

General Chemistry II

Syllabus

I. Liquids and Intermolecular Forces

- A. Intermolecular forces
- B. Properties of liquids
- C. Heating curves
- D. Vapor pressure and boiling point
- E. Superheated and supercooled fluids
- F. Phase diagrams

II. Properties of Solutions

- A. Formation of solutions
- B. Solubility and saturation
- C. Henry's law
- D. Solution concentration
- E. Colligative properties

III. Chemical Kinetics and Reaction Mechanisms

- A. Chemical kinetics
- B. Concentration vs. time and reaction rates
- C. Rate law
- D. Integrated rate laws, graphs, and half-lives
- E. Temperature and the collision model
- F. Activation energy and reaction energy profiles
- G. Arrhenius equation
- H. Reaction mechanisms
- I. Catalysts

IV. Chemical Equilibrium

- A. Dynamic equilibrium
- B. Equilibrium expression
- C. Equilibrium constant
- D. Applications of the equilibrium constant
- E. Le Châtelier's principle

V. Acid-Base Equilibria

- A. Acid and bases
- B. Acid strength and the acid-dissociation constant K_a
- C. Autoionization of water, K_w , and the pH scale
- D. Strong acids and bases
- E. Weak acids and bases
- F. Relationship between K_w , K_a , and K_b
- G. Acid-base properties of cations and anions
- H. Polyprotic acids and oxyacids
- I. Acid strength and molecular structure
- J. Lewis acids and bases

VI. Aqueous Ionic Equilibria

- A. Common-ion effect
- B. Buffer solutions
- C. Acid-base titrations and pH curves
- D. Solubility equilibria and the solubility-product constant K_{sp}
- E. Factors affecting solubility
- F. Precipitation and the separation of ions
- G. Qualitative chemical analysis of metals
- H. Complex ions

VII. Chemical Thermodynamics

- A. Spontaneous and nonspontaneous processes
- B. Entropy and the second law of thermodynamics
- C. Free energy
- D. Chemical reactions, temperature, and chemical equilibrium

VIII. Electrochemistry

- A. Reduction-oxidation reactions
- B. Voltaic cells
- C. Standard reduction potentials
- D. Cell potential, free energy, and chemical equilibrium
- E. Batteries and fuel cells
- F. Electrolysis
- G. Corrosion

IX. Nuclear Chemistry

- A. Nuclear instability and reactivity
- B. Nuclear stability
- C. Nuclear transmutations
- D. Detecting radioactivity and rates of radioactive decay
- E. Nuclear reactions and power
- F. Radiation in the environment and living systems
- G. Applications of radiation