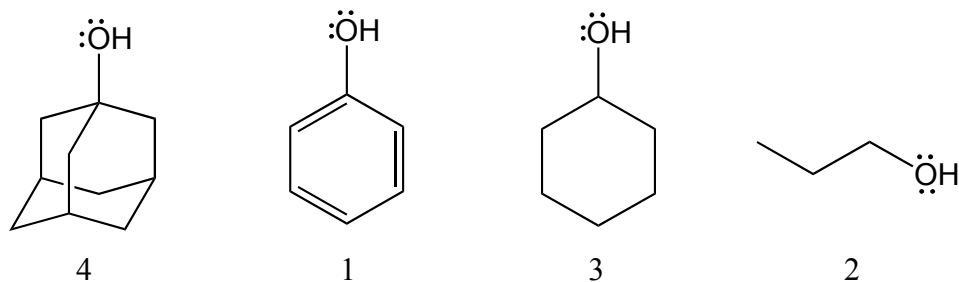
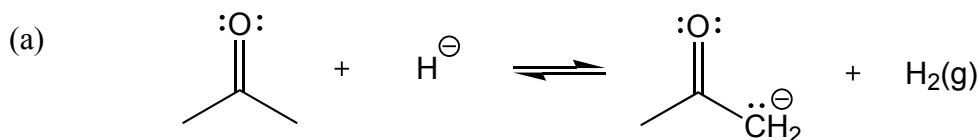


**Chem 143 Problem Set 4**  
**Friday 24th September 2010**

1. Rank the following alcohols in order of increasing acidity

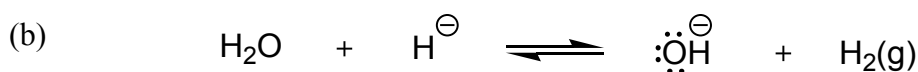


2. Predict the products of the following acid-base reaction (a) in diethyl ether,  $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$  and (b) in water,  $\text{H}_2\text{O}$ . Some useful  $\text{pK}_a$  values are given below.

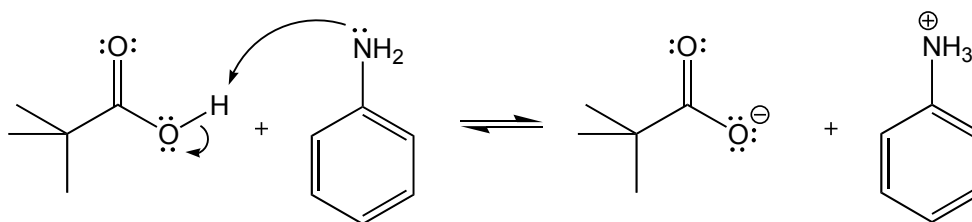


The reaction will go as written because acetone is the strongest acid and  $\text{H}^-$  (hydride) is the strongest base.

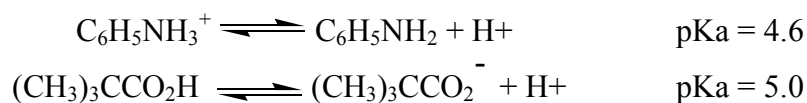
In water,  $\text{H}_2\text{O}$  is the strongest acid, so the reaction will proceed as follows:



3. Write the acid-base reaction between aniline  $C_6H_5NH_2$  and pivalic acid  $(CH_3)_3CCO_2H$ . Use bond-line structures and indicate the movement of electrons using curved arrows. If you're unsure of the structures of aniline and pivalic acid, look them up online or in the library.

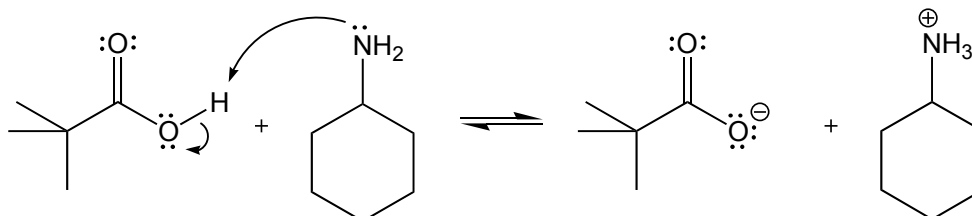


Based on the following pKa values, which side of the reaction is favored, and by how much?



The highest pKa indicates the strongest base, so the pivalate anion is the strongest base. This is where the proton will go, so the left side of the reaction is favored by a factor of  $10^{(5.0-4.6)}$ , or 2.5.

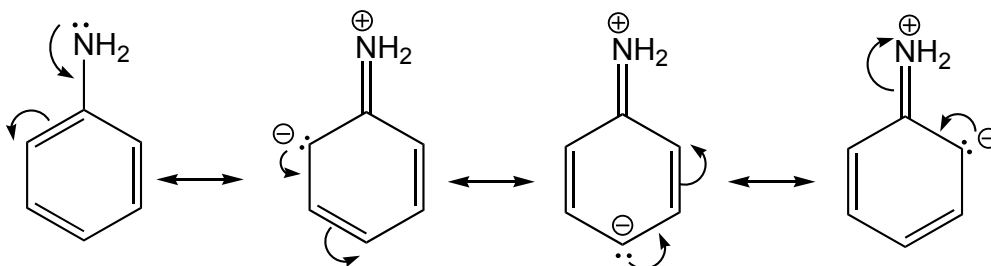
4. Repeat the exercise above using cyclohexylamine ( $C_6H_{11}NH_2$ ) instead of aniline. The pKa of the cyclohexylammonium cation is 10.6.



The strongest base is cyclohexylamine, so the right side of the reaction is favored by a factor of 400,000.

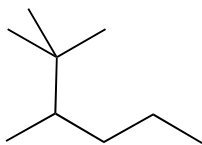
5. Explain why the reactions in 3 and 4 are so different.

Aniline is a much weaker base than cyclohexylamine because it is stabilized by resonance, leaving less -ve charge to hold the proton.

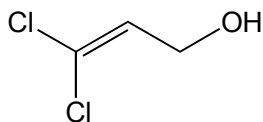


6. Draw bond-line structures for the following molecules:

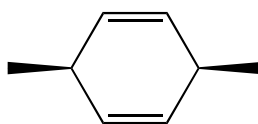
(a) 2-*tert*-butylpentane



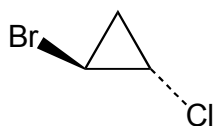
(b) 3,3-dichloropropen-1-ol



(c) *cis*-3,6-dimethyl-1,4-cyclohexadiene



(d) *trans*-1-bromo-2-chlorocyclopropane



(e) 3,3-dimethylcyclopropene



(f) 1,2-dimethylcyclopropene

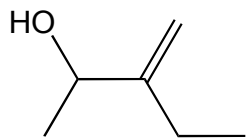


7. Which one of the above is incorrectly named?

(a) should be 2,2,3-trimethylhexane

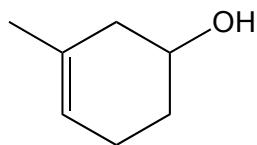
8. Name the following molecules according to IUPAC conventions:

(a)



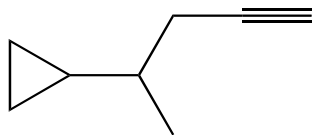
3-ethyl-3-buten-2-ol

(b)



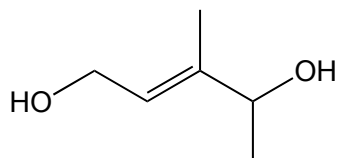
3-methyl-3-cyclohexen-1-ol

(c)



4-cyclopropyl-1-pentyne

(d)



3-methyl-2-pentene-1,4-diol