CHEM164/261, A2 **Practice Questions for the MidTerm Exam** 2010 10 20 HT

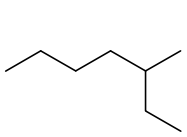
Review the Practice Questions for the Quiz as well as the Answer Keys for the actual Quiz.

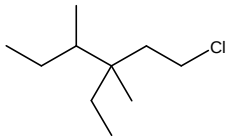
Here are some more questions. Remember this is not an exhaustive compilation.

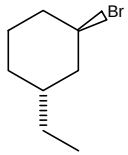
1. Define the following terms by description, example , sketch …
   a. optical isomers
   b. antiperiplanar
   c. IR absorption
   d. wavenumber
   e. meso
   d. angle strain

2. Consider $(CH_3)_2C{=}CHCN$.
   a. Determine the number of bond types: $(sp^3,sp^3)\sigma$ ___ , $(sp,sp^2)\sigma$ ___ , $(sp^3,sp^2)\sigma$ ___ , $(sp^2,sp^2)\sigma$ ___ , $(sp,sp)\pi$ ___ , $(p,p)\pi$ ___
   b. What other bond types are present?
   c. Which atoms lie in the same plane? Which ones are normally not in this plane.

3. For this question ignore R/S designation.
   a. Provide systematic (IUPAC) names for the following.







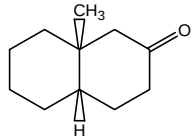
   b. Write a bond line structure for cis-1-sec-butyl-3-isopropylcyclopentane.

4. Sketch an IR chart with proper labeling of the x and y axes. Then indicate the relative positions of C,C double and C,C triple bond peaks on this chart.

5. For the halogenation reaction of ethane write an example for each of an initiation, a propagation and a termination step. Use proper electron movement arrows.

6. In the chlorination of pentane four (4) monochlorinated products are possible. Show their bond line structure , incl. stereochemistry as required.

7. Consider



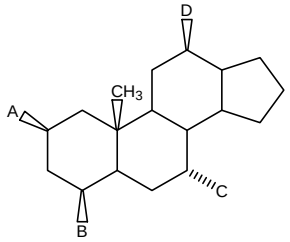
   a. Is it chiral? ____. Why? _____
   b. OK, it is. Now, indicate the stereogenic center(s) and identify them as R or S.
   c. Draw its enantiomer.
   d. Draw a diastereomer if there is any.

8. Rank the following groups in terms of C-I-P priority (highest first):

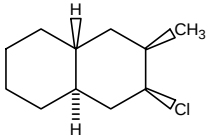
   a.) $-(CH_2)_2CH_3$, $-CH_2CH(OH)CH_3$, $-(CH_2)_2CH_2OH$, $-CH_2CH{=}CH_2$, $-CH(NH2)CH_2CH_3$.

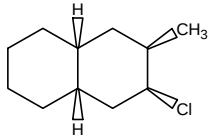
   b) $-(CH_2)_2CH_2Cl$, $-CH_2C(=O)CH_3$, $-(CH_2)_2CHO$, $-CH{=}CHCH_3$, $-CH_2CCl(CH_3)_2$

9.
   a. Determine whether the substituents A, B, C and D in this steroidal compound are equatorial or axial. (All rings are trans joined)
   b. If A, B, C and D are all -OH groups, what is the R/S designation of the carbon atoms that these -OH groups are attached to.

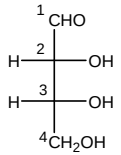


10. What positions (ax. or eq.) do the -Cl and $-CH_3$ groups occupy in the following molecules, preferentially?





11. Consider the Fischer formula

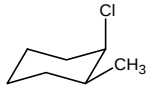


a. Show a Newman projection (looking from C3 to C2) of this molecule in the conformation where the H's at C3 and C2 are antiperiplanar.

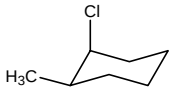
b. Determine R and S configuration at C2 andC3.

c. Show a 3-dimensionally correct "wedge and dash" structure of the above with a horizontal zigzag line and the aldehyde group up and to the right.

12. Consider



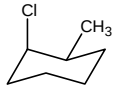
Compare the following with the reference structure and apply the labels :
identical structure, different conformer, enantiomer, diastereomer, constitutional isomer.



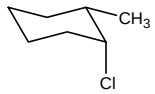
a.)

b.)

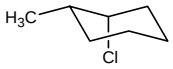
c.)



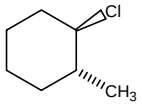
d.)



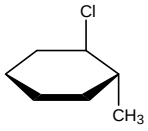
e.)



f.)

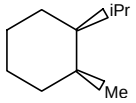


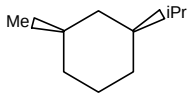
g.)

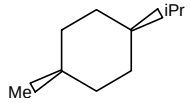


h.)

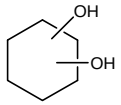
13. Write the preferred conformation for the following:







14. Consider



(which indicates 2 OH groups attached to different C atoms on the ring)

Show two constitutional isomers, both meso, that have this general structure.

15. What feature of the substrate structure is critical that will determine whether a substitution reaction will go by the S_N1 or S_N2 reaction mechanism? Why?

16. Attempt to draw the σ* antibonding orbital that is involved in the S_N2 reaction of chloroethane.