

**Chemistry 116 Sec. A (8:00-8:50)**  
**Exam No. 1**  
**“Structure and Functionality”**  
**September 22, 2000**

**Instructions:** You will have 50 min. to complete the exam. At the 50 min. mark, I will request that all remaining test takers cease writing, turn their exams over, and pass them to their rightmost isle. If you finish within 45 min. you may turn in the exam at the front of the room prior to leaving. If you finish in the final 5 min. of class, please turn your exam over and remain seated until I call for the remaining exams to be turned in. *In fairness to all, anyone still working on the exam after “time” is called will receive a grade of zero!*

Be sure to read the instructions for each question. It may be helpful to skim the entire exam and solve the easier questions first.

**Exam Agreement:** I, \_\_\_\_\_, have read and agree to

(Please print)

abide by the instructions above. On my honor, I have neither given nor accepted any help during this exam.

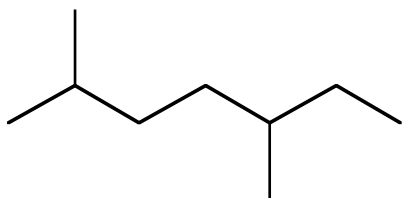
**Signature:** \_\_\_\_\_

**College:** \_\_\_\_\_

**DO NOT OPEN THIS EXAM UNTIL  
INSTRUCTED TO DO SO**

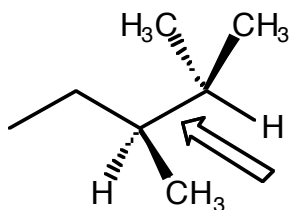
1) Translate the following structures to the representation requested above each box.

**Condensed Structural Formula** (6 points)

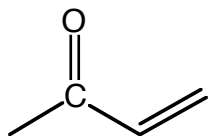


Name the molecule shown above (4 points)

The most stable **Newman Projection**  
looking down the indicated bond (6 points)



2) The following drawing represents the most stable Lewis structure for methylvinyl ketone, a molecule used in commercial paint strippers. Methylvinyl ketone has been found to react with various Lewis bases. Using your knowledge of resonance theory, indicate the position or positions on the molecule where a Lewis base might react and provide a rationale for your selection(s) using both pictures *and* words. (10 points)

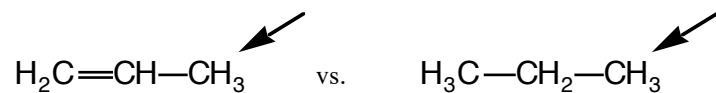


methylvinyl ketone

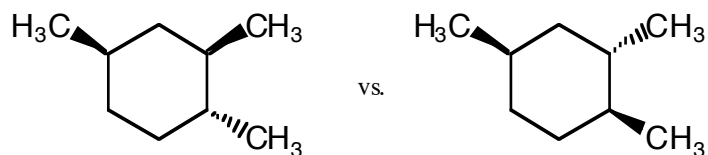
3) For each pair of molecules shown below, select the one that best fits the accompanying description by circling it. Provide a concise but thorough rationale for each of your decisions using pictures and/or words. (6 points each)

Rationale

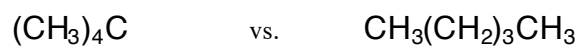
The most acidic proton?



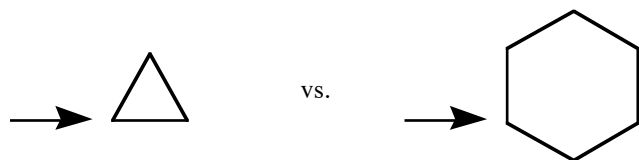
The most stable molecule?



The molecule with the highest melting point?



The carbon with the greatest "s" character?



- 4) Ozone ( $O_3$ ), a molecule found in the stratosphere, is vital in protecting the earth's inhabitants from the sun's harmful UV rays. Draw the Lewis structure of ozone in the box provided *showing all lone pairs of electrons and charges where applicable*. If any resonance contributors exist for ozone, draw those as well. Then answer the questions that follow:

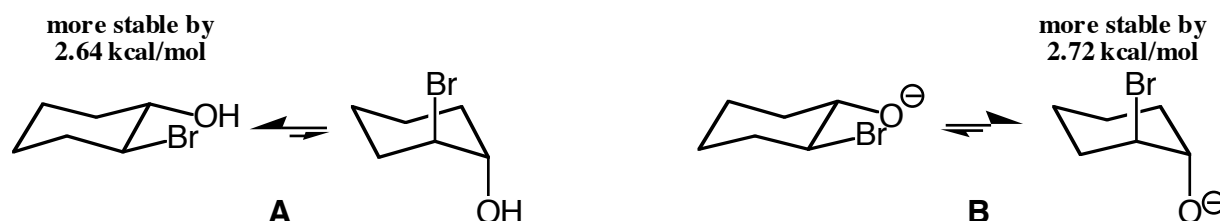
**Lewis Structure(s) for Ozone (6 points)**



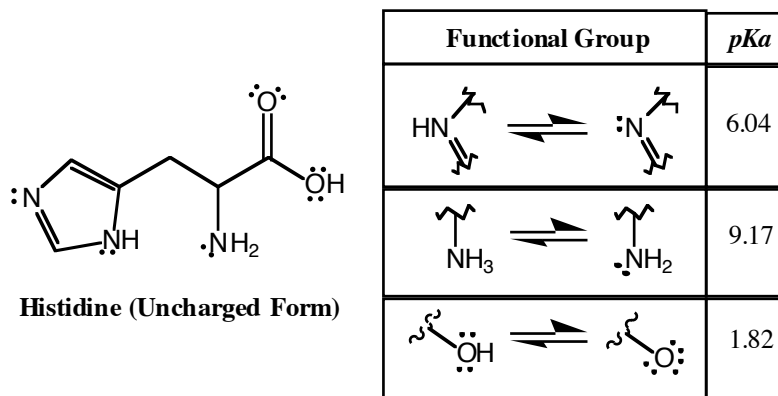
- a) Circle the oxygen or oxygens in ozone that would be *most* likely to react with a Lewis acid. (4 points)
- b) Sketch the orbital picture for ozone. Be sure to label the orbital types and bond types in your picture. You will be graded on the accuracy of your drawing (8 points).
- c) Does ozone have a permanent dipole moment? Why or why not? (6 points)

5) Provide an example of a molecule that contains a 1°, 2°, 3° and 4° carbon using a bond-line drawing. Label one of each carbon type in your drawing. (8 points)

6) Molecular modeling calculations show that the diequatorial conformer of **A** is, as expected, more stable than its diaxial conformer. However, calculations on **B** predict that the diaxial conformer is actually more stable than its diequatorial conformer. Using words and Newman projections, explain why axial conformers are generally less stable than equatorial conformers. Then provide an explanation for the unusual result shown below for **B**. (10 points)



7) Medical evidence suggests that some speech deficiencies in children are caused by a lack of the amino acid histidine. Histidine is shown below in its uncharged form along with a table of  $pK_a$ 's. Draw the predominant form of histidine at  $pH = 8$  and indicate its overall charge. (8 points)



## Grading Summary

<b>Page</b>	<b>Point Value</b>	<b>Points Earned</b>
2	26	
3	24	
4	24	
5	26	
	<b>Total Score =</b>	