

CHEM 8A Reading Questions: This document is designed to help guide your reading by providing the *bare minimum* material you should be familiar with when you walk into lecture. Find the responses to the questions or statements that follow. This should take 30 min or less! *The responses are not turned in for credit but I'd recommend keeping them in your HW notebook.* Complete the reading by quickly skimming the text again, paying attention to bold terms, figures, schemes, tables etc.

Lecture 1, Chapter 1

1. What is an orbital? What are the different types of orbitals?
2. How can you use the periodic table to determine an atom's electron configuration (location of electrons)?
3. Be able to identify or draw the following for B, C, N, O, and F...
 - a. Number of valence electrons
 - b. Electron configuration (ex. $1s^22s^2p^6$...)
4. What is a sigma bond and a pi bond? How do they relate to single, double, and triple bonds?
5. Consider the skeletal structure of 2-methylbutane. How are the carbons and hydrogens abbreviated in this structure and how many of each are there?

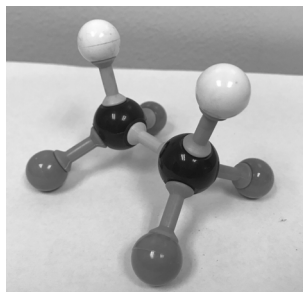
Lecture 2, Chapter 2.1-2.6

1. What is electronegativity and what is the most electronegative element?
2. What is a dipole? Draw the individual dipole arrows for each bond in water, methanol, and ammonia to explain the overall (net) dipole in each molecule.
3. Draw the Lewis structure of a phosphate ion, nitrate ion, and carbonate ion then calculate the formal charge on each atom.
4. What are the basic rules for resonance forms?

Lecture 3, Chapter 2.7-2.12

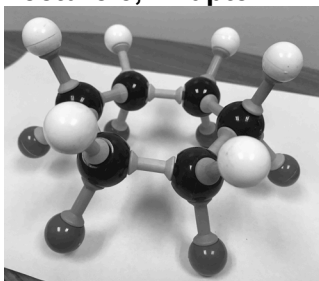
1. What's the difference between the Bronsted-Lowry definition and the Lewis definition of acids and bases?
2. How does pKa relate to acidity...higher pKa means a weaker or stronger acid? Begin memorizing the pKa's in the Lecture 3 notes.
3. What is the conjugate base of acetic acid ($\text{CH}_3\text{CO}_2\text{H}$)? Draw its Lewis structure.
4. What are the three intermolecular forces mentioned in section 2.12? Rank them in relative strength.

Lecture 4, Chapter 3



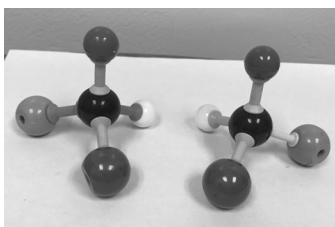
** Make a model and bring to lecture: 2 C's (black) with single bond between them, give each C 3 more single bonds to 3 different colors (same 3 on either side).*

1. Begin learning the functional groups in Table 3.1 (Name & Structure only). Flash cards are helpful!
2. What prefixes represent 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 carbons in an alkane chain?
3. What are the basic steps in drawing an alkane from its name? Note we will only be drawing structures from names, NOT naming alkanes from its structure.
4. What does a Newman projection represent? Draw the eclipsed and staggered conformation of ethane.

Lecture 5, Chapter 4

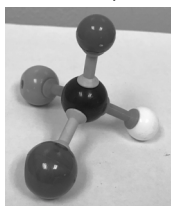
* *Cyclohexane model – make and bring to lecture: Link 6 C's (black) with single bonds in a ring. The remaining two bonds on each C should be white (pointing up if you hold the ring flat) and green (pointing down). If you don't have green and white, choose any 2 other colors.*

1. What differences are there in cycloalkane vs. alkane structures / names?
2. Define the terms: *stereochemistry*, *stereoisomers*, *cis-trans isomers*, *angle strain*, *torsional strain*, and *steric strain*.
3. Draw the two chair conformations of cyclohexane showing all axial and equatorial H's (the book has a nice tutorial).

Lecture 6, Chapter 5.1-5.5

* *Tetrahedral Carbons - make two separate models & bring to lecture – One C atom with 4 different colors. The other will be its mirror image – another C with 4 different colors single bonded.*

1. What does it mean for a molecule to be “chiral”?
2. What is the basic requirement for an atom to be referred to as a chirality center?
3. What is plane-polarized light?
4. What are the Cahn-Ingold-Prelog rules for ranking substituent priority?

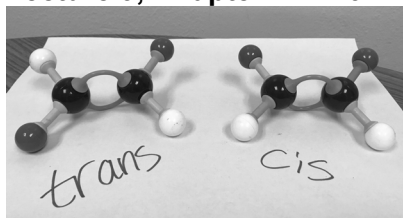
Lecture 7, Chapter 5.6-5.12

* *Bring the same model (just one of them) from Lecture 6.*

1. What is the difference between enantiomers and diastereomers?
2. What are the main criteria for a compound to be a meso compound?

Lecture 8, Chapter 6

1. Describe in your own words how to distinguish between an addition, elimination, substitution, and elimination reaction.
2. What is the difference between a radical and polar reaction mechanism?
3. Define the terms “nucleophile” and “electrophile” and give three functional group examples of each, specifying the *atom* that accepts or donates electrons.
4. What are the rules for using curved arrows in polar reaction mechanisms?
5. Describe the relationship between the value of the equilibrium constant (K_{eq}) of a reaction, the reaction free energy (ΔG°), and whether the reaction absorbs or releases energy.

Lecture 9, Chapter 7.1-7.6

* Make & bring two models to lecture: One *cis*-alkene and one *trans*-alkene. Use the longer, more flexible gray connectors for double bonds.

1. What does it mean for a compound to be unsaturated?
2. How does the numbering system for alkenes differ from that for alkanes? Be familiar with drawing an alkene structure from name.
3. Give a simple example of a *cis*-alkene, *trans*-alkene, *E*-alkene, and *Z*-alkene.
4. Compare the rules for prioritizing chiral centers to those for *E/Z* designation.

Lecture 10, Chapter 7.7-7.11

1. Explain how a reaction can be regioselective.
2. What is Markovnikov's Rule and how does it relate to carbocation stability?
3. What is the difference between a hydride and a proton?

Chapter 8.1-8.3

4. How does *anti/syn* stereochemistry compare to *trans/cis*?
5. How many different ways can halogens be introduced into a molecule with an alkene? How are the reaction mechanisms different and how are they similar?

Lecture 11, Chapter 8.4-8.6

1. Know these terms: Alkyl Halide, Alkyl Dihalide, Halohydrin, Alcohol, Alkane, Alkene, Epoxide, 1,2-Diol, Ketone, Aldehyde, Carboxylic Acid.
2. How many different ways can water be added across an alkene? What is the main difference in the outcome of these different methods?

Lecture 12, Chapter 8.7-8.8, 8.12-8.13

3. How can you tell if the organic reactant is oxidized or reduced?
4. Review all the new ways to introduce oxygen into an alkene.
5. How many of the alkene reactions occur with relative stereochemistry, assuming the products have chiral centers? Which reactions will always form a racemic mixture?

Lecture 13, Chapter 9.1-9.6

1. Review the system for drawing alkynes from a given name. This will not be covered in lecture.
2. Most of the reactions of alkynes in this chapter are identical to those of alkenes. Take the time to draw an example of each alkyne reaction (up to and including section 9.6) and then draw an example of an alkene reacting with those same reagents (or the parallel set of reagents based on what you learned in chapter 8).

Lecture 14, Chapter 9.7-9.9

1. What is a terminal alkyne and what is its pKa?
2. What is an acetylide ion and what can it react with?

Lecture 15, Chapter 10

1. Show a simple example of each reaction used to synthesize organobromides from (a) alkanes, (b) alkenes, and (c) alcohols.
2. What are organometallic reagents? Give a few examples. Are they nucleophiles or electrophiles?

Lecture 16, Chapter 11.1-11.5

1. Do alkyl halides behave as nucleophiles or electrophiles?
2. How many steps are there in the mechanism of an S_N1 reaction? Of an S_N2 reaction?
3. Is an S_N1 reaction favored with more or less highly substituted alkyl halides? What about an S_N2 reaction?
4. List a few examples of good leaving groups and good nucleophiles. Are hydroxide and fluoride good leaving groups? Are they good nucleophiles?

Lecture 17, Chapter 11.7-11.12 (skip $e1cB$ reaction and 11.11)

1. Show the stereochemistry of the E2 reaction using Newman projections for acyclic alkyl halides and chairs for cyclohexyl halides.
2. What do the S_N1 and E1 reactions have in common?
3. Give examples of strong bases and weak bases.
4. As best as you can, list examples of compounds that can act as...
 - a. Nucleophile and base
 - b. Nucleophile but not a base
 - c. A base but not a nucleophile
 - d. Nucleophile and solvent

Lecture 18, Chapter 14.1-14.5

1. What is the difference between a conjugated and an unconjugated diene?
2. Why does the addition of HBr or Br_2 to conjugated dienes become more complicated than with a non-conjugated diene?
3. What is meant by a 1,2-addition vs. a 1,4-addition of HBr to a conjugated diene?
4. What are the two functional group requirements for a Diels-Alder reaction?
5. What is the main structural characteristic of the product of a Diels-Alder reaction?

Lecture 19, Chapter 15.1-15.6

1. Memorize the common names of the aromatic compounds in Table 15.1.
2. How is *ortho*-, *meta*-, *para*- used in drawing aromatic compounds? When should numbering be used instead?
3. What are the criteria for a compound to be aromatic?