



Credit Chemistry

Detailed Lecture Syllabus (Six, two-hour Labs)

Matter & Measurement

Significant figures, unit conversions

Types of matter (elements, compounds, mixtures)

Memorize symbols and names of common elements (Properties of substances: density, melting point, and boiling point)

Atoms, Molecules, and Ions

Atomic theory: history of discovery of electron, proton, & neutron

Determining the number of protons, neutrons, & electrons for atoms and ions

Molar mass of molecules, concept of mole and molarity

Chemical Formulas and Stoichiometry

Percent composition: from formula to percent and vice-versa

Nomenclature: memorize polyatomic ions and charges (handout)

Writing and balancing equations: from names to formulas to reactions

Mass relations: Stoichiometry

Mole-mole relations, mole-mass relations, mass-mass relations

Limiting reactant problems and theoretical yield

Thermochemistry

Calorimetry, Definitions: endothermic & exothermic, reaction enthalpy (ΔH_{rxn})

Thermochemical equations; Laws of Thermochemistry

Stoichiometric relations in thermochemistry

Hess' Law and heats of formation ($\Delta H_{\text{rxn}} = \sum \Delta H_{\text{products}} - \sum \Delta H_{\text{reactants}}$)

Behavior of Gases

Boyle's Law, Charles' Law, Ideal Gas Law, Dalton's Law, Graham's Law

Stoichiometry using gas laws

Electronic Structure

History and Bohr model

Quantum numbers: definition of each number, drawings of orbitals

Pauli Exclusion Principle

Electron configurations: atoms and ions

Orbital diagrams and Hund's Rule, (exceptions: Cr and Cu)

**Periodic Law**

Atomic radii, ionization energy, including exceptions

Electron affinity, metallic character

Covalent Bonding

Lewis structures: simple molecules and polyatomic ions, resonance forms

Exceptions to the octet rule: B and Be compounds, odd-electron species

Bond energies, bond lengths, bond polarity, polarity in molecules

Molecular Structure

Hybridization: sp, sp², sp³, expanded octets: sp³d, sp³d²

Molecular polarity, sigma and pi bonds

Liquids and Solids

Intermolecular forces of attraction; dispersion, dipole, and hydrogen bonding

Types of solids: covalent network, ionic, molecular, and metallic

Acid-Base Equilibria

Titration curve problems (mixtures)

Hydrolysis of salt solutions: determine pH

Electrochemistry

Oxidation - Reduction; balancing redox equation

Galvanic cells and electrolysis (faraday)