

Preparing for the CH 232 final

The final for this class is on **Monday 5/5 at 8:00 AM**. The final will be comprehensive including the material we have studied since the last regular exam, which will account for about 20 % of the final exam. The best way to prepare for this final will be to study from the exams and problem sets as well as the old exams and final. One effective strategy is to study the material from one section of the semester and then work blank copies of the problem sets and exams that corresponds to that section. If you can rework the exams and problem sets (plus old exams) you will know you are ready for the final. Another good review in addition to the book problems in the syllabus is the second review problem set on page 1050 of the book. Below I have listed some of the main points from the each chapter to help you focus your studies. Also use the class outline. The final, like all the exams, will not cover anything that was not discussed in class.

Chapter 13: 13.2-11

- Writing resonance structures (very important)
- UV spectroscopy and λ_{MAX} .
- Electrophilic addition to conjugated dienes
- Diels-Alder reaction, particularly stereochemistry

Chapter 14: 14.1-9

- Huckel rule ($4n + 2$)
- Determining whether a molecule is aromatic, nonaromatic, or anti-aromatic
 - aromatic ions
 - heteroaromatic compounds

Chapter 15: 15.1-11, 13C, 14

- Mechanism for electrophilic aromatic substitution
- Electrophilic substitution reactions
 - halogenation
 - nitration
 - sulfonation
 - Friedel-Crafts reactions
- Limitations of Friedel-Crafts reactions
- Clemensen reduction
- Substituent effects
 - activating and deactivating groups
 - ortho, para- and meta-directing groups
 - Theory of substituent effects (be able to draw the resonance structures)
- Oxidation of side chains
- Substitution of disubstituted benzenes

Chapter 16: 16.1-10, 12-14

- Synthesis of aldehydes and ketones (See CH 11 for oxidation of alcohols)
- Nucleophilic addition to carbonyls
 - General mechanism

- Relative reactivity of aldehydes and ketones
- Mechanism for hemiacetal and acetal formation (be sure you can recognize an acetal)
- Thioacetals and Rainey Nickel reduction to alkanes
- Mechanism of imine formation
- Wolff-Kishner reaction
- HCN addition (cyanohydrins)
- Wittig reaction
- Review CH 12 dealing with addition of organometallic species (RLi, Grignard reagents, LiAlH_4 , NaBH_4 to aldehydes and ketones)

Chapter 17:

- Keto and enol tautomers
- Aldol reaction
 - Recognizing aldol products--both aldol and elimination product
 - Mechanism
 - Crossed aldol reactions
 - Intramolecular aldol reactions
- Conjugate additions
- Michael addition
- Thermodynamic and kinetic enolates

Chapter 18:

- Names of carboxylic acid derivatives
- Acidity of carboxylic acids
- IR peaks of carboxylic acid derivatives-why are they different
- Preparation of carboxylic acids
- Mechanism for nucleophilic substitution of carboxylic acid derivatives
- Interconversion of carboxylic acid derivatives (see handout chart) and relative reactivities
- Mechanism of acid catalyzed esterification
- Acid and base promoted mechanisms for amide hydrolysis
- See Chapter 12 for addition of organometallic reagents (RLi, Grignard reagents, and LiAlH_4) to carboxylic acid derivatives

Chapter 19:

- Claisen condensation
 - Recognizing products of Claisen condensation
 - Mechanism
 - Intramolecular Claisen condensation
- Acetoacetic ester synthesis
- Malonic ester synthesis
- Mannich Reaction
- Enamines

Chapter 20:

- Basicity of amines

- Preparation of amines
 - Primary amines
 - Don't do S_N2 on with amines--over alkylation
 - Gabriel
 - Sodium Azide, $LiAlH_4$
 - Reduction of nitro groups
 - Reduction of nitriles
 - Primary, secondary, or tertiary amines
 - Reductive amination
 - Reduction of amides
- Formation of diazonium ions
- Sandmeyer reactions

Chapter 21: 21.4A, 5-8, 11

- Synthesis of phenols by Sandmeyer reaction
- Acidity of phenols--substituent effects
- Nucleophilic aromatic substitution
 - Addition-elimination mechanism and role of electron withdrawing groups
 - Benzyne mechanism

Chapter 22: 22.1-6C, 7-12

- Classification and nomenclature of monosaccharides
- Fischer projections (D and L sugars)
- Cyclic forms - Haworth formulas
- Naming pyranoses and furanoses--conversion to/from Fischer projections
- Glycoside formation and mechanism
- Naming glycosides
- Ether formation of glycosides
- Tollens' and Benedict's tests--reducing and non-reducing sugars
- Oxidation to aldonic and aldaric acids
- Reduction of sugars--alditols
- Phenylsazones (don't need to know mechanism)
- Killiani-Fischer synthesis
- Ruff Degradation
- D-aldoses. Still need to know the 6 aldoses from exam 4
- Fischer's proof of the glucose structure and application to other unknowns
- Disaccharides
 - classification and naming
 - determining structure of unknown disaccharides

Chapter 24: 24.1-3D, 4-7

- Structure of amino acids
- Amino acids as dipolar ions--pI
- Synthesis of amino acids
- Resolution of amino acids
- Peptides and proteins

- Analysis of polypeptides
 - Hydrolysis
 - Sanger method
 - Edman degradation
 - Partial hydrolysis--acid or enzyme

General thoughts:

Mechanisms: The major mechanism chapters are 15, 16, and 18. The important ones are detailed on the class web site. If you look at the mechanisms we've covered there are only a few types (1-2/chapter). Make sure you know these very well. If they are reversible, be able to draw them forwards and backwards.

Reactions: For the major reactions learn to recognize the products, so that you will know what reaction formed them. Unfortunately there is a level of memorization that must be done to learn the reagents. Flash cards are a useful tool for doing this. Make one side with the starting material and reagents and the other side with the starting material products, but without the reagents. That way you can study both recognizing the products and remembering what the reagents do.

Others: Make sure you do many practice problems determining the structure of aldoses (Fischer proof), disaccharides, and peptides. This is one area where the book has a number of good problems. Practice is the only way to get good at these problems.

Good luck.