

TABLE OF CONTENTS

Licensing

1: Conjugated Compounds and Ultraviolet Spectroscopy

- 1.1: Introduction
- 1.2: Stability of Conjugated Dienes- Molecular Orbital Theory
- 1.3: Electrophilic Additions to Conjugated Dienes- Allylic Carbocations
- 1.4: Kinetic vs. Thermodynamic Control of Reactions
- 1.5: The Diels-Alder Cycloaddition Reaction
- 1.6: Characteristics of the Diels-Alder Reaction
- 1.7: Diene Polymers- Natural and Synthetic Rubbers
- 1.8: Structure Determination in Conjugated Systems - Ultraviolet Spectroscopy
- 1.9: Interpreting Ultraviolet Spectra- The Effect of Conjugation
- 1.10: Conjugation, Color, and the Chemistry of Vision
- 1.11: Additional Problems
- 1.S: Conjugated Compounds and Ultraviolet Spectroscopy (Summary)

2: Benzene and Aromaticity

- 2.1: Introduction
- 2.2: Naming Aromatic Compounds
- 2.3: Structure and Stability of Benzene
- 2.4: Aromaticity and the Hückel $4n + 2$ Rule
- 2.5: Aromatic Ions
- 2.6: Aromatic Heterocycles - Pyridine and Pyrrole
- 2.7: Polycyclic Aromatic Compounds
- 2.8: Spectroscopy of Aromatic Compounds
- 2.9: Additional Problems
- 2.S: Benzene and Aromaticity (Summary)

3: Chemistry of Benzene - Electrophilic Aromatic Substitution

- 3.1: Introduction
- 3.2: Electrophilic Aromatic Substitution Reactions - Bromination
- 3.3: Other Aromatic Substitutions
- 3.4: Alkylation and Acylation of Aromatic Rings - The Friedel-Crafts Reaction
- 3.5: Substituent Effects in Substituted Aromatic Rings
- 3.6: An Explanation of Substituent Effects
- 3.7: Trisubstituted Benzenes - Additivity of Effects
- 3.8: Nucleophilic Aromatic Substitution
- 3.9: Benzyne
- 3.10: Oxidation of Aromatic Compounds
- 3.11: Reduction of Aromatic Compounds
- 3.12: Synthesis of Polysubstituted Benzenes
- 3.13: Additional Problems
- 3.S: Chemistry of Benzene - Electrophilic Aromatic Substitution (Summary)

4: Ethers and Epoxides; Thiols and Sulfides

- 4.1: Introduction
- 4.2: Names and Properties of Ethers
- 4.3: Preparing Ethers
- 4.4: Reactions of Ethers - Acidic Cleavage
- 4.5: Reactions of Ethers - Claisen Rearrangement
- 4.6: Cyclic Ethers - Epoxides
- 4.7: Reactions of Epoxides - Ring-opening
- 4.8: Crown Ethers
- 4.9: Thiols and Sulfides
- 4.10: Spectroscopy of Ethers
- 4.11: Interchapter - A Preview of Carbonyl Chemistry
- 4.12: Additional Problems
- 4.S: Ethers and Epoxides; Thiols and Sulfides (Summary)

5: Aldehydes and Ketones- Nucleophilic Addition Reactions

- 5.1: Chapter Objectives and Preview of Carbonyl Chemistry
- 5.2: Naming Aldehydes and Ketones
- 5.3: Preparing Aldehydes and Ketones
- 5.4: Oxidation of Aldehydes and Ketones
- 5.5: Nucleophilic Addition Reactions of Aldehydes and Ketones
- 5.6: Nucleophilic Addition of Water- Hydration
- 5.7: Nucleophilic Addition of HCN - Cyanohydrin Formation
- 5.8: Nucleophilic Addition of Hydride and Grignard Reagents - Alcohol Formation
- 5.9: Nucleophilic Addition of Amines - Imine and Enamine Formation
- 5.10: Nucleophilic Addition of Hydrazine - The Wolff-Kishner Reaction
- 5.11: Nucleophilic Addition of Alcohols - Acetal Formation
- 5.12: Nucleophilic Addition of Phosphorus Ylides - The Wittig Reaction
- 5.13: Biological Reductions
- 5.14: Conjugate Nucleophilic Addition to α , β -unsaturated Aldehydes and Ketones
- 5.15: Spectroscopy of Aldehydes and Ketones
- 5.16: Additional Problems
- 5.S: Aldehydes and Ketones (Summary)

6: Carboxylic Acids and Nitriles

- 6.1: Chapter Objectives and Introduction to Carboxylic Acids
- 6.2: Naming Carboxylic Acids and Nitriles
- 6.3: Structure and Properties of Carboxylic Acids
- 6.4: Biological Acids and the Henderson-Hasselbalch Equation
- 6.5: Substituent Effects on Acidity
- 6.6: Preparing Carboxylic Acids
- 6.7: Reactions of Carboxylic Acids - An Overview
- 6.8: Chemistry of Nitriles
- 6.9: Spectroscopy of Carboxylic Acids and Nitriles
- 6.10: Additional Problems
- 6.S: Carboxylic Acids and Nitriles (Summary)

7: Carboxylic Acid Derivatives- Nucleophilic Acyl Substitution Reactions

- 7.1: Chapter Objectives and Introduction to Carboxylic Acid Derivatives
- 7.2: Naming Carboxylic Acid Derivatives

- 7.3: Nucleophilic Acyl Substitution Reactions
- 7.4: Nucleophilic Acyl Substitution Reactions of Carboxylic Acids
- 7.5: Chemistry of Acid Halides
- 7.6: Chemistry of Acid Anhydrides
- 7.7: Chemistry of Esters
- 7.8: Chemistry of Amides
- 7.9: Chemistry of Thioesters and Acyl Phosphates - Biological Carboxylic Acid Derivatives
- 7.10: Polyamides and Polyesters - Step-Growth Polymers
- 7.11: Spectroscopy of Carboxylic Acid Derivatives
- 7.12: Additional Problems
- 7.S: Carboxylic Acid Derivatives (Summary)

8: Carbonyl Alpha-Substitution Reactions

- 8.1: Chapter Objectives and Introduction to Carbonyl Alpha-Substitution Reactions
- 8.2: Keto-Enol Tautomerism
- 8.3: Reactivity of Enols- The Mechanism of Alpha-Substitution Reactions
- 8.4: Alpha Halogenation of Aldehydes and Ketones
- 8.5: Alpha Bromination of Carboxylic Acids
- 8.6: Acidity of Alpha Hydrogen Atoms- Enolate Ion Formation
- 8.7: Reactivity of Enolate Ions
- 8.8: Alkylation of Enolate Ions
- 8.9: Additional Problems
- 8.S: Carbonyl Alpha-Substitution Reactions (Summary)

9: Carbonyl Condensation Reactions

- 9.1: Chapter Objectives
- 9.2: Carbonyl Condensations - The Aldol Reaction
- 9.3: Carbonyl Condensations versus Alpha Substitutions
- 9.4: Dehydration of Aldol Products - Synthesis of Enones
- 9.5: Using Aldol Reactions in Synthesis
- 9.6: Mixed Aldol Reactions
- 9.7: Intramolecular Aldol Reactions
- 9.8: The Claisen Condensation Reaction
- 9.9: Mixed Claisen Condensations
- 9.10: Intramolecular Claisen Condensations - The Dieckmann Cyclization
- 9.11: Conjugate Carbonyl Additions - The Michael Reaction
- 9.12: Carbonyl Condensations with Enamines - The Stork Reaction
- 9.13: The Robinson Annulation Reaction
- 9.14: Some Biological Carbonyl Condensation Reactions
- 9.15: Additional Problems
- 9.S: Carbonyl Condensation Reactions (Summary)

10: Amines and Heterocycles

- 10.1: Chapter Objectives
- 10.2: Naming Amines
- 10.3: Structure and Properties of Amines
- 10.4: Basicity of Amines
- 10.5: Basicity of Arylamines
- 10.6: Biological Amines and the Henderson-Hasselbalch Equation
- 10.7: Synthesis of Amines
- 10.8: Reactions of Amines

- 10.9: Reactions of Arylamines
- 10.10: Heterocyclic Amines
- 10.11: Spectroscopy of Amines
- 10.12: Additional Problems
- 10.S: Amines and Heterocycles (Summary)

11: Biomolecules- Carbohydrates

- 11.1: Introduction
- 11.2: Classification of Carbohydrates
- 11.3: Depicting Carbohydrate Stereochemistry - Fischer Projections
- 11.4: D, L Sugars
- 11.5: Configurations of Aldoses
- 11.6: Cyclic Structures of Monosaccharides - Anomers
- 11.7: Reactions of Monosaccharides
- 11.8: The Eight Essential Monosaccharides
- 11.9: Disaccharides
- 11.10: Polysaccharides and Their Synthesis
- 11.11: Other Important Carbohydrates
- 11.12: Cell-Surface Carbohydrates and Influenza Viruses
- 11.13: Additional Problems
- 11.S: Biomolecules- Carbohydrates (Summary)

12: Biomolecules- Amino Acids, Peptides, and Proteins

- 12.1: Introduction
- 12.2: Structures of Amino Acids
- 12.3: Amino Acids, the Henderson-Hasselbalch Equation, and Isoelectric Points
- 12.4: Synthesis of Amino Acids
- 12.5: Peptides and Proteins
- 12.6: Amino Acid Analysis of Peptides
- 12.7: The Edman Degradation
- 12.8: Peptide Synthesis
- 12.9: The Merrifield Solid-Phase Technique
- 12.10: Protein Structure
- 12.11: Enzymes and Coenzymes
- 12.12: How do Enzymes Work? Citrate Synthase
- 12.13: Summary of Reactions
- 12.14: Additional Problems

13: Biomolecules - Lipids

- 13.1: Introduction to Lipids
- 13.2: Waxes, Fats, and Oils
- 13.3: Soap
- 13.4: Phospholipids
- 13.5: Prostaglandins and Other Eicosanoids
- 13.6: Terpenoids
- 13.7: Steroids
- 13.8: Biosynthesis of Steroids
- 13.9: Additional Problems
- 13.S: Biomolecules - Lipids (Summary)

14: Biomolecules - Nucleic Acids

- 14.1: Chapter Objectives
- 14.2: Nucleotides and Nucleic Acids
- 14.3: Base Pairing in DNA - The Watson-Crick Model
- 14.4: Replication of DNA
- 14.5: Transcription of DNA
- 14.6: Translation of RNA - Protein Biosynthesis
- 14.7: DNA Sequencing
- 14.8: DNA Synthesis
- 14.9: The Polymerase Chain Reaction
- 14.10: Additional Problems

15: Orbitals and Organic Chemistry - Pericyclic Reactions

- 15.1: Chapter Overview
- 15.2: Molecular Orbitals of Conjugated Pi Systems
- 15.3: Electrocyclic Reactions
- 15.4: Stereochemistry of Thermal Electrocyclic Reactions
- 15.5: Photochemical Electrocyclic Reactions
- 15.6: Cycloaddition Reactions
- 15.7: Stereochemistry of Cycloadditions
- 15.8: Sigmatropic Rearrangements
- 15.9: Some Examples of Sigmatropic Rearrangements
- 15.10: A Summary of Rules for Pericyclic Reactions
- 15.11: Additional Problems

16: Synthetic Polymers

- 16.1: Chapter Objectives
- 16.2: Chain-Growth Polymers
- 16.3: Stereochemistry of Polymerization - Ziegler-Natta Catalysts
- 16.4: Copolymers
- 16.5: Step-Growth Polymers
- 16.6: Olefin Metathesis Polymerization
- 16.7: Polymer Structure and Physical Properties
- 16.8: Summary
- 16.9: Additional Problems

Appendix

- Appendix A - Nomenclature of Polyfunctional Organic Compounds
- Appendix B - Acidity Constants for Some Organic Compounds
- Appendix C - Glossary
- Appendix D - Periodic Table
- Index
- Glossary
- Detailed Licensing

Index

Glossary

