

## Argenta-Oreana High School Advanced Chemistry

Chemistry, 4<sup>th</sup> ed., 1997  
Steven S. Zumdahl

Date Semester	IL Learning Standards	Unit and/or Essential Question Content and/or Skills	Assessments and/or Products
1 week		Introduction Review of the following topics: Units of measurement, uncertainty, dimensional analysis, temperature, density, and classification of matter	1. Homework assignments 2. Problem solving 2. Test
1.5 weeks	12.C.4b	Atoms, Molecules, and Ions Modern view of atomic structure Molecules and ions Periodic table Naming compounds	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b	Stoichiometry Review of the following: Atomic masses, mole, molar mass, percent composition, Chemical equations, stoichiometric calculations Limiting reactants, including calculations	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b	Types of Chemical Reactions and Solution Stoichiometry Water and aqueous solutions Types of reactions Precipitation reactions Acid-base reactions Oxidation-reduction reactions	1. Homework assignments 2. Problem solving 3. Test

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2 weeks		Gases Gas laws Ideal gas law Gas stoichiometry Partial pressures Kinetic molecular theory of gases	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b 12.C.5b	Thermochemistry Nature of energy Enthalpy and calorimetry Hess's law Standard heats of formation	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4a 12.C.4b 12.C.5b	Atomic Structure and Periodicity Bohr model Quantum mechanical model Orbital shapes and energies Pauli principle Polyelectronic atoms Aufbau principle	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4a 12.C.4b 12.C.5b	Bonding: General concepts Types of chemical bonds Electronegativity Bond polarity Ions Covalent chemical bonds Bond energies	1. Homework assignments 2. Problem solving 3. Test

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		Lewis structures Exceptions to octet rule Resonance VESPR model	
1 week	12.C.4a 12.C.4b 12.C.5b	Covalent Bonding: Orbitals Hybridization Molecular orbital model	1. Homework assignments 2. Problem solving 3. Test
1.5 weeks	12.C.4b 12.C.5b 12.D.4B 12.D.5b	Liquids and Solids Intermolecular forces Liquid state Molecular solids Ionic solids Vapor pressure and changes of state Phase diagrams	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b 12.C.5b 12.D.4B 12.D.5b	Properties of Solutions Molarity, molality, mole fraction, mass percent Energies of solution formation Factors affecting solubility Vapor pressures of solutions Colligative properties	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b 12.C.5b 12.D.4B	Chemical Kinetics Reaction rates Rate laws Reaction mechanisms	1. Homework assignments 2. Problem solving 3. Test

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	12.D.5b	Activation energy	
2 weeks	12.C.4b 12.C.5b 12.D.4B	Chemical Equilibrium Law of mass action Equilibrium expressions/constant Applications of equilibrium constant Equilibrium problems Le Chatelier's principle	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b 12.C.5b 12.D.4B	Acids and Bases Nature of Strengths, $K_a$ , $K_b$ pH Calculations involving pH Polyprotic acids Lewis acid-base model	1. Homework assignments 2. Problem solving 3. Test
1.5 weeks	12.C.4b 12.C.5b 12.D.4B	Applications of Aqueous Equilibria Buffers Buffer capacity Acid-Base Titrations Solubility product	1. Homework assignments 2. Problem solving 3. Test
2 weeks	12.C.4b 12.C.5b 12.D.4B 12.D.5b	Spontaneity, Entropy, and Free Energy Spontaneous processes and entropy Free energy Entropy changes in chemical reactions Free energy and chemical reactions	1. Homework assignments 2. Problem solving 3. Test

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2 weeks	12.C.4b 12.C.5b 12.D.4B 12.D.5b	Electrochemistry Balancing oxidation-reduction reactions Galvanic cells Standard reduction potentials Batteries Electrolysis	1. Homework assignments 2. Problem solving 3. Test
1 weeks	12.C.5b	Organic Chemistry Alkanes Alkenes Alkynes Aromatic hydrocarbons Polymers	1. Homework assignments 2. Problem solving 3. Test
Throughout First and Second Semesters	11.A.5a 11.A.5b 11.A.5c 11.A.5d 13.A.4b	Laboratory The following labs are examples of experiments/lab work that the students will perform. The actual experiments may vary somewhat from this list. 1. Qualitative Analysis of Cations This is a major lab activity that takes a considerable amount of time during second semester. 2. Thin Layer Chromatography 3. Melting points 4. Synthesis of alum 5. Analysis of alum 6. Thermochemistry and Hess's Law 7. Acid-Base titrations 8. Silver coating a flask 9. Molar mass of butane 10. Luminol reaction	1. Lab reports 2. Lab tests 3. Quality of work in lab setting

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		11. Vapor pressure and enthalpy of the vaporization of Water 12. Measuring the rate of a chemical reaction 13. Analysis of commercial bleach 14. Determination of the hardness of water 15. Study of the kinetics of a reaction 16. Determination of the dissociation constants of weak Acids 17. Equilibrium and Le Chatelier's principle	