

AP CHEMISTRY

Strand 1: Atomic Structure and Properties

1. Moles and Molar Mass
2. Mass Spectroscopy of Elements
3. Elemental Composition of Pure Substances
4. Composition of Mixtures
5. Atomic Structure and Electronic Configuration
6. Photoelectron Spectroscopy
7. Periodic Trends
8. Valence Electrons and Ionic Compounds

Strand 2: Molecular and Ionic Compound Structure and Properties

1. Types of Chemical Bonds
2. Intramolecular Force and Potential Energy
3. Structure of Ionic Solids
4. Structure of Metals and Alloys
5. Lewis Diagrams
6. Resonance and Formal Charge
7. VSEPR and Bond Hybridization

Strand 3: Intermolecular Forces and Properties

1. Intermolecular Forces
2. Properties of Solids
3. Solids, Liquids, and Gases
4. Ideal Gas Law
5. Kinetic Molecular Theory
6. Deviation from Ideal Gas Law
7. Solutions and Mixtures
8. Representations of Solutions
9. Separation of Solutions and Mixtures Chromatography
10. Solubility
11. Spectroscopy and Electromagnetic Spectrum
12. Photoelectric Effect
13. Beer-Lambert Law

Strand 4: Chemical Reactions

1. Introduction for Reactions
2. Net Ionic Equations
3. Representations of Reactions
4. Physical and Chemical Changes
5. Stoichiometry
6. Introduction to Titration
7. Types of Chemical Reactions
8. Introduction to Acid-Base Reactions
9. Oxidation-Reduction (Redox) Reactions



Strand 5: Kinetics

1. Reaction Rates
2. Introduction to Rate Law
3. Concentration Changes Over Time
4. Elementary Reactions
5. Collision Model
6. Reaction Energy Profile
7. Introduction to Reaction Mechanisms
8. Reaction Mechanism and Rate Law
9. Steady-State Approximation
10. Multistep Reaction Energy Profile
11. Catalysis

Strand 6: Thermodynamics

1. Endothermic and Exothermic Processes
2. Energy Diagrams
3. Heat Transfer and Thermal Equilibrium
4. Heat Capacity and Calorimetry
5. Energy of Phase Changes
6. Introduction to Enthalpy of Reaction
7. Bond Enthalpies
8. Enthalpy of Formation
9. Hess's Law

Strand 7: Equilibrium

1. Introduction to Equilibrium
2. Direction of Reversible Reactions
3. Reaction Quotient and Equilibrium Constant
4. Calculating the Equilibrium Constant
5. Magnitude of the Equilibrium Constant
6. Properties of the Equilibrium Constant
7. Calculating Equilibrium Concentrations
8. Representations of Equilibrium
9. Introduction to Le Chatelier's Principle
10. Introduction to Solubility Equilibria
11. Common-Ion Effect
12. pH and Solubility
13. Free Energy of Dissolution



Strand 8: Acids and Bases

1. Introduction to Acids and Bases
2. pH and pOH of Strong Acids and Bases
3. Weak Acid and Base Equilibria
4. Acid-Base Reactions and Buffers
5. Acid-Base Titrations
6. Molecular Structure of Acids and Bases
7. pH and pK_a
8. Properties of Buffers
9. Henderson-Hasselbach Equation
10. Buffer Capacity

Strand 9: Applications of Thermodynamics

1. Introduction to Entropy
2. Absolute Entropy and Entropy Change
3. Gibbs Free Energy and Thermodynamic Favorability
4. Thermodynamic and Kinetic Control
5. Free Energy and Equilibrium
6. Coupled Reactions
7. Galvanic (Voltaic) and Electrolytic Cells
8. Cell Potential and Free Energy
9. Cell Potential Under Nonstandard Conditions
10. Electrolysis and Faraday's Law

Science Practices

1. Models and Representations: describe models and representations including across scales
2. Question and Method: determine scientific questions and methods
3. Representing Data and Phenomena: create representations of models of chemical phenomena
4. Model Analysis: Analyze and interpret models and representations on a single scale or across multiple scales
5. Mathematical Routines: solve problems using mathematical relationships
6. Argumentation: develop an explanation or scientific argument

