

Fruit Straight from the Chemistree

Thanks to for Ryan F. the title!



Organic Chemistry I CHE 310 002, Exam #1

100 sweet, tree-ripened points
September 22, 2017

Rules of the road:

1. There are 10 questions on 5 pages plus a couple of extra credit questions.
2. No notes are allowed.
3. No electronic devices of any kind are allowed. This includes, but is not limited to the following: PDAs, cell phones, pagers, calculators, mp3 players and multifunctional watches.
4. No, I am not kidding!
5. Read the agreement and sign below before you begin.
6. Good Luck!

K.C. Russell

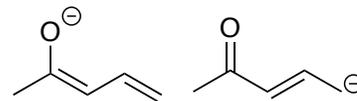
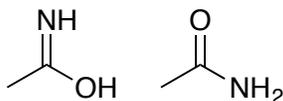
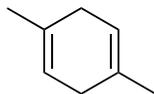
I hereby recognize that I am subject to and agree to abide by the Northern Kentucky University Honor Code, which provides standards that encourage ethical academic behavior and imposes penalties for violations of such standards.

Printed Name : _____

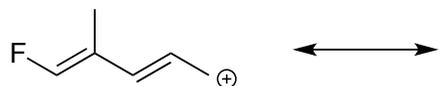
Student ID# _____
Last four of SSN or last eight of ISO

Signature : _____

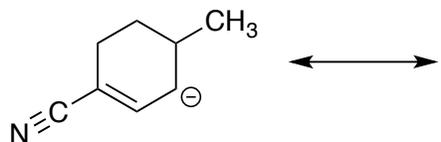
4. **Clearly label** each pair of compounds below as resonance contributors, constitutional isomers, or non-isomeric. (6 points)



5. For each ion below... (16 points)
- Draw** the other relevant resonance contributors that distribute the charge.
 - Use **curved arrows** to show all implied electron motion from one resonance contributor to the next. Include the motion which takes you from your final structure back to the first.
 - Circle** the most stable resonance contributor(s), if there is one (are any). If all contributors are of the same energy write, "SAME".
 - In a couple of words **explain** your answer in part c.

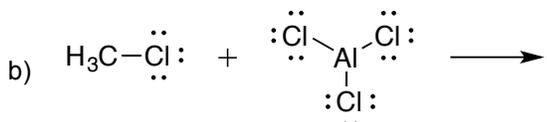
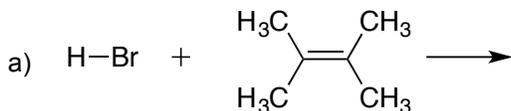


Explanation:



Explanation:

6. a. **Draw** the structure of the product(s) that result from each acid / base reaction.
 b. Use **curved arrows** to show all electron motion. Be sure to include any formal charges (12 points)



7. a. Using the correct combination of straight, wedged and dashed lines **re-draw** the compounds below in three-dimensional form. (10 points)
 b. **Check the boxes** below each molecule to indicate whether that compound has a dipole moment ($\mu \neq 0$) or not ($\mu = 0$).

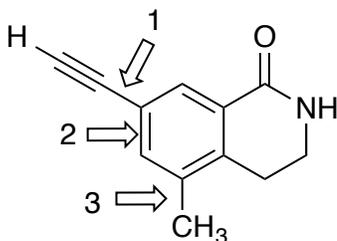
c. For those compounds that have dipole moments **indicate the direction of the dipole**. $\uparrow \text{H}-\text{O}-\text{H}$

HC(O)OH
 $\mu = 0$ $\mu \neq 0$

H₃CCN
 $\mu = 0$ $\mu \neq 0$

3D structure and
 direction of dipole
 moment (if any)

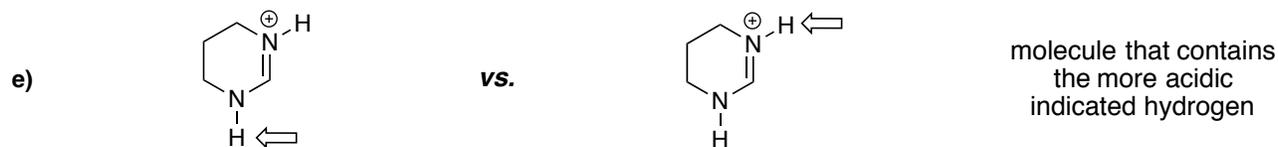
8. Refer to the molecule shown below to answer the questions that follow. (7 points)



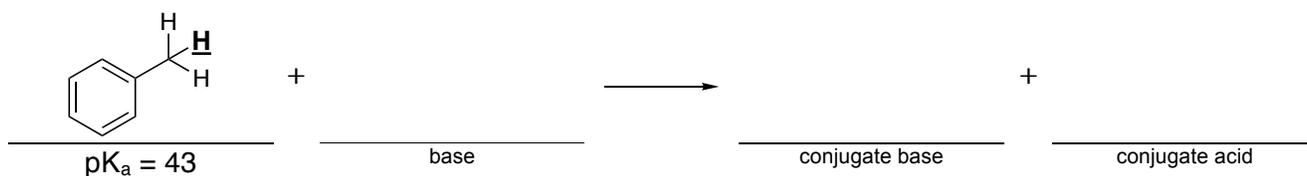
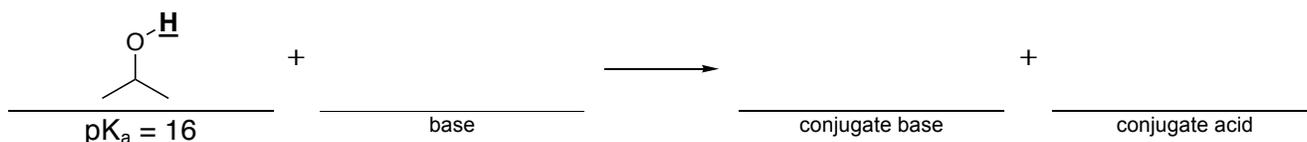
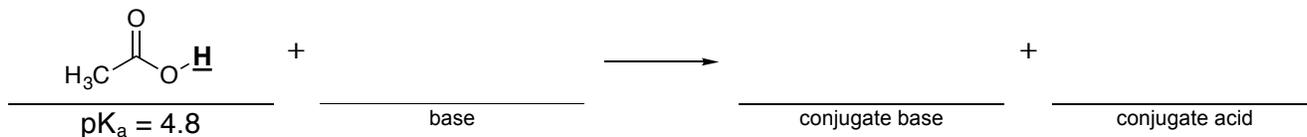
- a. In what type of orbital are the lone pair electrons on the N atom located?
 Briefly explain your answer.

b. Rank the numbered bonds in order of *increasing* length. _____ < _____ < _____

9. For each pair below: (20 points)
- CIRCLE** the molecule that best fits the description on the right. If both molecules fit the description equally circle them both and write "same". (2 pts)
 - Provide a brief explanation including the fundamental physical property behind the trait. Typically one sentence will do. If your answer to part is, "same," provide your reasoning. (2 pts)



10. Refer to the conjugate acids listed underneath the reactions to choose an appropriate base to fully deprotonate the underlined hydrogen atoms on the left and complete the reaction. The pK_a values are for the underlined hydrogen atoms are given below the structure. Do not use a base more than once. (9 pts)



Compound (pK_a): HCl (-7); H_3O^+ (-2); NH_4^+ (9); H_2O (15.7); CH_3OH (16); H_2 (36); NH_3 (38), $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ (50).

Extra Crud:

1. For what contribution did your laureate win his / her Nobel Prize? (2 pts)

2. What is the pK_a for acetylene below (± 3)? (2 pts)

