

CH 251 - Exam #1 Review Sheet – Fall 2008

Chapter 1 - Chemical Bonding

- electronic configuration of carbon, valence shell electrons, octet rule
- covalent bonding (single, double, triple), sigma vs. pi bonds
- Lewis structures, condensed structures, bond-line
- electronegativity
- bond polarity (ionic, polar covalent, covalent), dipole moment of molecule
- formal charges
- resonance, resonance structures, electron localization/delocalization
- VSEPR, shape/geometry, hybridization (sp , sp^2 , sp^3)
- constitutional isomers, cis/trans isomers
- orbitals used in a particular bond ($s-sp^3$, sp^2-sp^2 , $p-p$, etc.)

Chapter 2 - Functional Groups, Intermolecular Forces and IR Spectroscopy

- functional groups (alkanes, alkenes, alkynes, aromatic hydrocarbons, alkyl halides, alcohols, ethers, aldehydes, ketones, esters, carboxylic acids, amides, amines, nitriles)
- "R" terminology for generic alkyl group
- bond polarity/polar molecules
- physical properties & molecular structure (intermolecular forces: ion-ion, dipole-dipole, hydrogen bonding, van der Waals)
- IR spectroscopy - basics of the technique, recognize functional groups

Chapter 3 - An Introduction to Organic Reactions: Acids and Bases

(Skip 3.15)

- types of reactions: substitution, addition, elimination, rearrangement
- homolytic cleavage vs. heterolytic cleavage
- acid/base definitions (Brønsted-Lowry, Lewis)
- more definitions: nucleophile, electrophile
- curved arrow notation
- acid-base equilibria: predict the products, compare pK_a s, determine direction of equilibrium
- definition of pK_a ; use in determining relative acidities
- inverse relationship between acid and base strength
- know the list of pK_a s given in lecture
- structure/acidity relationships
 - * across a row
 - * down a column
 - * hybridization effects
 - * inductive effects
 - * resonance effects
- energy changes: know ΔG° equations, reaction coordinate diagrams
- solvent effects
- organic molecules as bases (lone pairs, π bonds)

****Note: All of Chapter 3 is included on this review sheet, but depending on how far we get in lecture, it is possible that not all of it will be on Exam #1.***