiz	Nov
	Dalton's Law of Partial Pressure, Graham's Law			<ul style="list-style-type: none"> <li>Use Dalton's Law to find the partial pressure of a gas in a mixture; relate partial pressure to mole fraction</li> <li>Use Graham's Law to relate the molar masses of two gases to their rates or times of effusion</li> </ul>	HW 10.3, 10.30, 10.32, 10.34, 10.36, 10.44, 10.46, 10.48, 10.52 10.5, 10.8, 10.56, 10.58, 10.66, 10.68 Quiz	Nov
	Nonideal-Gas Behavior			<ul style="list-style-type: none"> <li>Calculate the average speed of a gas molecule at a given temperature</li> <li>Use the van der Waals equation (10.27) to explain why real gases deviate from ideal gas behavior</li> </ul>	HW 10.70, 10.72, 10.74, 10.76, 10.82, 10.84, 10.103, 10.110 Quiz	Nov
11) Intermolecular Forces	KMT and IM Forces			<ul style="list-style-type: none"> <li>Compare different molecular substances with respect to physical properties (melting point, boiling point, conductivity, water solubility, etc.) and types of intermolecular forces</li> <li>Use the Clausius-Clapeyron equation (equation 11.1) to calculate one of the three quantities <math>P_2</math>, <math>T_2</math>, or <math>H_{vap}</math>, given the values of the other two and <math>P_1</math> and <math>T_1</math></li> </ul>	HW 11.2, 11.3, 11.12, 11.14, 11.16, 11.22, 11.30, 11.32 Quiz	Dec
	Phase Diagrams			<ul style="list-style-type: none"> <li>Draw a phase diagram for a pure substance, given appropriate data, and state what phases are present at any given point on the diagram</li> </ul>	HW 11.34, 11.40, 11.42, 11.46, 11.50a, 11.90a&b Quiz	Dec

	Types of Solid Substances			<ul style="list-style-type: none"> <li>Distinguish among ionic, molecular, network covalent, and metallic solids with regards to both particle structure and physical properties (melting point, boiling point, conductivity, water solubility, etc.).</li> </ul>	HW 11.6, 11.54, 11.56, 11.72, 11.74, 11.100a,b,c&d Quiz	Dec
	Structure of Solids			<ul style="list-style-type: none"> <li>Given the type of unit cell for a substance (simple cubic, face-centered cubic, or body-centered cubic), relate the cell dimensions to atomic radius</li> </ul>	HW 11.58, 11.60, 11.62, 11.64, 11.70, 11.93 Quiz	Dec
13) Properties of Solutions	The Solution Process			<ul style="list-style-type: none"> <li>Write balanced equations to represent the dissolution of an electrolyte or nonelectrolyte</li> <li>Discuss the energy changes that occur during the solution process</li> </ul>	HW 13.3, 13.4, 13.12, 13.20, 13.22, 13.24, 13.32 Quiz	Dec
	Saturated Solution: Factors Affecting Solubility			<ul style="list-style-type: none"> <li>Predict the effect of change in temperature or pressure upon the solubilities of solids and gases in solution</li> </ul>	HW Quiz	Dec
	Concentrations of Solutions			<ul style="list-style-type: none"> <li>Given appropriate data, calculate the mass percent, ppm, ppb, mole fraction, molarity or molality of a solution</li> <li>Convert between the molarity, molality, mole fraction, and mass percent of a solution</li> <li>Relate the molarity of an electrolyte solution to the molarities of its ions</li> </ul>	HW 13.5, 13.7, 13.34b, 13.42, 13.48 Quiz	Dec

	Colligative Properties			<ul style="list-style-type: none"> <li>Use equation 13.10 to relate vapor pressure lowering to solute mole fraction</li> <li>Use equation 13.13 to relate osmotic pressure to Molarity</li> <li>Use equations 13.11 and 13.12 to obtain <ul style="list-style-type: none"> <li>the boiling point or freezing point of a nonelectrolyte solution, knowing or having calculated the molality</li> <li>the molar mass of a nonelectrolyte</li> </ul> </li> <li>Compare the colligative properties of electrolytes to those of nonelectrolytes and be able <ul style="list-style-type: none"> <li>to determine the ideal van't Hoff factor (<i>i</i>) for a solute.</li> <li>to calculate the approximate boiling point or freezing point of an electrolyte solution, knowing or having calculated the molality</li> </ul> </li> </ul>	HW 13.8, 13.56, 13.58, 13.64, 13.68a&c, 13.70, 13.72 Quiz	Dec
24) Chemistry of Coordination Compounds	Metal Complexes and Geometry			<ul style="list-style-type: none"> <li>Given the charge and composition of a metal complex, determine the charge and coordination number of the central metal cation</li> <li>Given the composition of a metal complex, sketch its geometry, including any geometric isomers</li> </ul>	HW 24.10b, 24.14abc&d, 24.20d, 24.22a, 24.28b, 24.53a&c, 24.60b&c Quiz	Dec
	Nomenclature of Metal Complexes			<ul style="list-style-type: none"> <li>Given either the name or the formula of a complex, give the other</li> </ul>	HW 24.24a&e, 24.26, 24.13c&f and 24.14b Quiz	Dec
	Electronic Structure of Metals in Complexes			<ul style="list-style-type: none"> <li>Write the hybridized orbital diagram (valance bond model) of a transition metal ion and complexes derived from it</li> </ul>	HW Quiz	Dec
	Crystal Field Theory			<ul style="list-style-type: none"> <li>For any octahedral complex, draw diagrams for the "high spin" and "low spin" forms (crystal field model)</li> <li>Explain, using crystal-field theory, the magnetism of coordination compounds</li> <li>Explain, using crystal-field theory, the color of coordination compounds</li> <li>Explain how changing a weak-field ligand for a strong-field ligand can change the color of a compound</li> </ul>	HW 24.8, 24.38, 24.40, 24.42, 24.48bcd&e, 24.50 Quiz	Dec

14) Chemical Kinetics	Reaction Rates			<ul style="list-style-type: none"> <li>Describe how each of the following affects reaction rate. (a) the physical state of the reactants. (b) the concentration of the reactants (c) the temperature at which the reactions occurs (d) the presence of a catalyst</li> </ul>	HW 14.2, 14.14, 14.20, 14.22, 14.28 Quiz	Jan
	Rate Laws			<ul style="list-style-type: none"> <li>Determine the order of a reaction, given the initial rate as a function of concentration of reactants</li> </ul>	HW Quiz	Jan
	Change of Concentration with Time			<ul style="list-style-type: none"> <li>For a first order reaction, calculate               <ul style="list-style-type: none"> <li>the concentration of reactant after a given time, knowing its original concentration and the rate constant.</li> <li>the time required for the concentration to drop by a given amount, knowing the rate constant</li> </ul> </li> <li>Given the half-life or the rate constant for a first order reaction, calculate the other quantity</li> </ul>	HW 14.4, 14.30, 14.34, 14.36, 14.44 14.46, 14.48, 14.50, 14.54, 14.56 Quiz	Jan
	Reaction Mechanism			<ul style="list-style-type: none"> <li>Given two of the three quantities: <math>\Delta H</math>, <math>E_a</math>, <math>E_a'</math> (activation energy for the reverse reaction), calculate the other quantity</li> <li>Use the Arrhenius equation (Equation 14.20) to calculate any one of the five quantities: <math>k_1</math>, <math>k_2</math>, <math>T_1</math>, <math>T_2</math>, <math>E_a</math>, knowing or having calculated the other quantities</li> <li>Determine whether a proposed mechanism for a reaction is consistent with the observed rate expression</li> </ul>	HW 14.7, 14.9, 14.60, 14.62, 14.64, 14.66, 14.68 Quiz	Jan
15) Equilibrium	Systems at Equilibrium			<ul style="list-style-type: none"> <li></li> </ul>	HW Quiz	Jan
	Calculating Equilibrium Constant			<ul style="list-style-type: none"> <li></li> </ul>	HW Quiz	Jan
	Applications of Equilibrium Constant			<ul style="list-style-type: none"> <li></li> </ul>	HW Quiz	Jan
	Le Chatelier's Principle			<ul style="list-style-type: none"> <li></li> </ul>	HW Quiz	Jan
16) Acid-Base Equilibria	Arrhenius and Bronstead-Lowry Acids and Bases			<ul style="list-style-type: none"> <li></li> </ul>	HW Quiz	Feb

	Autoionization of Water			•	HW Quiz	Feb
	PH Scale			•	HW Quiz	Feb
	Strong Acids and Bases			•	HW Quiz	Feb
	Weak Acids and Bases			•	HW Quiz	Feb
	Relationship between $K_a$ and $K_b$			•	HW Quiz	Feb
	Acid-Base Properties of Salts			•	HW Quiz	Feb
	Lewis Acids and Bases			•	HW Quiz	Feb
17) Additional Aspects of Aqueous Equilibria	Common-Ion Effect			•	HW Quiz	Feb
	Buffers			•	HW Quiz	Feb
	Acid-Base Titrations			•	HW Quiz	Feb
	Solubility Equilibria and Factors Affecting Solubility			•	HW Quiz	Feb
	Formation of Complex ions			•	HW Quiz	Feb
	Precipitation Reactions: Qualitative Analysis			•	HW Quiz	Feb

19) Chemical Thermodynamics	Spontaneous Processes			•	HW Quiz	Mar
	Entropy and the Second Law of Thermodynamics			•	HW Quiz	Mar
	The Molecular Interpretation of Entropy			•	HW Quiz	Mar
	Entropy Changes in Chemical Reactions			•	HW Quiz	Mar
	Gibb's Free Energy			•	HW Quiz	Mar
	Free Energy and Equilibrium			•	HW Quiz	Mar
20) Electrochemistry	Oxidation States			•	HW Quiz	Mar
	Balancing Redox Reactions				HW Quiz	Mar
	Voltaic Cells				HW Quiz	Mar
	Cell EMF Under Standard Conditions				HW Quiz	Mar
	Strength of Oxidizing and Reducing Agents				HW Quiz	Mar
	Free Energy and Redox Reactions				HW Quiz	Mar
	Cell EMF Under Nonstandard Conditions				HW Quiz	Mar
	Batteries and Fuel Cells				HW Quiz	Mar

	Corrosion				HW Quiz	Mar
	Electrolysis and Electrolytic Cells				HW Quiz	Mar
	Quantitative Aspects of Electrolysis				HW Quiz	Mar
21) Nuclear Chemistry	Radioactivity				HW Quiz	Apr
	Nuclear Stability				HW Quiz	Apr
	Nuclear Transmutations				HW Quiz	Apr
	Rates of Radioactive Decay				HW Quiz	Apr
	Energy Changes				HW Quiz	Apr
	Fission and Fusion				HW Quiz	Apr
25) The Chemistry of Life	General Characteristics of Organic Molecules				HW Quiz	Apr
	Introduction to Hydrocarbons				HW Quiz	Apr
	Alkanes				HW Quiz	Apr
	Alkenes and Alkynes				HW Quiz	Apr
	Aromatic Hydrocarbons				HW Quiz	Apr

	Alcohols and Ethers				HW Quiz	Apr
	Aldehydes and Ketones				HW Quiz	Apr
	Carboxylic Acids and Esters				HW Quiz	Apr
	Amines and Amides				HW Quiz	Apr
	Chirality of Organic Chemistry				HW Quiz	Apr