

Organization and Content

1. Foundations of Chemistry
 - a. History, role, and potential of chemistry
 - b. A Christian perspective on studying science
2. Matter
 - a. States of matter, interactions with energy, phase changes
3. Measuring and Calculating
 - a. Measurement systems, SI units, significant digits in measurement and calculation, organized problem solving
4. Atomic Structure
 - a. Historical development of atomic models, subatomic particles, orbitals, quantum numbers, orbital notation, electron configuration, isotopic notation
5. Elements
 - a. Development of the modern periodic table, descriptive chemistry
 - b. Periodic trends of atomic and ionic radius, electronegativity, electron affinity, ionization energy
6. Chemical Bonds: causes and types of bonding, Lewis structures, formula units, properties of different kinds of compounds
7. Bonding Theories and Molecular Geometry
 - a. Valence bond theory, molecular resonance, molecular orbital theory, valence shell electron pair repulsion theory, molecular shapes, polar covalent bonds
8. Chemical Composition and Reactions
 - a. Oxidation numbers, writing formulas, chemical nomenclature, polyatomic ions, balancing chemical equations, types of reactions
9. Chemical Calculations
 - a. The mole
 - b. Structural, molecular, and empirical formulas; percent composition
 - c. Stoichiometric conversions
 - d. Limiting reactants
 - e. Percent yield
10. Gases
 - a. Properties of gases, measuring pressure, gas laws, partial pressures, stoichiometric conversions with gases
11. Solids and Liquids
 - a. Intermolecular forces, properties of solids and liquids, phase changes, crystalline solids, phase diagrams
12. Solutions
 - a. Solution types, solvation, solubility, rate of solution, measuring concentration, colligative properties, colloids
13. Chemical Thermodynamics
 - a. Thermochemistry, enthalpy, specific heat, reaction tendency, entropy, free-energy change
14. Chemical Kinetics
 - a. Energy diagrams, rates of reactions, reaction mechanisms, rate laws

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15. Chemical Equilibrium
 - a. Reversible and irreversible reactions, equilibrium concentrations, equilibrium constants, Le Châtelier's principle, applications of equilibrium chemistry
16. Acids, Bases, and Salts
 - a. Properties of acids and bases, acid and base definitions, pH and pOH scales, neutralization, titrations, buffers
17. Oxidation-Reduction
 - a. Redox reactions, electrochemistry, electrolytic cells, electrolysis, voltaic cells
18. Organic Chemistry and Biochemistry
 - a. Organic compounds, hydrocarbons, functional groups, organic reactions, carbohydrates, proteins, lipids
19. Modern Materials
 - a. Ceramics, polymers, plastic recycling, nanotechnology
20. Nuclear Chemistry
 - a. Nuclear reactions
 - b. Alpha, beta, and gamma radiation
 - c. Measuring radiation
 - d. Nuclear equations
 - e. Induced reactions