Hour Exam #1 (PM)
Chemistry 343
Professor Gellman
5 October 2011

Last Name Answer

First Name Key

General Instructions:

(i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.

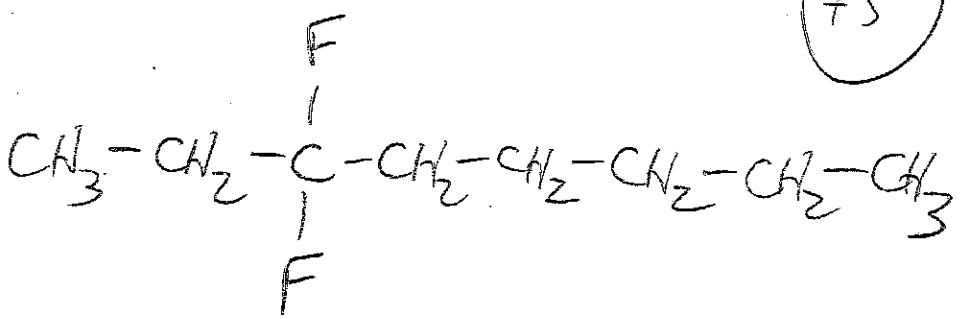
(ii) Print your name on each page.

(iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to failure in the course.

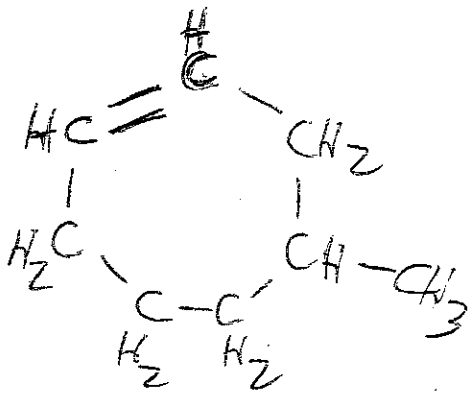
1. (15 points) Draw a structure that corresponds to each of the following names. Show all atoms in each structure, including hydrogen atoms.

(a) 3,3-difluoro-octane

+5

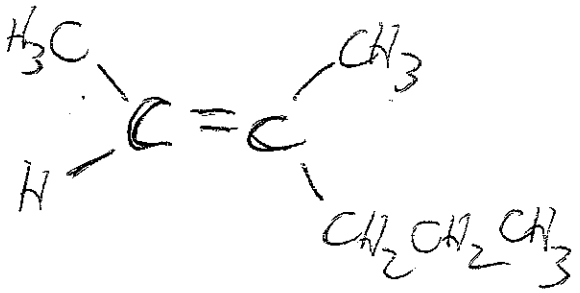


(b) 4-methyl-cycloheptene



+5

(c) *E*-3-methyl-2-hexene



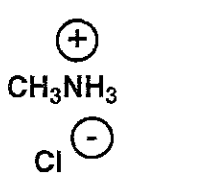
+5 (+3 is alkene

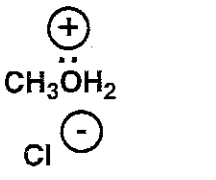
stereochem is incorrect or unclear)

Name _____

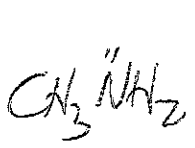
2. (14 points) For each set of three structures shown below, redraw them in the order of DECREASING pK_a, left to right. (Note: Positive charges are balanced by a chloride counterion.)

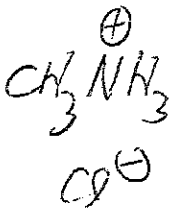
(a)

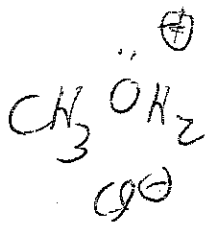




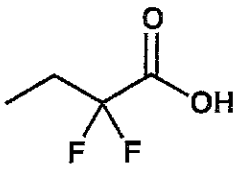
+7

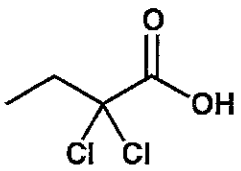


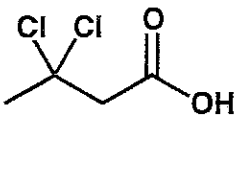




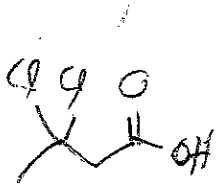
(b)

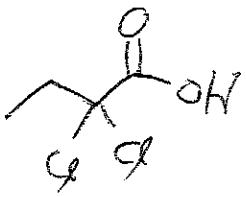


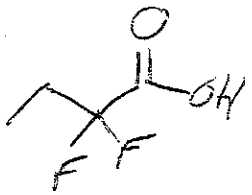




+7



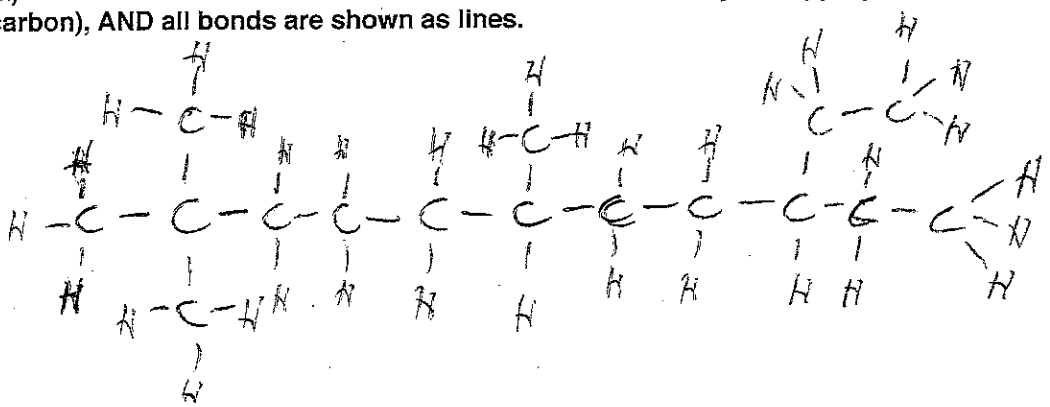




3. (7 points) Consider the alkane indicated below.

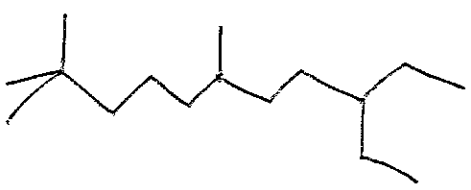
$(CH_3)_3CCH_2CH_2CH_2CH(CH_3)CH_2CH_2CH(CH_2CH_3)_2$

(a) Redraw the molecule so that ALL atoms are indicated by the appropriate atomic symbol (e.g, C for carbon), AND all bonds are shown as lines.



+2

(b) Provide a SKELETAL drawing for this molecule (lines only).



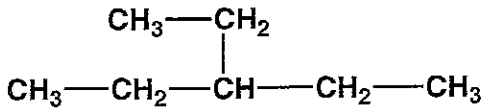
+5

Name _____

4. (20 points)

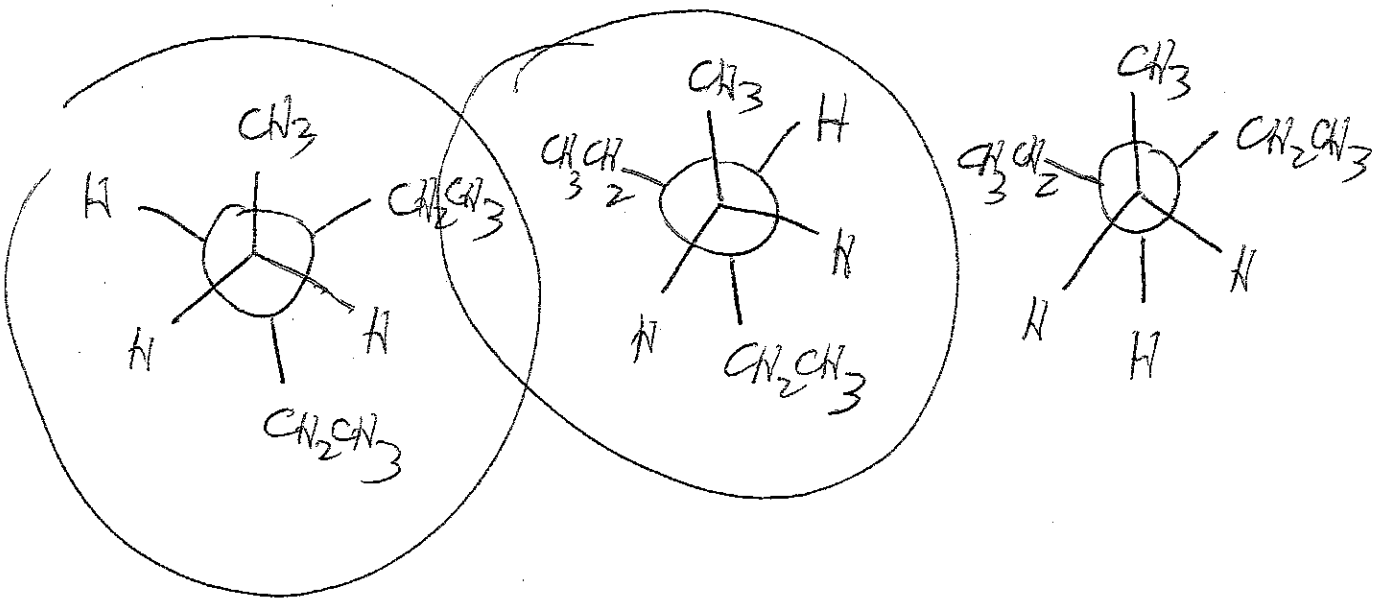
(a) Propane has two carbon-carbon bonds, but these bonds are equivalent in terms of their local environments (i.e., the bonding partners of the pair of carbons). Thus, one can say that propane contains only one TYPE of carbon-carbon bond.

Shown below is 3-ethyl-pentane. How many different TYPES of carbon-carbon bond are found in this molecule?



Number of TYPES of C-C bond = 2 +4

(b) Draw Newman projections for all staggered conformations about the bond between carbon-2 and carbon-3 bond of 3-ethyl-pentane. CIRCLE the conformation(s) that you expect to be most stable.

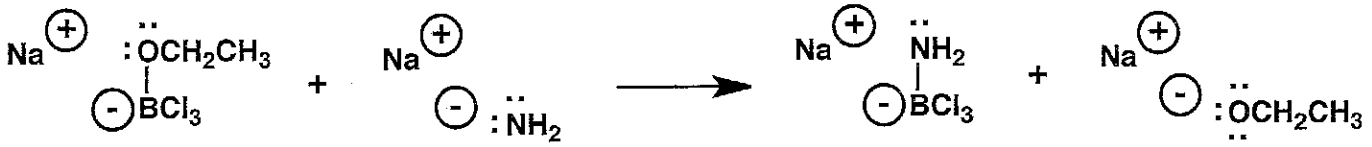


+3 for each correct Newman projection (+9 total)

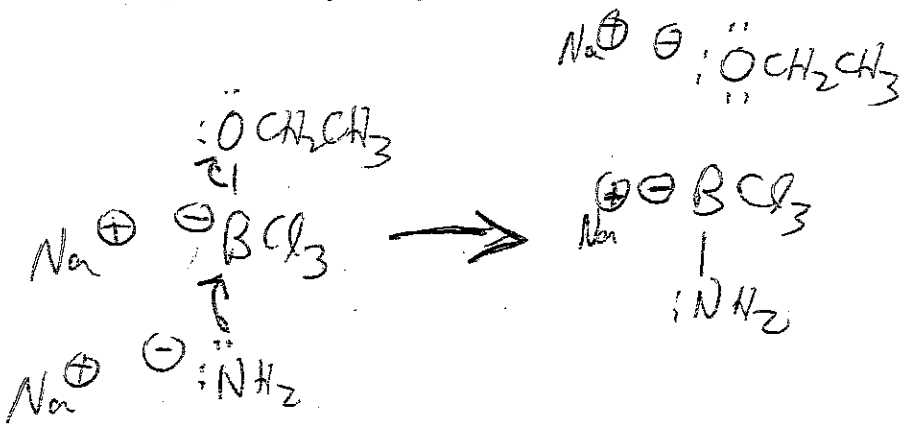
+5 for 1st correct circle, +2 for second (+7 total)

Name _____

5. (14 points) Consider the reaction below, which involve Lewis acids and bases and their complexes.

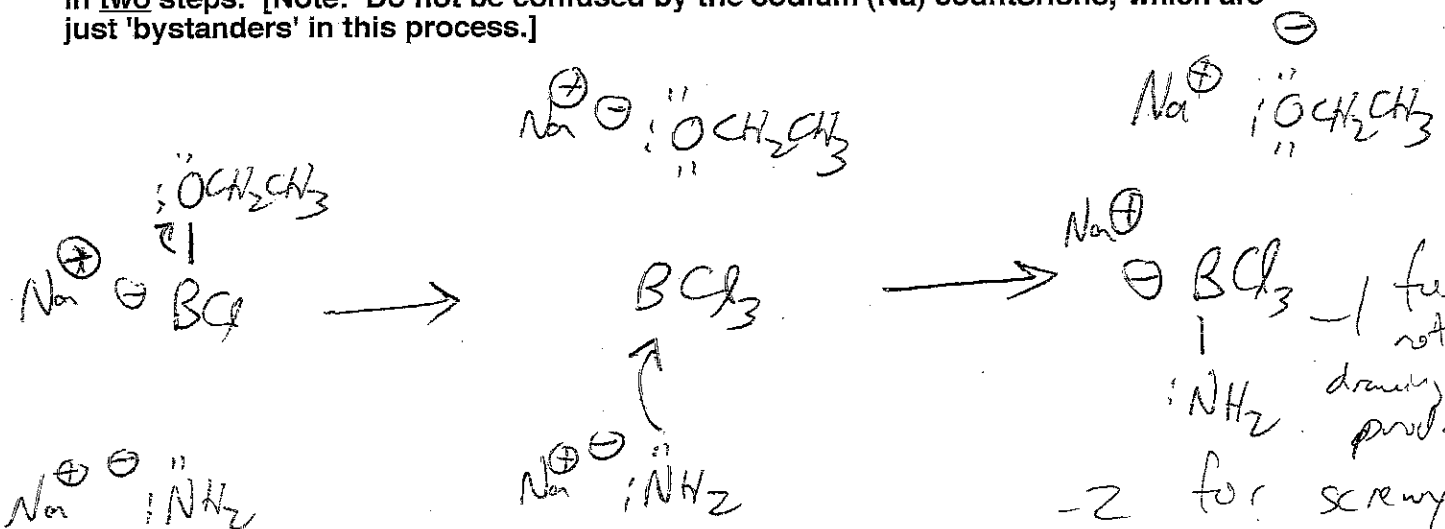


(a) Propose a mechanism (curved arrows) in which the reaction shown above occurs in a single step (no intermediates). [Note: Do not be confused by the sodium (Na) counterions, which are just 'bystanders' in this process.]



+3 for each correct curved arrow (+6 total)

(b) Propose a mechanism (curved arrows) in which the reaction shown above occurs in two steps. [Note: Do not be confused by the sodium (Na) counterions, which are just 'bystanders' in this process.]



+2 for each correct curved arrow (~~+4~~ total)
+ +4 for correct intermediate

-1 for not drawing prod.
-2 for screwy formal charges (w/ a little leeway unless O on part 2)

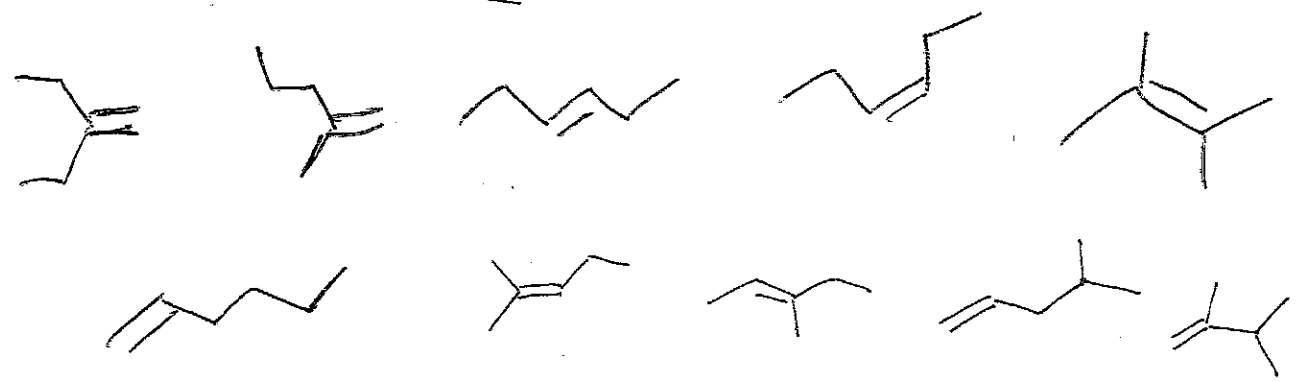
+5 for each correct structure

Name _____

6. (30 points)

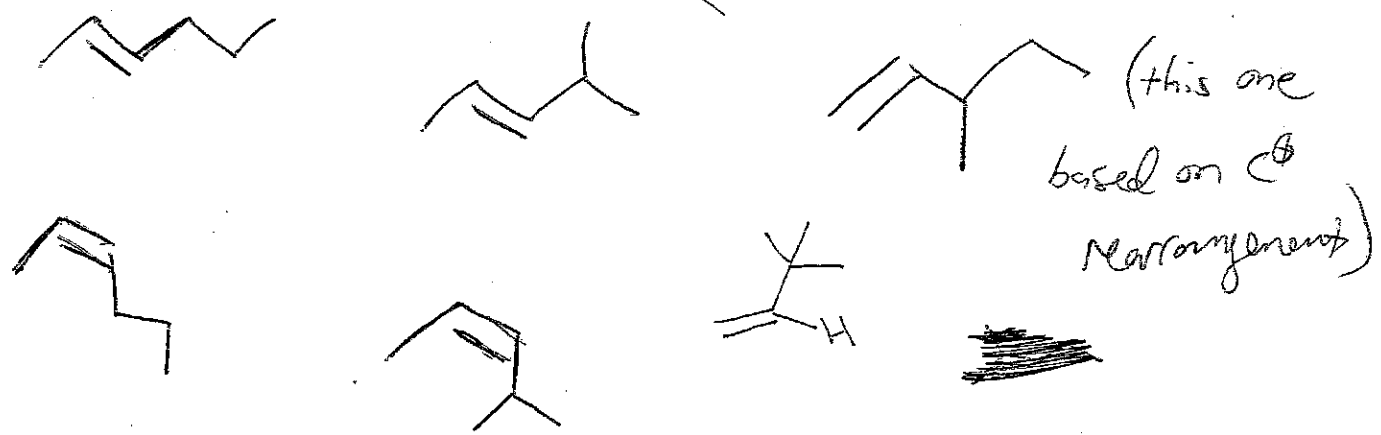
(a) Identify (with appropriate drawings) TWO hydrocarbon molecules corresponding to the formula C_6H_{12} that would be expected to produce only ONE product upon reaction with HBr.

Correct answers include:



(b) Identify (with appropriate drawings) TWO hydrocarbon molecules corresponding to the formula C_6H_{12} that would be expected to produce TWO products upon reaction with HBr.

Correct answers include:



(this one based on C⊕ rearrangement)

(c) Identify (with appropriate drawings) TWO hydrocarbon molecules corresponding to the formula C_6H_{12} that would NOT be expected to react with HBr.

Correct answers include: