Name: Key Date: Pd:

Organic Chemistry – Acid/Base Practice Problems (#2)

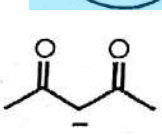
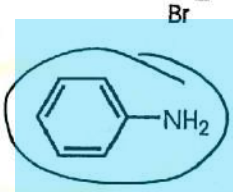
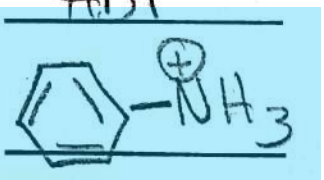
1. For each of the species below, identify the most acidic proton and provide the structure of the corresponding conjugate base. You might want to draw detailed Lewis formulas in some cases.

AKa: Take away $H^+$

| | | | |
|---|---|---|---|
| HF | $F^-$ | $CH_3CH_3$ | $CH_3CH_2^-$ |
| $CH_3CH_2OH$ | $CH_3CH_2O^-$ | $CH_3CN$ | $CH_2CN^-$ |
| $H_3O^+$ | $H_2O$ | $HC\equiv CH$ | $HC\equiv C^-$ |
| $H_2O$ | $OH^-$ ($HO^-$) | $H_2$ | $H^-$ |

2. For each of the species below, identify the basic atom and provide the structure of the corresponding conjugate acid. You might want to draw detailed Lewis formulas in some cases.

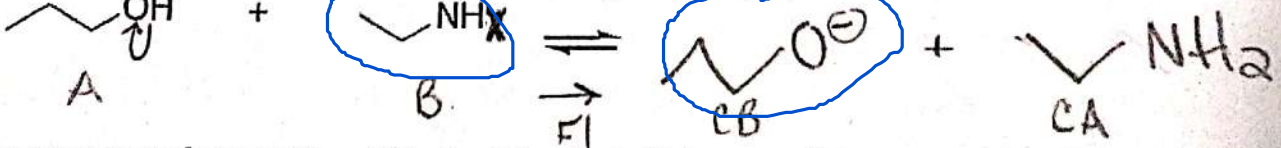
AKa: Add $H^+$

| | | | |
|---|---|---|---|
| $^-CN$ | HCN | $CH_3CH_2O^-$ | $CH_3CH_2OH$ |
| $SO_4^{-2}$ | $H_2SO_4$ & $HSO_4^-$ | $OH^-$ | $H_2O$ |
| $CH_3CH_2OH$ | $CH_3CH_2OH_2^+$ | $PhCOO^-$ | PhCOOH |
| $H_2O$ | $H_3O^+$ | $Br^-$ | HBr |
|  |  |  |  |

3. Finish the acid- base reaction. Draw the mechanism. Label the A, B, CA, CB. Predict the direction of equilibrium.

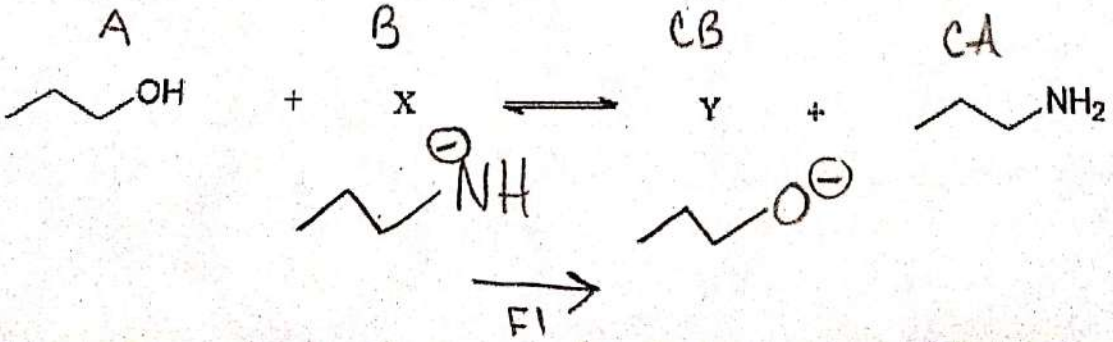
a. $CH_3CH_2OH$ (A) + $OH^-$ (B) $\rightleftharpoons$ $CH_3CH_2O^-$ (CB) + $H_2O$ (CA) — F3 ← ; destabilizing

b. $CH_3CH_2NH_2$ (A) + $CH_3O^-$ (B) $\rightleftharpoons$ $CH_3CH_2NH^-$ (CB) + $CH_3OH$ (CA) — F1 ←

c.  — F1 →

4. Show the structures of species X and Y in the following acid-base reactions.

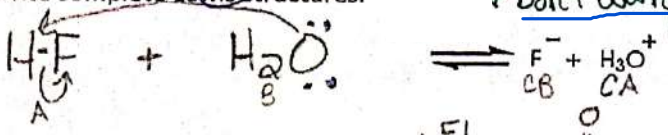
A + B ⟶ CB + CA

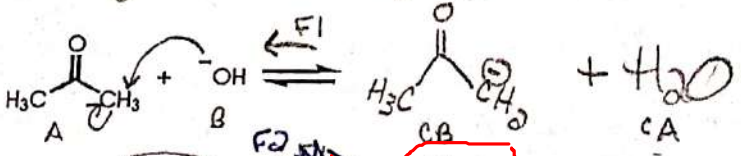


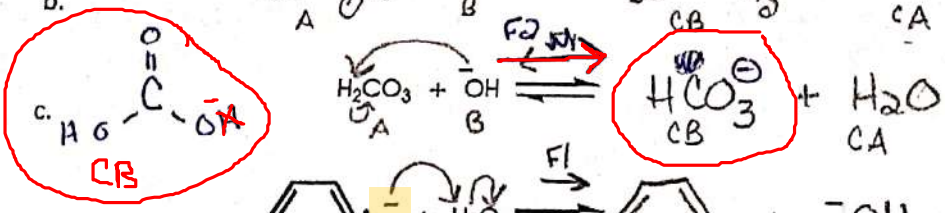
Key

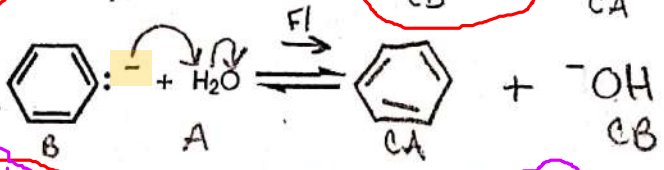
5. Fill in the reactants or products for the following acid-base reactions. Follow the labeling procedure used for number 3. Keep in mind that in bond-line hydrogens are not shown. When in doubt, write complete Lewis structures.

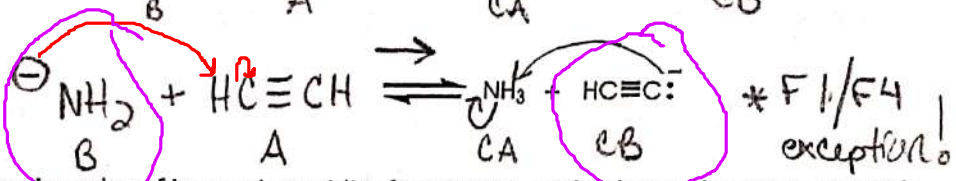
* Don't worry about eq. for "a"

a. 

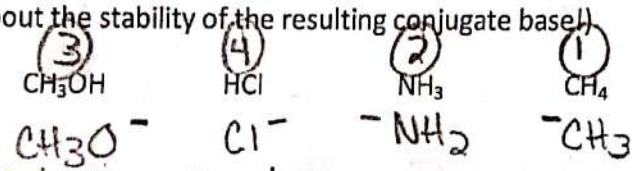

b. 


c. 


d. 


e. 

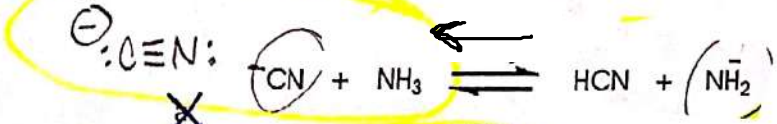

6. Rank the following in order of increasing acidity from 1 to 4, with 4 being the strongest acid: (Hint: think about the stability of the resulting conjugate base!)

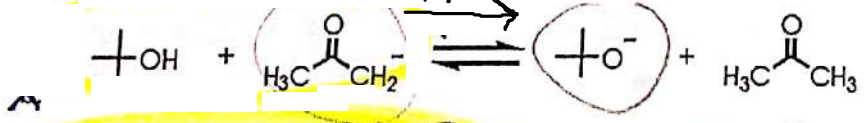



strongest acid will form the most stable product

7. Circle the side favored by equilibrium in the following acid-base r

F1/F4 exception






Factor 1 - the atom

(L) side is resonance stabalized

c. 

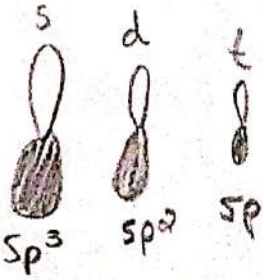

8. List out the four factors and their information to consider when looking at that factor:

a. Factor 1: Atom → electroneg. or ↓ size - stabalized more stable

b. Factor 2: Resonance

c. Factor 3: Induction — alkyl groups = destabalizing; "pull" of electroneg. atoms

d. Factor 4: Orbitals




* closer to nucleus = more stable

R: 2°'s = better than many C's