Chem 261 Assignment & Lecture Outline 3: Stereochemistry, Alkenes & Alkynes: Nomenclature & Properties

Read

Organic Chemistry, W. Ogilvie et al. 1st Edition - 2018 - Nelson Ltd.

Functional Group List – Learn to recognize – Please see Green Handout – also p 76 of text

- Functional Group List Learn to recognize Please see Green Handout also p 76 of text
- Periodic Table http://www.ptable.com/#Writeup/Wikipedia know 1st 10 elements (up through Neon) – atomic numbers, atomic weights (2 significant figures), electron configuration
- Relative Strength of Acids and Bases page 257 (reference only)
- Chapter 4 Stereochemistry
- Chapter 2 Naming Alkenes & Alkynes pp 74-80
- Chapter 8 Ionic Reactions: π Bond as Nucleophile Addition Reactions of Alkenes & Alkynes

Problems:

Do Not turn in, answers available in "Study Guide Student Solutions Manual " W. Ogilvie et al.

- Chapter 4: 4.1 to 4.5; 4.7 to 4.9; 4.11; 4.13; 4.14; 4.17; 4.19; 4.29; 4.31 to 4.33
- Chapter 2: 2.26; Chapter 8: 8.1a & b; 8.2 to 8.7; 8.11; 8.12; 8.15; 8.22; 8.32; 8.37; 8.47

Lecture Outline # 3

I. Comparison of 2 Structures:

Same Molecular Formula ? -> If Yes, Possibly Isomers or Identical Same Arrangement (Sequence) of Groups ? If No -> Structural Isomers If Yes -> Superposable? If Yes -> Identical Structures If No -> Stereoisomers Non-Superposable Mirror Images ? If NO -> Diastereomers If Yes -> Enantiomers II. Chirality and Stereoisomers

- A. The Concept of Chirality
 - 1. Identification of chiral objects
 - a) achiral = not chiral
 - b) planes of symmetry within a molecule
 - 2. Types of stereoisomers enantiomers and diastereomers
 - B. Location of stereogenic (chiral) centres 4 different groups on tetrahedral atom
 - 1. Enantiomers & diastereomers
 - 2. Meso compounds chiral centers with plane of symmetry within molecule
 - 3. Molecules with more than one chiral centre
 - 4. Recognition of chiral centers in complex molecules cholesterol 8 chiral centres Drawing the enantiomer of cholesterol and its potential 255 stereoisomers
 - 5. Fischer projections

- C. R and S nomenclature
 - 1. Rules for Assigning R and S configurations
 - 2. Treatment of multiple bonds

III. Optical Rotation, Optical Purity, and Resolution of Enantiomers

- A. Optical Rotation
 - 1. Measurement, factors, and absolute rotation
 - 2. Optical purity and enantiomeric excess
 - 3. Physical Properties of Enantiomers and Diastereomers
 - 4. Racemic mixtures 50-50 mixtures of enantiomers
 - 5. Optical Purity = enantiomeric excess (ee)
- B. Separation (Resolution) of Enantiomers (e.g. Racemic mixtures)
 - 1. Creation of diastereomers
 - 2. Biological recognition

IV. Structure and Nomenclature of Alkenes and Alkynes

- A. Alkenes with one double bond
 - 1. Nomenclature
 - 2. Orbital Hybridization
 - 3. Stereoisomerism cis, trans, and Z, E.
 - 4. Cycloalkenes
 - 5. Polyenes
- B. Alkynes
 - 1. Nomenclature
 - 2. Structure and Orbital Hybridization

V. Physical Properties and Sources

- A. Physical Properties solubility, density, BP, MP
- B. Occurrence of Alkenes and Alkynes
- C. Terpenes and Isoprene Units

VI. Reactions of Multiple Bonds between Carbons

- A. General Characteristics Addition Reactions, electrophiles and nucleophiles
- B. Addition Reactions of Alkenes Stereospecificity
 - 1. Hydrogenation
 - 2. Halogenation
 - 3. Halohydrin Formation
 - 4. Hydrogen Halide Addition Markovnikov's Rule
 - 5. Water Addition Alcohol synthesis
 - 6. Alcohol Addition Ether synthesis
 - 7. Hydroboration Oxidation
 - 8. Hydroboration and Treatment with Acid
- C. Oxidation of Alkenes
 - 1. Ozonolysis
 - 2. Osmium Tetroxide and Potassium Permanganate
 - 3. Epoxidation
- D. Addition Reactions of Alkynes
 - 1. Hydrogenation
 - 2. Halogenation
 - 3. Hydrogen Halide Addition
 - 4. Hydration aldehyde and ketone synthesis tautomers
 - a) Markovnikov Addition of Water
 - b) Hydroboration Oxidation
- E. Oxidation of Alkynes
 - 1. Ozonolysis
 - 2. Potassium Permanganate