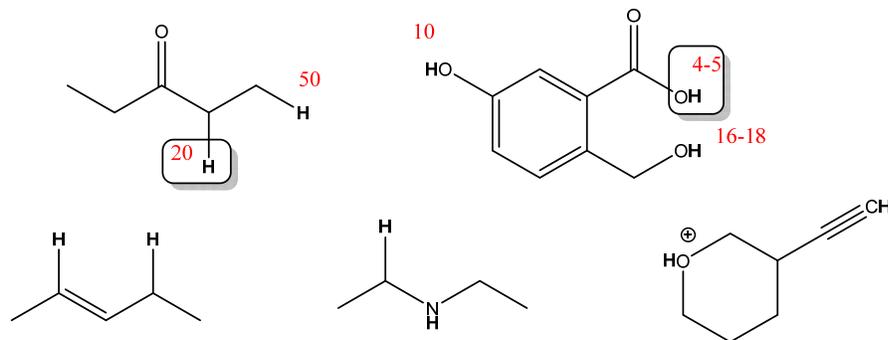


Discussion Worksheet #3  
Acid/base chemistry

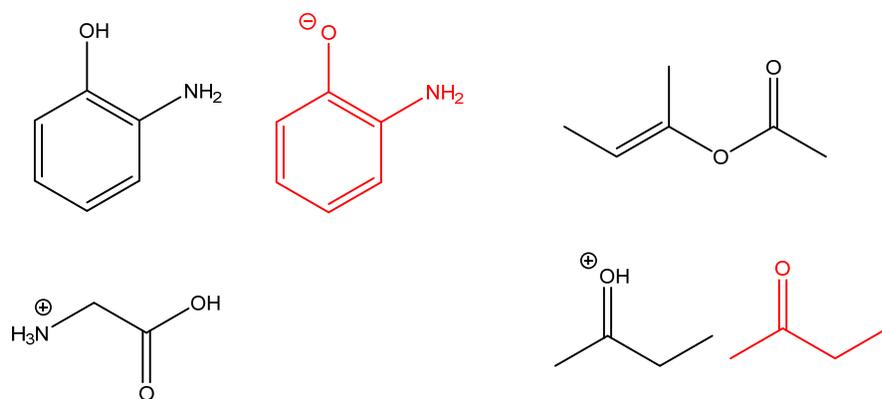
Skill 1: Identify acids and predict products of their reactions

- Relative strength of acids can be determined if pKa values are known
- The most acidic proton can be predicted by recognizing the most stable conjugate base

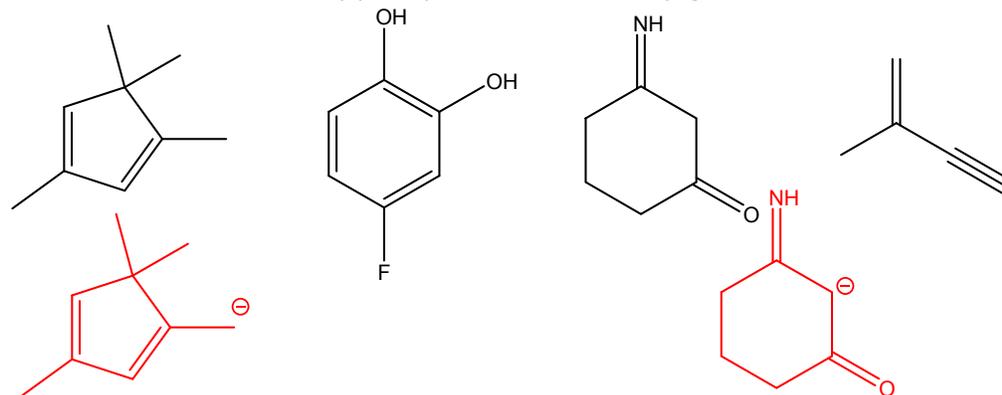
Problem 1. Indicate the approximate pKa values for each of the protons indicated. Which proton on each compound will be the first to react with a base?



Problem 2. Use pKa values to draw the conjugate bases of each of the following molecules.



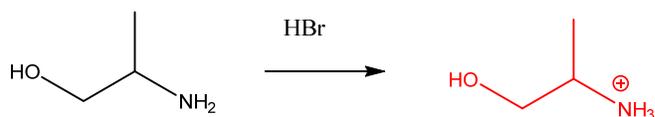
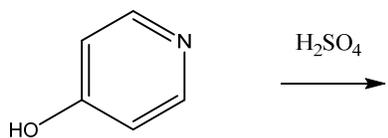
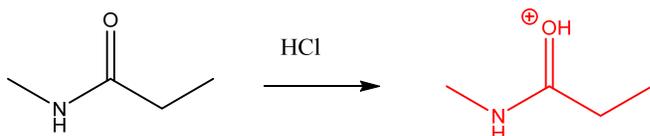
Problem 3. Use base stability principles to draw the conjugate base of each of the following molecules.



Skill 2: Identify bases and predict products of their reactions

- Identify bases by considering the stability of lone pairs
- Rank basicity using the pKa of the conjugate acid or structural stability principles

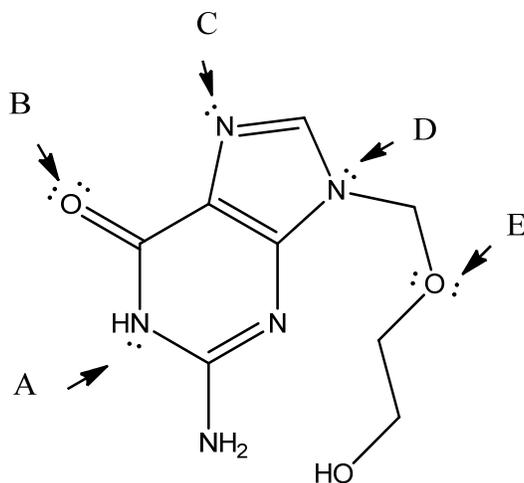
Problem 4. Draw the product of each acid/base reaction.



Problem 5. Draw each of the following bases. Rank them from strongest to weakest base. (You should be familiar with these terms.)

- Alkoxide ion (conjugate base of an alcohol)
- Acetylide ion (conjugate base of an alkyne)
- Carboxylate ion (conjugate base of a carboxylic acid).

Problem 6. Acyclovir is an anti-viral used in the treatment of chicken pox, shingles, and other forms of herpes virus. Five lone pairs are indicated with letters A-E.

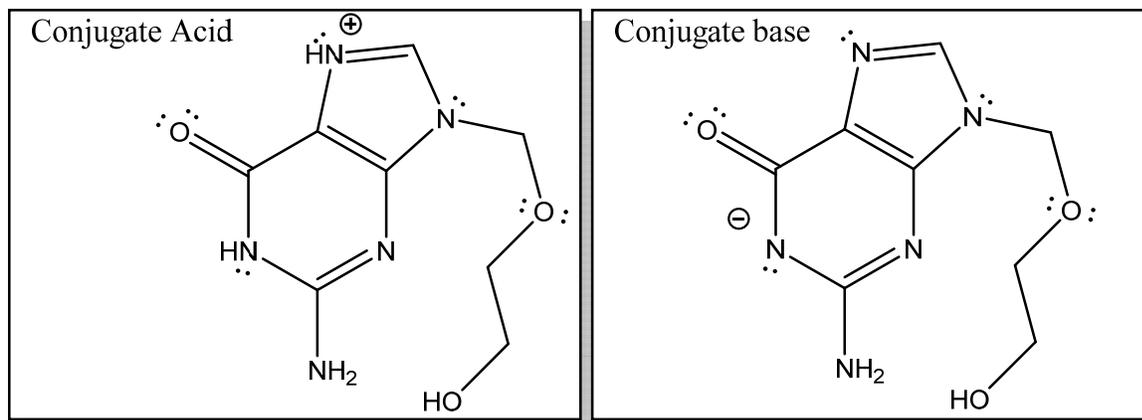


A. Write the letters of all lone pairs that are delocalized: A, D

B. Write the letter of the lone pair that is most reactive: \_\_\_\_\_

C. Write the letter of the lone pair that is least stable: \_\_\_\_\_

D. Draw the structure of the conjugate acid and conjugate base of acyclovir:

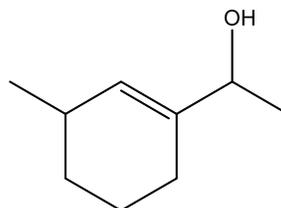
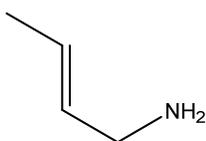
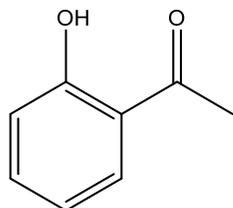


Skill 3: Predict the products of acid/base reactions.

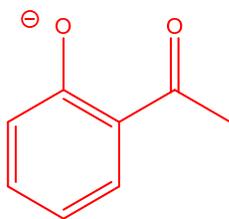
- Determine the strongest acid and the most basic lone pair.
- Determine whether the reaction occurs by considering the equilibrium direction of the reaction.
- Consider the impact of solvent on the reaction.

Problem 7. Indicate whether each of the following compounds will be completely deprotonated by each of the bases: NaOH, NaH, NaHCO<sub>3</sub>, NaNH<sub>2</sub>. If it is deprotonated, draw the product.

pK<sub>a</sub> = 10

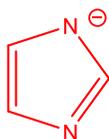
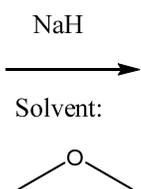
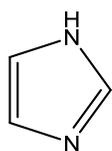


Completely deprotonated by  
NaOH, NaH, NaNH<sub>2</sub>



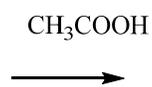
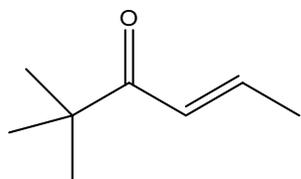
Problem 8. Predict the products of each acid/base reaction, or write "no reaction."

A.



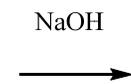
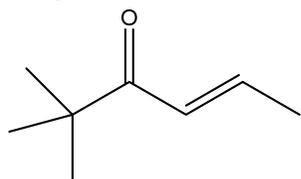
The ether solvent is inert, so it does not interfere with the reaction.

B

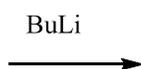
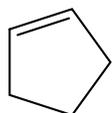


No Reaction: The carboxylic acid is not strong enough to protonate the ketone

C



D.



E.

