Honors Chemistry - Topic III Outline

Atoms - The Building Blocks of Matter

I. Basic Atomic Structure

A. Early Concepts: Greek & Roman — pp. 73; 78-79; 100; 81-85; 206-207

B. Beginnings of The Modern Model
1. Mathematical nature of matter
2. Dalton's atomic model

C. Composition of The Atom
1. Matter's electrical connection
   a. anode/cathode rays; photoelectric effect
   b. Faraday and electrolysis
2. Electrons: Thompson and Millikan
   a. discovering the electron & its charge
   b. Thompson's atomic model
3. The Nucleus: Rutherford
   a. discovery of radioactivity; types of radiation
   b. Rutherford's experiment
   c. Rutherford's atomic model

D. Typical Atomic Properties
1. Atomic sizes
2. Atomic number; Moseley
3. Atomic masses
   a. relative mass scale
   b. isotopes
   c. average isotopic mass; calculations

II. Bohr Model of The Atom

pp. 303-312

A. The Nature of Light
1. Types of spectra
2. Concepts of light
   a. light as a wave
   b. light as a particle
   c. electromagnetic spectrum
3. Quantizing line spectra: Rydberg Equation

B. The Bohr Atomic Model
1. Explaining the existence of line spectra
2. Energy-level diagram and quantum numbers
3. Electron configurations

III. Modern Atomic Structure

A. Changing Bohr's Model — p.312-318; 319-327; 352
1. Duality of matter: DeBroglie
2. Heisenberg's Uncertainty Principle
3. Matter-Waves: Schroedinger's wave concept

B. Describing The Modern Atom
1. Quantum numbers
2. Atomic orbitals
   a. shapes of orbitals
   b. Pauli Exclusion Principle
3. Electron configurations
   a. Aufbau Principle
   b. Hund's Rule
   c. electron blocks and the periodic table
   d. Lewis dot structures

IV. Basic Nuclear Chemistry

A. Nuclear Stability — p.582-600
1. Stable zone
2. Half-life

B. Nuclear Reactions
1. Common nuclear particles
2. Natural decay
3. Fission & fusion
4. Writing/balancing nuclear equations

C. Uses of Radioactive Materials