

ORGANIC CHEMISTRY II – REVIEW FOR FINAL EXAM

Dr. Gholam Pahlavan

Chapter 12: Structure Determination: Mass Spectrometry and Infrared Spectroscopy-You should know;

1. Mass Spectrometry and Infra-Red applications
2. Interpreting Mass Spectra
3. Interpreting Mass Spectral Fragmentation Patterns
4. Mass Spectral Behavior of Some Common Functional Groups
5. Spectroscopy and the Electromagnetic Spectrum
6. Infrared Spectroscopy of Organic Molecules
7. Interpreting Infrared Spectra
8. Infrared Spectra of Hydrocarbons
9. Infrared Spectra of Some Common Functional Groups

Chapter 13: Structure Determination: Nuclear Magnetic Resonance Spectroscopy- You should know;

1. Nuclear Magnetic Resonance Spectroscopy applications
2. The Nature of ^1H NMR (proton NMR) Absorptions
3. Characteristics of Chemical Shifts in ^1H NMR Spectroscopy
4. Uses of ^1H NMR Spectroscopy
5. ^1H NMR Spectroscopy and Proton Equivalence
6. Integration of ^1H NMR Absorptions: Proton Counting
7. Spin—Spin Splitting in ^1H NMR Spectra

Chapter 14: Conjugated Dienes and Ultraviolet Spectroscopy application- You should know;

1. Preparation of Conjugated Dienes
2. Stability of Conjugated Dienes
3. Molecular Orbital Description and Bond Lengths of 1,3-Butadiene
4. Electrophilic Additions to Conjugated Dienes: Allylic Carbocations
5. Kinetic versus Thermodynamic Control of Reactions
6. The Diels—Adler Cycloaddition Reaction
7. Characteristics of the Diels—Adler Reaction
8. Structure Determination in Conjugated Systems: Ultraviolet Spectroscopy (UV)
9. Ultraviolet Spectrum of 1,3-Butadiene
10. Interpreting Ultraviolet Spectra: The Effect of Conjugation

Chapter 15: Benzene and Aromaticity- You should know;

1. Sources of Aromatic Hydrocarbons
2. Naming Aromatic Compounds
3. Structure and Stability of Benzene
4. Molecular Orbital Description of Benzene
5. Aromaticity and the Hückel $4n + 2$ Rule
6. Aromatic Ions
7. Pyridine and Pyrrole: Two Aromatic Heterocycles

8. Naphthalene: A Polycyclic Aromatic Compound

Chapter 16: Chemistry of Benzene: Electrophilic Aromatic Substitution- You should know;

1. Bromination of Aromatic Rings and Other Aromatic Substitutions
2. Alkylation of Aromatic Rings: The Friedel—Crafts Reaction
3. Acylation of Aromatic Rings
4. Substituent Effects in Substituted Aromatic Rings
5. An Explanation of Substituent Effects
6. Trisubstituted Benzenes: Additivity of Effects
7. Nucleophilic Aromatic Substitution
8. Benzyne
9. Oxidation of Aromatic Compounds- Reduction of Aromatic Compounds
10. Synthesis of Substituted Benzenes

Chapter 17: Alcohols and Phenols- You should know;

1. Naming Alcohols and Phenols
2. Properties of Alcohols and Phenols: Hydrogen Bonding
3. Properties of Alcohols and Phenols: Acidity and Basicity
4. Preparation of Alcohols from Reduction of Carbonyl Compounds
5. Preparation Alcohols from Reaction of Carbonyl Compounds with Grignard Reagents
6. Reactions of Alcohols
7. Oxidation of Alcohols
8. Protection of Alcohols
9. Preparation and Uses of Phenols
10. Reactions of Phenols

Chapter 18: Ethers and Epoxides; Thiols and Sulfides – You should know;

1. Naming Ethers
2. Structure, Properties, and Sources of Ethers
3. The Williamson Ether Synthesis
4. Alkoxymercuration of Alkenes
5. Reactions of Ethers: Acidic Cleavage
6. Reactions of Ethers: Claisen Rearrangement
7. Cyclic Ethers: Epoxides
8. Ring-Opening Reactions of Epoxides
9. Crown Ethers
10. Thiols and Sulfides

Chapter 19: Aldehydes and Ketones: Nucleophilic Addition Reactions – You should know

1. Naming Aldehydes and Ketones
1. Nucleophilic addition of Grignard and hydride reagents
3. Preparation of Aldehydes and Ketones
4. Oxidation of Aldehydes and Ketones
5. Nucleophilic Addition Reactions of Aldehydes and Ketones
6. Relative Reactivity of Aldehydes and Ketones

7. Nucleophilic Addition of H₂O: Hydration
8. Nucleophilic Addition of HCN: Cyanohydrins
9. Nucleophilic Addition of Grignard Reagents and Hydride Reagents: Alcohol Formation
10. Nucleophilic Addition of Amines: Imine and Enamine Formation
11. Nucleophilic Addition of Hydrazine: The Wolff—Kishner Reaction
12. Nucleophilic Addition of Alcohols: Acetal Formation
13. Nucleophilic Addition of Phosphorus Ylides: The Wittig Reaction
14. The Cannizzaro Reaction
15. Conjugate Nucleophilic Addition to α , β -Unsaturated Aldehydes and Ketones

Chapter 20: Carboxylic Acids- You should know;

1. Naming Carboxylic Acids
2. Structure and Physical Properties of Carboxylic Acids
3. Dissociation of Carboxylic Acids
4. Substituent Effects on Acidity
5. Substituent Effects in Substituted Benzoic Acids
6. Preparation of Carboxylic Acids
7. Reactions of Carboxylic Acids

Chapter 21: Carboxylic Acid Derivatives and Nucleophilic Acyl Substitution Reactions

1. Naming Carboxylic Acid Derivatives
2. Nucleophilic Acyl Substitution Reactions
3. Nucleophilic Acyl Substitution Reactions of Carboxylic Acids
4. Chemistry of Acid Halides, Acid Anhydrides, Esters, Amides, and Nitriles

Chapter 22: Carbonyl Alpha-Substitution Reactions- You should know;

1. Keto-Enol Tautomerism
2. Reactivity of Enols: The Mechanism of Alpha-Substitution Reactions
3. Alpha Halogenation of Aldehydes and Ketones
4. Alpha Bromination of Carboxylic Acids: The Hell—Volhard—Zelinskii Reaction
5. Acidity of Alpha Hydrogen Atoms: Enolate Ion Formation
6. Reactivity of Enolate Ions
7. Halogenation of Enolate Ions: The Haloform Reaction
8. Alkylation of Enolate Ions

Chapter 23: Carbonyl Condensation Reactions – You should know;

1. Mechanism of Carbonyl Condensation Reactions
2. Condensations of Aldehydes and Ketones: The Aldol Reaction
3. Carbonyl Condensation Reactions versus Alpha-Substitution Reactions
4. Dehydration of Aldol Products: Synthesis of Enones
5. Using Aldol Reactions in Synthesis
6. Mixed Aldol Reactions
7. Intramolecular Aldol Reactions
8. The Claisen Condensation Reaction
9. Mixed Claisen Condensations

10. Intramolecular Claisen Condensations: The Dieckmann Cyclization
11. The Michael Reaction and The Stork Enamine Reaction
12. Carbonyl Condensation Reactions in Synthesis: The Robinson Annulation Reaction

Chapter 24: Amines- You should know;

1. Naming Amines
2. Structure and Bonding in Amines
3. Properties and Sources of Amines
4. Basicity of Amines
5. Basicity of Substituted Arylamines
6. Synthesis of Amines
7. Reactions of Amines
8. Reactions of Arylamines
9. Tetraalkylammonium Salts as Phase-Transfer Catalysts