Printed Name: _____

CHEM 3311, Fall 2009
Professor Walba
First Hour Exam
September 24, 2009

scores:

1)

2)

3)

4)

5)

_____

CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

Name (printed): _____

Signature: _____

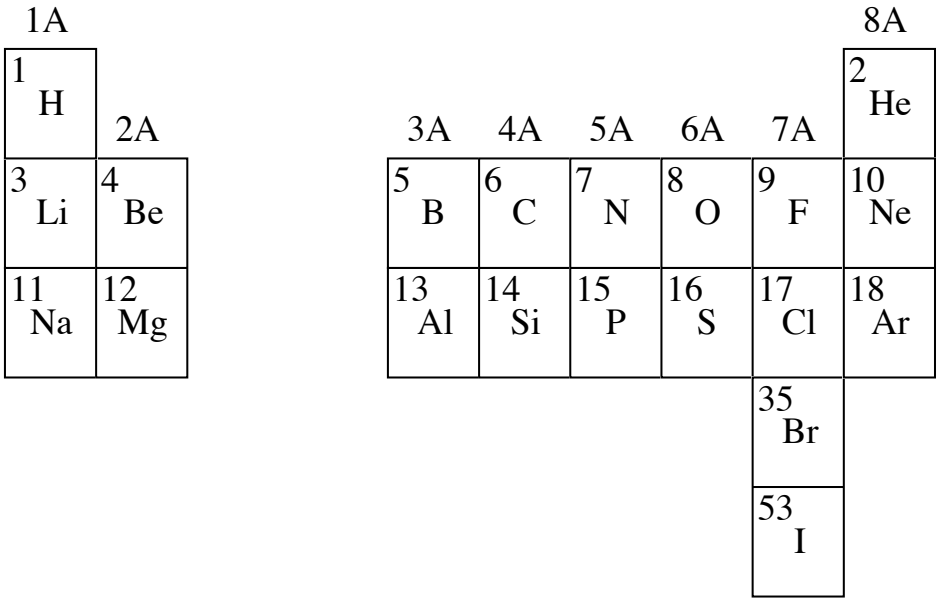
Recitation TA Name: _____

Recitation day and time: _____

This is a closed-book exam. The use of notes, models, calculators, scratch paper, or any other paraphernalia will not be allowed during the exam. Please put all you answers on the test. Use the backs of the pages for scratch.

PLEASE read the questions very carefully!

Partial Periodic Table



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1) (20 points) Draw a valid valence bond structure, showing all formal charges and unshared electrons, for each of the following molecules. Indicate by name the hybridization of each second row atom in your structures.

a) $(BH_4)^{\ominus}$

b) $(CH_3)^{\ominus}$

c) $(CH_3)^{\oplus}$

d) $(NH_4)^{\oplus}$

e) $(C_2H_3)^{\ominus}$

BE SURE TO INDICATE THE HYBRIDIZATION OF THE SECOND ROW ATOMS!

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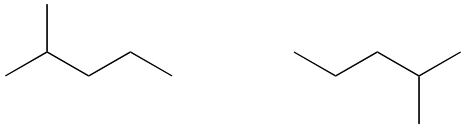
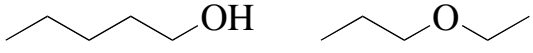
2) (18 pts) A) Indicate the relationship of each of the following pairs of structures, using one of the following pairwise descriptors: Constitutional Isomers, Stereoisomers, or Homomers.

a) 

b) 

c) 

d) 

e) 

B) For the structures 2a - 2d, indicate which of the pair of structures represents the more stable compound. If the two structures have the same stability, label them “same.”

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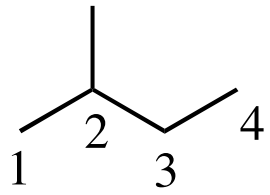
3) (20 pts) The molecular graph of 2-methylbutane is given below, with the carbon atoms in the principal chain numbered.



a) Draw Newmann Projections of the three staggered conformations (not eclipsed conformations) of 2-methylbutane, sighting down the C2-C3 bond (C2 in front!).

b) For the conformations in part 3a, circle the **LEAST STABLE** conformation.

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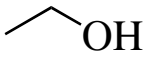
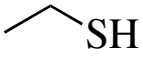
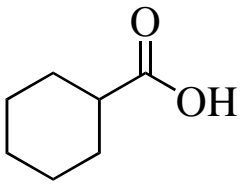
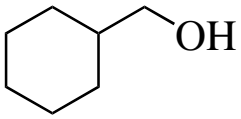
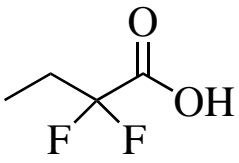
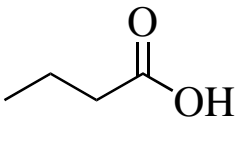
4) (18 pts) A) For each of the following pairs of molecules, circle the stronger Brønsted acid.

a) NH_3 CH_4

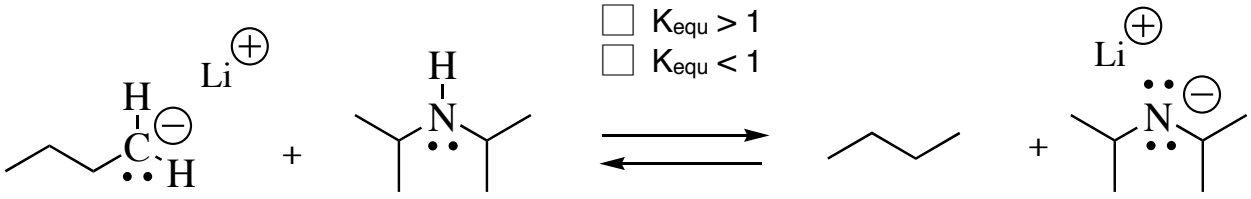
b) $\overset{\oplus}{NH_4}$ $\overset{\oplus}{OH_3}$

c)  

d)  

e)  

B) For the following reaction, indicate whether the equilibrium constant is less than 1 or greater then 1 by checking the correct box.



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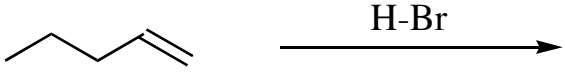
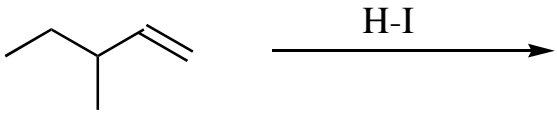
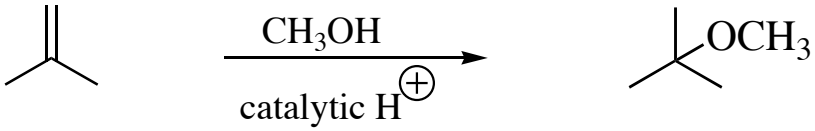
5) (24 pts) A) Give the single major organic product for each of the following reactions.

a) 

b) 

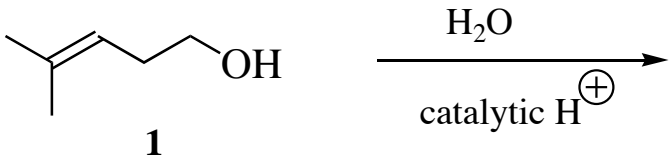
c) 

B) Propose an arrow-pushing mechanism for the following transformation. Be sure to show all of the intermediates in your mechanism.



5) - continued

C) When compound **1** below is treated with catalytic H^+ in H_2O, a new product is formed in high yield. The new product has the same molecular formula as the starting material **1**, and has no OH group and no double bond. Propose a structure for this product.



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