

This is an outline of the material you learned in Chem 341 that you need to know for Chem 342. For more detailed information, see my lecture notes at: http://www.ndsu.nodak.edu/instruct/grcook/chem341_99/notes.shtml

Chapter 1: Structure and Bonding

Atomic Structure

Ionic and Covalent Bonding

Hybridization

sp^3 , sp^2 , sp and their geometries

Chapter 2: Polar Bonds and Their Consequences

Polar Covalent Bonds

Electronegativity

Formal Charges

Resonance Forms

Acid-Base Concepts

Brønsted-Lowry and Lewis Definitions

Acidity Constant

Drawing Chemical Structures

Condensed Formulas and Skeletal Structures

Chapter 3: Organic Compounds: Alkanes and Cycloalkanes

Functional Groups

Constitutional Isomers

Alkyl Groups

Nomenclature

Cycloalkanes

Cis-Trans Stereoisomers

Chapter 4: Stereochemistry of Alkanes and Cycloalkanes

Conformations of alkanes

Newman Projections, anti, gauche, eclipsed

Ring Strain

Angle Strain, Torsional Strain, Steric Strain

Cycloalkane Conformations

Chair and Boat Cyclohexanes

Substituted Cyclohexanes - axial and equatorial positions

Chapter 5: An Overview of Organic Reactions

Reaction Mechanisms

Polar and Radical Reactions

Curved Arrow Notation to Indicate Electron Movement

Equilibria and Reaction Rates

Bond Energies

Reaction Energy Diagrams

Rate Determining Step, Transition States, Intermediates

Chapter 6: Alkenes: Structure and Reactivity

Degree of Unsaturation

Structure of Alkenes

Pi bonds and Cis/Trans and E/Z Stereoisomers

Alkene Stability

Electrophilic Addition to Alkenes

Markovnikov's Rule

Carbocation Stability and Structure

Carbocation Rearrangements

Chapter 7: Alkenes: Reactions and Synthesis

Preparation of Alkenes

Elimination Reactions

Electrophilic Addition to Alkenes

Addition of Halogens to Alkenes

Halohydrin Formation

Addition of Water to Alkenes

Oxymercuration and Hydroboration

Addition of Carbenes to Alkenes

Hydrogenation of Alkenes

Oxidation of Alkenes

Ozone, Permanganate

Radical Polymerization of Alkenes

Chapter 8: Alkynes: An Introduction to Organic Synthesis

Structure of Alkynes

Preparation of Alkynes

Electrophilic Addition to Alkynes

Addition of HX and X₂

Addition of Water, Hydration

Reduction of Alkynes

Hydrogenation, Lindlar's Catalyst, Li/NH₃ reduction
Oxidation of Alkynes
Ozone, Permanganate
Alkyne Acidity
Formation of Carbanions and Alkylation for Organic Synthesis

● **Chapter 9: Stereochemistry**

Chirality
Handedness, Optical Activity, Specific Rotation
Centers of Chirality - R and S Configuration
Stereoisomers
Enantiomers
Diastereomers
Meso Compounds
Stereochemistry of Reactions

● **Chapter 10: Alkyl Halides**

Preparation of Alkyl Halides
Addition of HX to alkenes and alkynes, Radical halogenation, Allylic Bromination
Preparation from Alcohols
Organometallics from Alkyl Halides
Organomagnesium Compounds - Grignard Reagents
Organolithium Compounds
Coupling Reactions

● **Chapter 11: Reactions of Alkyl Halides: Nucleophilic Substitution and Eliminations**

S_N1 and S_N2 Substitutions
Stereochemistry
Primary, Secondary, Tertiary Substrates
Leaving Groups and Nucleophiles
Solvents
E1 and E2 Eliminations
Antiperiplanar Geometry for E2
Competition between Substitution and Elimination