

ACS Standardized Final Exam Review Suggestions

This is by no means a comprehensive list of topics to study. I simply went through the ACS Study Guide and identified topics that have been covered throughout the semester and should therefore be reviewed. If you find any major conflicts in this list please let me know. This is meant to help you find areas you need to focus on the most. The best advice for studying for the final is PRACTICE. I would also suggest not writing directly in your study guide so that you can go over it multiple times without the answers already being there. Additionally, you will be reusing this guide for the comprehensive Organic Chemistry II Final Exam next semester.

- Nomenclature
 - Focus on what functional groups have been covered in this semester
 - Go over the remaining functional groups that have not been covered yet and just be familiar with the name endings, substituent names, etc.
- Structure Hybridization, Resonance, Aromaticity
 - Lewis Dot Structures and proper formal charge assignment
 - VSEPR theory and hybridization
 - General MO Theory – sigma and pi bonds formed from hybridization
 - Carbocation stability
 - Condensed, molecular, and structural formulas
 - Intermolecular forces and strengths
 - Isomer types
 - Resonance
- Acids and Bases
 - Lewis Acid-Base definitions
 - Resonance effects on acidity/basicity
 - pH and pK_a relationships to acidity/basicity
 - Inductive effect
 - Effect of s- and p-characters on acidity/basicity
- Stereoisomerism
 - Nomenclature – R/S, cis/trans, E/Z, chiral, achiral, stereocenter, racemic, etc.
 - Be able to determine the stereochemistry around a chiral center
 - Chair conformations
 - Newman projections
 - Fischer projections
 - Any differences in physical properties of different types of isomers
 - Stereochemistry of electrophilic addition and substitution reactions
- Nucleophilic Substitutions and Eliminations
 - All details for S_N1 , S_N2 , E1, and E2 reactions
 - Mechanisms of reactions
 - Rate laws
 - Trends in nucleophilicity
 - Trends in leaving groups
 - Stereochemical difference in reactions
 - Structural effects on nucleophilicity/basicity
 - Carbocation rearrangements
- Electrophilic Additions

- Hydrohalogenation reactions
- Acid-catalyzed reactions
- Weak base reactions – such as methanol, ethanol, etc.
- Halogenation reactions
- Halohydrin formation reactions
- Oxymercuration reactions
- Hydroboration reactions
- ~~Nucleophilic Addition at Carbonyl Groups~~
- ~~Nucleophilic Substitution at Carbonyl Groups~~
- ~~Enols and Enolate Ion Reactions~~
- ~~Electrophilic and Nucleophilic Aromatic Substitution~~
- Free Radical Substitutions and Additions
 - Radical stability
 - Mechanisms – initiation, propagation, termination
 - Selectivity of radical bromination
 - Selectivity of radical chlorination
 - Effects of peroxides on reactions
- Oxidations and Reductions
 - Ozonolysis reactions
 - Osmium tetroxide reactions
 - Catalytic reduction reactions
 - Hydrogenation reactions – complete and stereochemically controlled partial
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- Spectroscopy
 - Major IR frequencies
 - Identify structure from given IR spectrum
 - Factors that can effect range
 - Major ^1H and ^{13}C NMR frequencies
 - Splitting patterns for NMR
 - Factors that can effect shifts
 - Identify structure from given NMR spectrum
- Synthesis and Analysis
 - Be able to follow a roadmap type reaction to last step
 - Creation of specific functional groups – alcohols, alkenes, alkynes, etc.