

Key

CHEM 51A LEC A (40260)

Midterm (Summer I 2014) - LETTER SIZE



5849 (2499)

Assigned Seat#: _____

Instructions to Instructor:

Do not alter this coversheet in ANY way. Substantial delays and additional fees may apply.

Instructions to Student:

1. Clearly print your Last Name, First Name and the Date
2. Clearly print your Student ID number in the boxes provided. Use large, dark numbers. These numbers are captured automatically during the scanning process.
3. Bubble in each number of your Student ID completely. The bubbles are used only if your written ID number is not captured.
4. Write your Name and Student ID number in the upper right corner of all following pages of your exam.

Last Name, First Name: _____

Date: ____/____/____

STUDENT ID:

For Access UCI student, leave first column blank then enter your 7-digit Student ID number.

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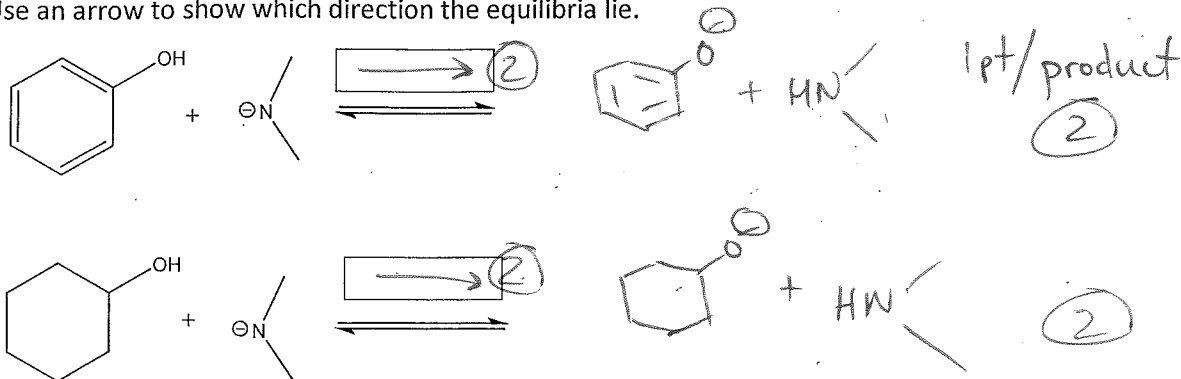
----- (This space for Instructor/TA use only) -----

Graded by: _____ Total Correct: _____

1. For the two equilibria shown below:

a. Draw the products of the reactions. You may omit spectator ions.

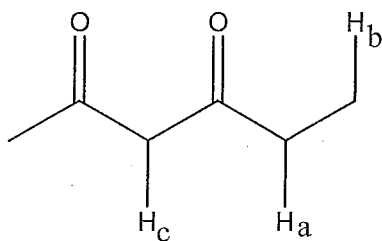
b. Use an arrow to show which direction the equilibria lie.



c. Is the top or bottom reaction more highly favored? Explain in 1-2 sentences. (4)

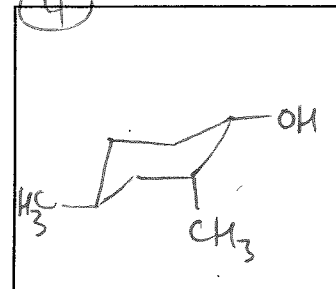
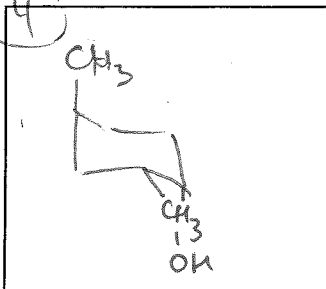
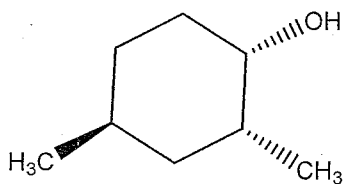
Top is favored because of resonance

2. Rank the three labeled hydrogens from most acidic to least acidic (1=most acidic). Write the letter labels on the lines provided.



C A B
 1 2 3

3. For the structure below, draw both the low-energy chair conformation and the high-energy chair conformation in the boxes provided. Label each structure as low- or high-energy.



High

Low

No pts for enantiomers
2 pts if axial/equat. are right but angles are really ugly.

_____ (2) _____

28

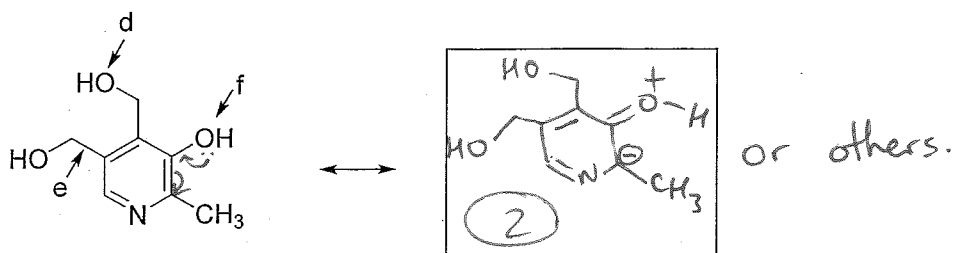
12

6
2 each

4

4

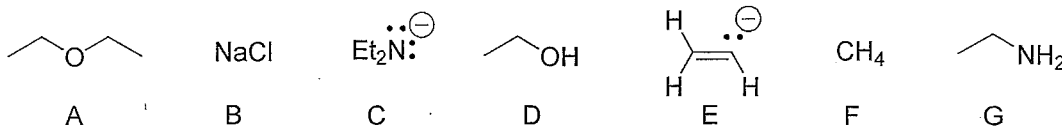
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4. Use the structure of vitamin B6 drawn above to answer the following questions

- a. How many sp^2 carbons are present? 5 (2)
- b. How many sp^3 carbons are present? 3 (2)
- c. Identify the hybridization of the nitrogen atom. sp^2 (2)
- d. Name the functional group labeled d. hydroxyl or alcohol (2)
- e. Identify the type of bond (σ , π) and the types of orbitals on each atom used to make this bond labeled e. σ , $Csp^2 - Csp^3$ (2pt) (2pt)
- f. In the box provided above, draw the resonance structure for vitamin B6 that places a positive charge on the oxygen labeled f. On the original structure, draw the curved arrows needed to show how you arrived at this new resonance structure. (2)

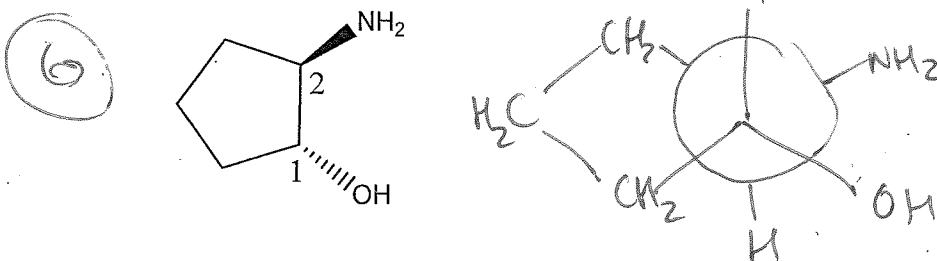
Arrows must come from a lone pair and end on carbon



5. Write the letter of the molecule or species above that fits the criteria in each item. If there is more than one answer, write all appropriate letters. An incorrect answer for an item negates a correct answer for that same item.

- a. Most acidic D (2)
- b. Most basic E (2)
- c. Not ionic, but soluble in water D, G (2) (1 each)
- d. Most soluble in hexanes F (2)
- e. Lowest melting point F (2)
- f. Shortest C-C bond E (2)
- g. Can act as hydrogen bond acceptor but not as hydrogen bond donor A (2) (1pt if 2) but can also have C, E

6. Draw a Newman projection for the molecule below, looking down the C1-C2 bond. Place C1 in front.



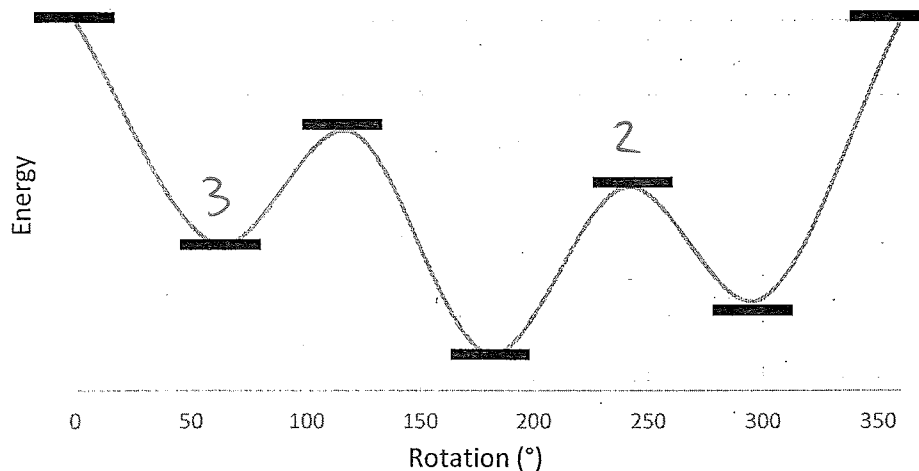
3 for everything but ring.
trans = 3 pts.

36

16

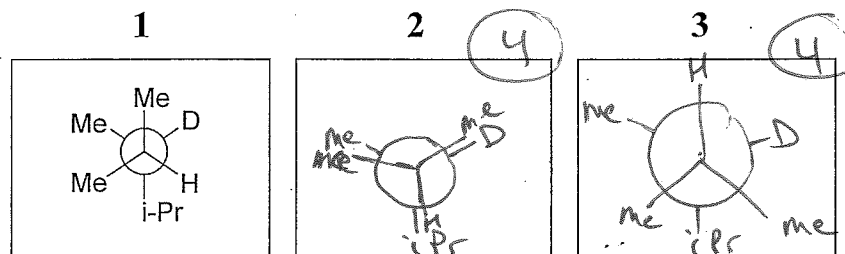
14

7. A Newman projection of a deuterated alkane and the corresponding potential energy versus internal rotation graph are shown below.

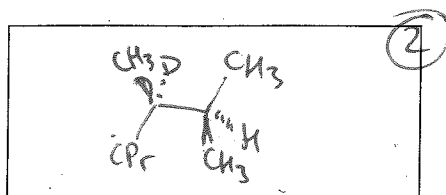


- On the graph, label the point corresponding to the lowest energy eclipsed conformer with the number 2.
- On the graph, label the point corresponding to the highest energy staggered conformer with the number 3.
- Rotating ONLY the front carbon, draw the Newman projection corresponding to the lowest energy eclipsed conformer in the box labeled 2. Rotating only the front carbon, draw the Newman projection corresponding to the highest energy staggered conformer in the box labeled 3.

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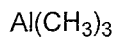
- Convert the Newman projection in box 1 above to a skeletal drawing. Don't forget wedges and dashes!



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8. In the boxes provided:

a. Label the structures below as either Lewis acids (LA) or Lewis bases (LB).



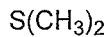
LA

(2)



LB

(2)



LB

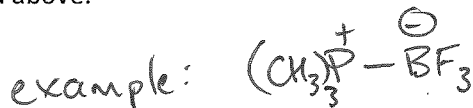
(2)



LA

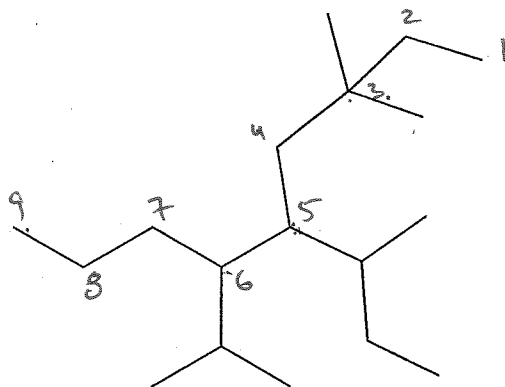
(2)

b. Draw the product of the reaction of one the Lewis acids listed above with one of the Lewis bases listed above.



charges must be shown

9. In the box provided, give the proper IUPAC name for the structure shown below.



5 4 7 7
1 1 1

5-sec-butyl-6-isopropyl-3,3-dimethylnonane

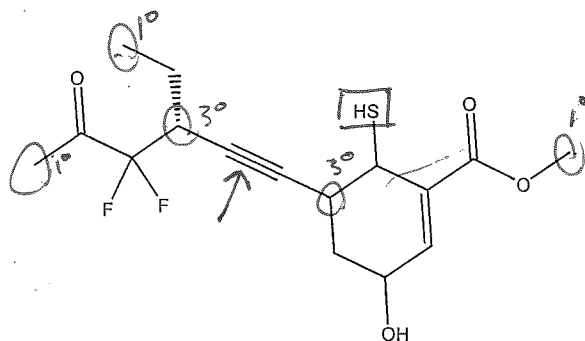
10. For the structure shown below:

a. Circle three functional groups (not including alkyl groups or alkyl halides), label them A, B, and C, and name them in the boxes provided at the right. 9 3 each 2 name, 1 circle

b. Draw a box around the most acidic hydrogen. 2

c. Use an arrow to indicate the shortest bond. 2

d. Label the primary (1°) and tertiary (3°) carbons. 5



A	
B	
C	