

Equilibrium and Acid Reactions

5.1 Static and Dynamic Equilibrium

- Reversibility of reactions
 - Practical investigations
- Types of equilibrium
 - Static equilibrium
 - Dynamic equilibrium
- Systems
 - Open systems
 - Closed systems
- Energy considerations
 - Enthalpy
 - Entropy
- Collision theory
 - Reaction rate relationship

5.2 Factors Affecting Equilibrium

- Le Chatelier's principle
 - Temperature effects
 - Concentration effects
 - Pressure/volume effects
- Activation energy
 - Energy barrier
 - Effect on equilibrium position

5.3 Equilibrium Constant (K_{eq})

- Equilibrium expressions
 - Homogeneous systems
- Calculations
 - K_{eq} values
 - Concentration predictions
- Temperature effects
 - K_{eq} variation
- Applications
 - Dissociation of ionic compounds
 - Acid/base equilibria

5.4 Solution Equilibria

- Dissolution processes
 - Ionic compounds in water
- Solubility rules
 - Precipitation reactions
- Solubility product (K_{sp})
 - Expressions
 - Calculations
- Applications
 - Predicting precipitates
 - Indigenous applications

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Acid/Base Reactions

6.1 Properties of Acids and Bases

- Definitions
 - Arrhenius theory
 - Brønsted–Lowry theory
- Reactions
 - Acid + base
 - Acid + carbonate
 - Acid + metal
- Indicators
 - Natural indicators
 - Synthetic indicators
- Neutralisation
 - Enthalpy of neutralisation
 - Industrial applications

6.2 Brønsted–Lowry Theory

- Proton transfer
 - Acids donate protons
 - Bases accept protons
- pH calculations
 - pH
 - pOH
 - $[H^+]$ and $[OH^-]$
- Strength vs concentration
 - Strong vs weak
 - Dilute vs concentrated
- Amphiprotic substances
 - Example salts

6.3 Quantitative Analysis

- Titration
 - Determining concentration
- Titration curves
 - Strong acid/strong base
 - Strong acid/weak base
 - Weak acid/strong base
- Dissociation constants
 - K_a
 - p K_a
- Buffers
 - Buffer preparation
 - Natural buffer systems
- Applications
 - Industry
 - Household substances

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Organic Chemistry

7.1 Nomenclature

- IUPAC naming
 - Alkanes, alkenes, alkynes
 - Functional groups
- Isomerism
 - Chain isomers
 - Position isomers
 - Functional group isomers

7.2 Hydrocarbons

- Structure
 - Molecular formulae
 - Structural formulae
- Bonding
 - Single bonds
 - Double bonds
 - Triple bonds
- Properties
 - Intermolecular forces
 - Reactivity

7.3 Hydrocarbon Reactions

- Addition reactions
 - Hydrogenation
 - Halogenation
 - Hydration
- Substitution reactions
 - Halogen substitution

7.4 Alcohols

- Classification
 - Primary
 - Secondary
 - Tertiary
- Reactions
 - Combustion
 - Oxidation
 - Dehydration
- Production
 - Fermentation
 - Substitution reactions

7.5 Organic Acids and Bases

- Functional groups
 - Carboxylic acids
 - Amines
 - Amides
- Reactions
 - Esterification
 - Acid-base reactions
- Applications
 - Soaps and detergents
 - Synthesis pathways

7.6 Polymers

- Addition polymers
 - Polyethylene
- Condensation polymers
 - Nylon
 - Polyesters

Applying Chemical Ideas

8.1 Analysis of Inorganic Substances

- Qualitative analysis
 - Flame tests
 - Precipitation reactions
- Quantitative analysis
 - Gravimetric analysis
 - Titrations
- Instrumental methods
 - Colourimetry
 - Spectroscopy

8.2 Analysis of Organic Substances

- Functional group testing
 - Carbon-carbon double bonds
 - Hydroxyl groups
 - Carboxylic acids
- Structural analysis
 - NMR
 - Mass spectrometry
 - IR spectroscopy

8.3 Chemical Synthesis and Design

- Design factors
 - Reagent availability
 - Reaction conditions
 - Yield and purity
- Applications
 - Pharmaceuticals
 - Fuels
 - Environmental considerations

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