

**Exam #1**  
**Chem 2310 - Organic I Chemistry**  
Dr. Davies  
Wednesday January 25, 2012

Ch. 1 Introduction and Review  
Ch. 2 Structures and Properties of Organic Molecules  
Ch. 3 Structure and Stereochemistry of Alkanes

Name: \_\_\_\_\_

My signature indicates that I have neither given nor received any unauthorized assistance on this exam.

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

Tips

Look over the whole exam first.

Check the page numbers to make sure you are not missing any pages. If you are missing a page, trade for another exam at the desk.

Read questions thoroughly.

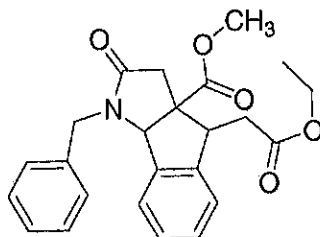
Do the problems you know first.

Show all your work.

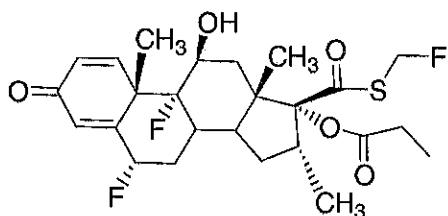
Relax, and just do the best you can.

## I. Nomenclature

1. A report of the synthesis of the compound below has recently been reported in *J. Org. Chem.* **2012**, 160. Circle and name each functional group in this structure. (6 points)



2. Fluticasone propionate is a top 5 best selling prescription drug to treat asthma and respiratory problems. How many tertiary carbons are there in Fluticasone propionate? (3 points)

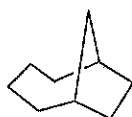


3. How many degrees of unsaturation in Fluticasone propionate, shown above? (3 points)
4. Provide structures for the two compounds listed below and circle the structure having the higher boiling point. (6 points)

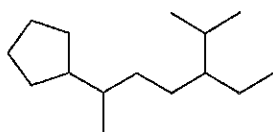
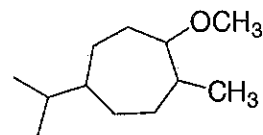
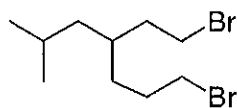
isobutylbromide

*tert*-butylbromide

5. Provide a name for the following bicyclic structure. (3 points)

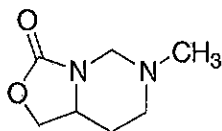


6. Provide a correct IUPAC name for each of the following structures. (9 points)



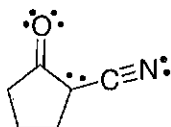
## II. Theory

1. A(n) \_\_\_\_\_ bond is one in which atoms share electrons unsymmetrically. (2 points)
2. Circle all  $sp^2$  centers in the structure below. (3 points)

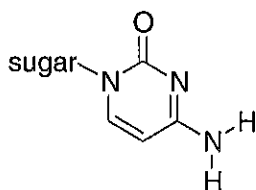


3. The geometry of an  $sp^3$  hybridized carbon is said to be \_\_\_\_\_. (2 points)
4. Combination of atomic orbitals on different atoms creates \_\_\_\_\_ orbitals. (2 points)

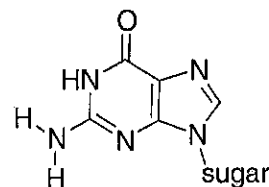
5. Provide two additional significant resonance structures for the following structure. Indicate any formal charges and circle the major contributor to the overall resonance hybrid. (10 points)



6. In strands of DNA, cytosine base pairs up with guanine through 3 hydrogen bonds. Show these hydrogen bonding interactions by drawing a line from each hydrogen bond donor to each acceptor. Circle the hydrogen bond acceptor in each hydrogen bond. (6 points)

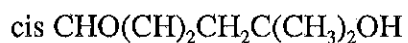


Cytosine

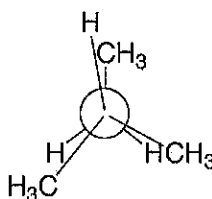
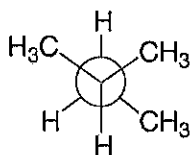


Guanine

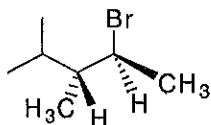
7. Translate the following condensed structure to a line-angle structure. (4 points)



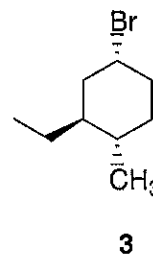
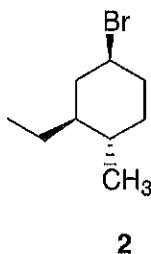
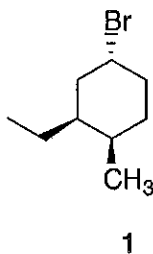
8. For the structures below, how much higher in energy (Kcal / mol) is the eclipsed conformation than the staggered conformation? (3 points)



9. In a Newman projection, sighting down the C2-C3 bond, draw the structure below in its most stable conformation. (6 points)

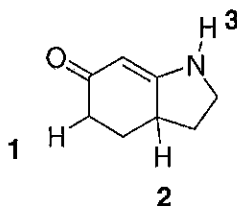


10. Drawn in their most stable chair structures, which sequence ranks the following structures in order of increasing stability? (3 points)



- a) 1<2<3    b) 2<3<1    c) 3<1<2    d) 3<2<1    e) 2<1<3    f) 1<3<2

11. Which sequence ranks the indicated protons in order of increasing acidity? (3 points)



- a) 1<2<3    b) 2<3<1    c) 3<1<2    d) 3<2<1    e) 2<1<3    f) 1<3<2

12. Which sequence ranks the following rings in order of increasing stability? (3 points)

1 cyclohexane

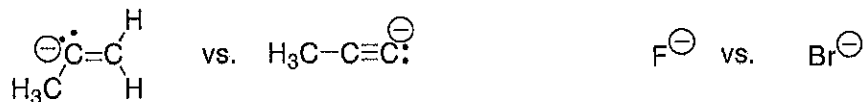
2 cycloheptane

3 cyclooctane

- a) 1<2<3    b) 2<3<1    c) 3<1<2    d) 3<2<1    e) 2<1<3    f) 1<3<2

13. Which cycloalkane favors an envelop conformation? (2 points)

14. In each series circle the stronger base. (4 points)



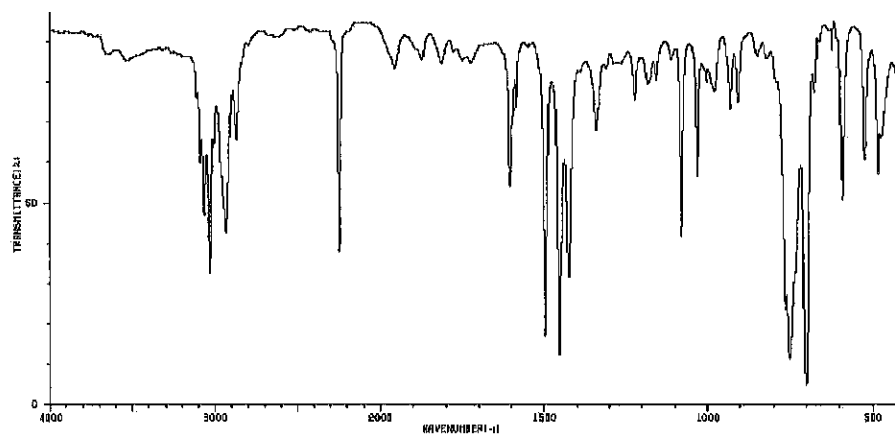
15. An  $\text{sp}^2$  hybridized carbon can form as many as \_\_\_\_\_ pi bonds and \_\_\_\_\_ sigma bonds. (2 points)

16. If compound B,  $\text{C}_5\text{H}_6\text{O}$ , contains 1 ring, how many pi bonds are there in this compound. (3 points)

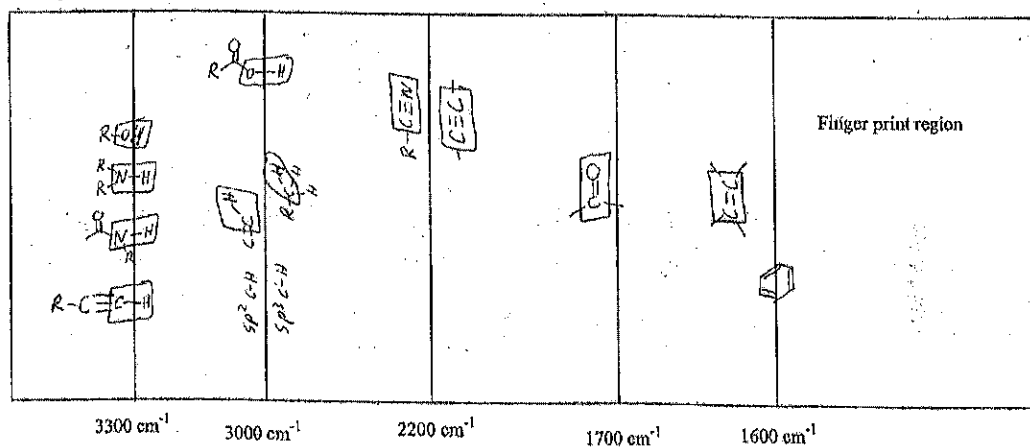
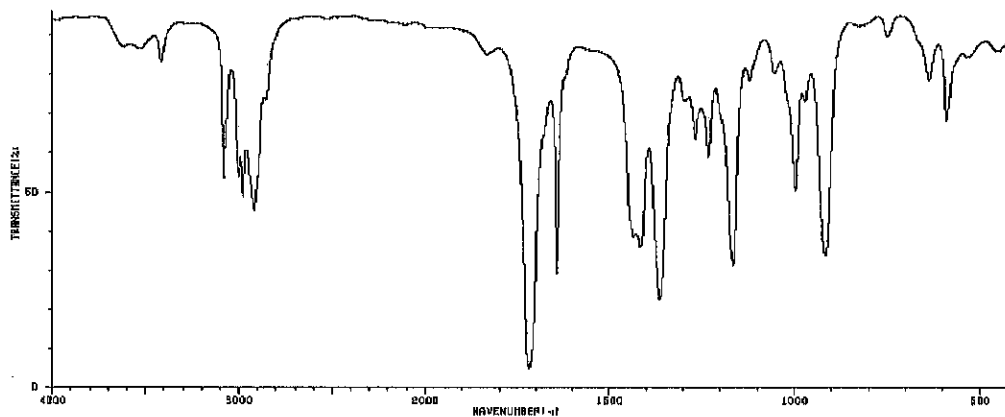
17. \_\_\_\_\_ strain occurs when substituents on one side of a ring overlap with substituents on the opposing side. (2 points)

### III. IR spectroscopy

1. Name the functional group(s) in the structure represented in the following IR spectrum. Justify your answer by labeling all key peaks. (6 points)

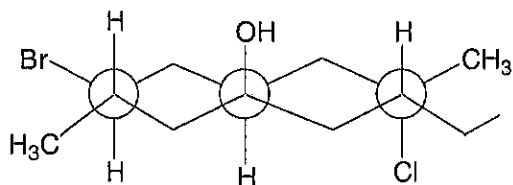


2. Compound C,  $C_6H_{10}O$ , gave the following IR spectrum. Propose a possible structure for compound C. Justify your answer by labeling key peaks in the spectrum. (4 points)



**IV. Extra Credit (5 points)**

1. Translate the following Newman projection to a chair structure. Circle all groups occupying an axial position.



You received \_\_\_\_\_ points out of 100 points possible. To check your overall performance in lecture see <http://vista.weber.edu/>.

**Abbreviated Periodic Table**

<b>5</b> <b>B</b> 10.81	<b>6</b> <b>C</b> 12.01	<b>7</b> <b>N</b> 14.01	<b>8</b> <b>O</b> 16.00	<b>9</b> <b>F</b> 19.00
<b>13</b> <b>Al</b> 26.98	<b>14</b> <b>Si</b> 28.09	<b>15</b> <b>P</b> 30.97	<b>16</b> <b>S</b> 32.07	<b>17</b> <b>Cl</b> 35.45
<b>31</b> <b>Ga</b> 69.72	<b>32</b> <b>Ge</b> 72.59	<b>33</b> <b>As</b> 74.92	<b>34</b> <b>Se</b> 78.96	<b>35</b> <b>Br</b> 79.90
<b>49</b> <b>In</b> 114.82	<b>50</b> <b>Sn</b> 118.71	<b>51</b> <b>Sb</b> 121.75	<b>52</b> <b>Te</b> 127.60	<b>53</b> <b>I</b> 126.90