

Final Exam Study Guide

This is not meant to be exhaustive or all encompassing, but to list some major points. I suggest reviewing the 4 exams; make sure you understand the tested concepts. There is a practice test for Section 5 (new material) on the course website.

Chapter 1

- Hybridization of orbitals
- Geometry / shape / bond angles
- What are the orbitals at a given carbon atom?
 - What is the shape?
 - What is the (ideal) bond angle?

Chapter 2

- Dipole moment
 - Which molecules are polar and which are not
- Formal charges. I will give a molecule and ask the formal charge at an atom
- Resonance. Be able to draw resonance forms. For example, draw the resonance forms for the nitrate ion, NO_3^- .
- Strong and weak acids and bases
- Which is which; where does equilibrium lie?
- Is a particular conjugate base strong enough to remove a proton from a certain acid, given their pK_a values.

Chapters 3-5

- Given a compound be able to identify the functional group
 - Given a functional group, be able to sketch a compound

- Naming
 - From the name, write the structure
 - From the structure, write the name

Know how to name cycloalkanes; given a structure, be able to name it; given a name, be able to draw the structure

Know all about Newman structures; how to draw them; what the several conformations are called: gauche, staggered, eclipsed, anti; which is higher energy than which.

Know about chair and flip chair of cyclohexane. Be able to draw them; be able to indicate axial versus equatorial; know what happens in a flip; know which is lower in energy.

Be able to draw each of the steps and their mechanisms in a free radical reaction and indicate which steps are initiation, propagations and termination.

Know about endergonic and exergonic; fast and slow reactions; and what their energy diagrams look like

Chapter 6

Given a formula, be able to calculate degree of unsaturation

Be able to name alkenes, including cis/trans and E/Z

Understand addition of HX to alkenes

Which carbocation intermediate is formed and which product is formed

Be able to write the mechanism

Understand relative stability of carbocations

Understand 1,2-hydride shifts and 1,2-methyl shifts and be able to draw a mechanism involving them

Chapter 7

Know all the reactions we discussed

Which products are formed (including Markovnikov vs anti-Markovnikov)

What reagents are used.

Syn versus anti addition

Know the major points of mechanisms

- know about the bromonium ion
- partial carbocation intermediate for oxymercuration of alkene
- partial carbocation intermediate for reaction of borane with alkene

Know about carbenes

How formed

Geometry, hybridization, charge (zero)

Reaction products

Know alkene cleavage reactions

Be able to write mechanism for all of the free radical reactions we reviewed (including alkane halogenation, allylic halogenation).

Chapter 8

Be able to name alkynes. From the name, be able to draw the structure.

Know all the reactions we discussed

Which products are formed

What reagents are used.

Know cleavage reactions – given the cleavage products, be able to draw the structure of the alkyne.

Chapter 9

Be able to assign R or S

Know when a compound is meso, an enantiomer, a diastereomer, optically active and optically inactive.

Know what a racemic mixture is

Chapter 10.

Know all the reactions we discussed

Which products are formed

What reagents are used.

Be able to show how to convert A to B

Given a starting material and reagents, be able to fill in the products

Understand the mechanism and products for allylic halogenation.

Chapter 11

Know about S_N1 , S_N2 , E1, & E2

- the mechanism of each
- effect on stereochemistry
- what factors favor one mechanism over another

Chapter 12

Skip section on mass spectroscopy

Know the general concepts of infrared and how it is used.

Learn a few major absorption frequencies: OH, NH, C=O, C=C, C-O

Chapter 13 – covered in CHM 212 (skip for now)

Chapter 14

Why things absorb in UV

Effect of conjugation on wavelength

Diels-Alder reaction

- what products are formed; from the products be able to draw the reactants
 - o cis versus trans
 - o endo

Kinetic versus thermodynamic

1,2 versus 1,4 addition including mechanism