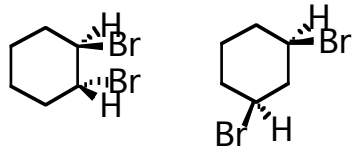
JASPERSE CHEM 350 TEST 1 VERSION 3 Organic Chemistry I - Jasperse
Intro and Review
Structure and Properties of Organic Molecules
Structure, Nomenclature, and Conformation/Stereochemistry of Alkanes

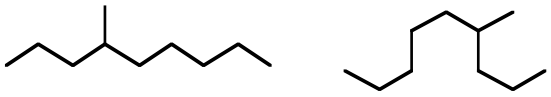
1. (12 points) Give the relationship between the following pairs of structures. The possible relationships are the following:
   same compound structural isomers resonance structures
   stereo isomers not isomers (different molecular formula)

a. 

b. 

c. 

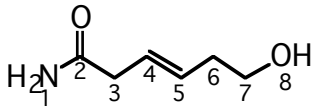
d. 

e. 

f. 

2. (8 points) Draw line-angle structures and names for 4 of the 5 structural isomers of C_6H_{14}.

3. (10 Points)



a. For the above structure, what is the hybridization and approximate bond angles (109, 120, or 180) about:

C-2

C-4

C-6

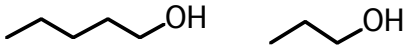
O-8

b. In the above structure, N-1 is actually found to have 120º bond angles. (This may seem unexpected to you at this point, but we'll learn why later in the course.) What must be the hybridization of the nitrogen?

4. (2 Points) Bond rotation around C6-C7 in the above structure has a 7 kcal/mol barrier, while rotation around the C4-C5 bond has a 70 kcal/mol barrier. Explain very briefly why it is so much harder to rotate the latter bond?

5. (4 points) For each of the pairs listed, circle the one with the higher boiling point.

a. 

b. 

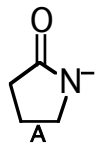
6. (6 points) Write a Lewis structure and assign any non-zero formal charges.

a. $[CH_3NH_3]+$

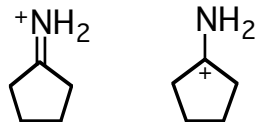
b. CH_3CO_2Na

c. CH_3CHO

7. (5 points) a) Draw the best resonance structure for anion A, and circle the resonance structure that would make the greater contribution to the resonance hybrid.



b. For the two resonance structures shown below, circle the resonance structure that would make the greater contribution to the resonance hybrid.

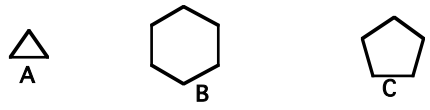


8. (6 points) Rank the acidity of the following molecules, 1 being most acidic, 4 being least acidic. Hint: draw the anions!

NH_3 CH_3CH_2OH CH_3CO_2H HCl

9. (6 points) Draw a line-angle picture for all of the atoms in the molecule $CH_3CH_2COCHClCH_3$, including the hydrogens. Use the hash-wedge convention to indicate atoms that are not in the plane of the paper.

10. (5 points) Rank the ring strain in the following, from 1(most) to 3 (least). Explain very briefly the differences in strain.



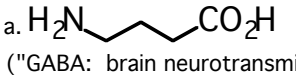
11. (6 points) Which of the following are capable of cis-trans stereoisomerism? (Yes/No).

a. 3-ethyl-1,1-dimethylcyclopentane

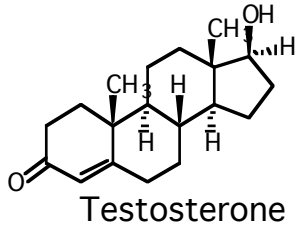
b. 3-pentene (name means a double bond is between carbons 3 and 4)

c. 1,3-dimethylcyclohexane

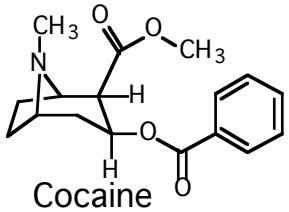
12. (9 points) Identify the functional groups in the following molecules. (Do not include "alkane", since that is not "functional". And do not specify "cyclic".)

a. 

("GABA: brain neurotransmit

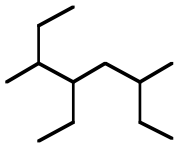
b. 

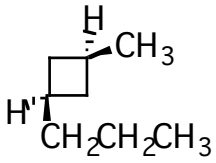
Testosterone

c. 

Cocaine

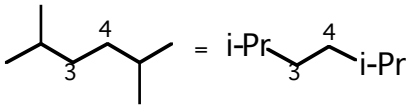
13. (5 points) Give the IUPAC name for the following compounds.

a. 

b. 

14. (8 points) a. Draw Newman projections for the totally eclipsed, the gauch, and the anti conformations of 2,5-dimethylhexane, relative to the C3-C4 bond. You may abbreviate the isopropyl groups attached to C3 and C4 as "i-Pr" for convenience.

b. Explain very briefly why the rotation barrier around the C3-C4 bond of 2,5-dimethylhexane is greater than the rotation barrier in butane.



15. (8 points) a.) Draw the two chair conformations of cis-3-methyl-1-isopropylcyclohexane. (You don't need to show the H's on carbons other than 1 and 3). For convenience, you may abbreviate methyl as "Me" and isopropyl as "iPr"

b.) Circle the more stable conformation.

c) Would trans-3-methyl-1-isopropylcyclohexane be more stable or less stable than the cis isomer?