Name: _Key_   Date: _____   Pd: _____

Organic Chemistry - Acid/Base Practice Problems (#3)

1. What is pKa? How can we use it to determine the "direction" the reaction equilibrium will take?

2. For each of the following acid-base reactions place one of the arrows below into the center box to show the extent of the reaction:

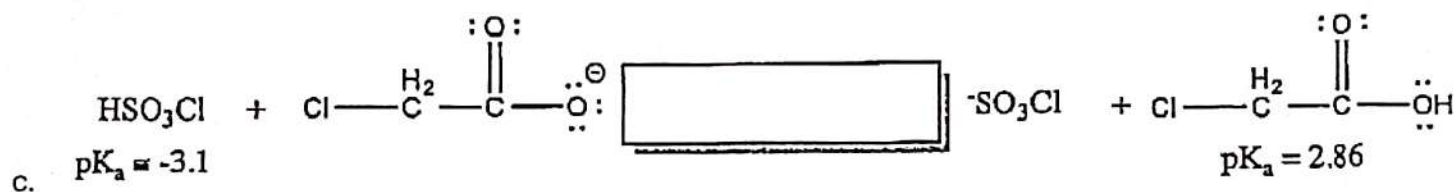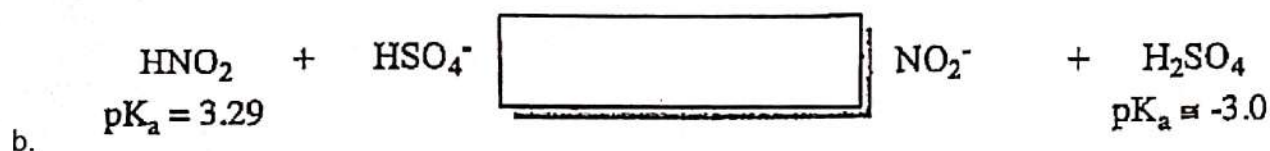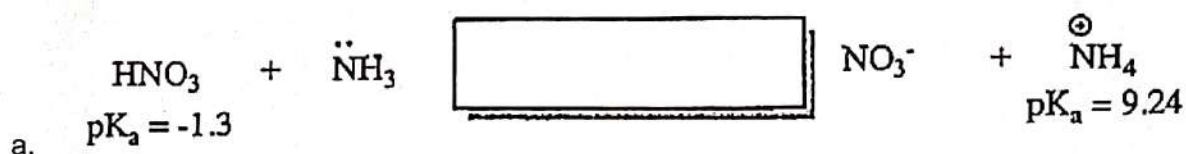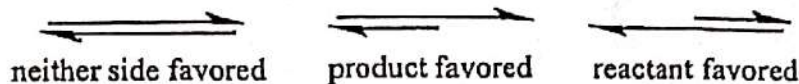neither side favored   product favored   reactant favored

a. HNO_3 + $\ddot{N}H_3$ [   ] NO_3^- + $\overset{\oplus}{N}H_4$
    $pK_a = -1.3$ $pK_a = 9.24$

b. HNO_2 + HSO_4^- [   ] NO_2^- + H_2SO_4
    $pK_a = 3.29$ $pK_a \approx -3.0$

c. HSO_3Cl + $Cl\text{—}\overset{H_2}{C}\text{—}\overset{\overset{:O:}{||}}{C}\text{—}\ddot{\overset{\ominus}{\underset{..}{O}}}:$ [   ] $^-SO_3Cl$ + $Cl\text{—}\overset{H_2}{C}\text{—}\overset{\overset{:O:}{||}}{C}\text{—}\ddot{O}H$
    $pK_a \approx -3.1$ $pK_a = 2.86$

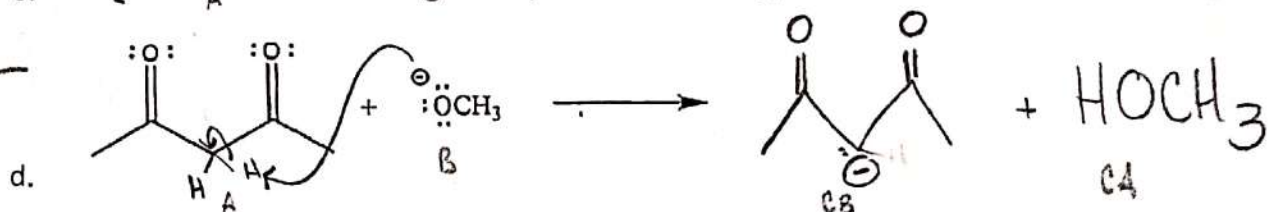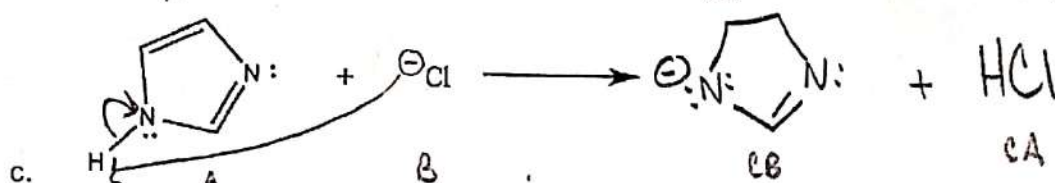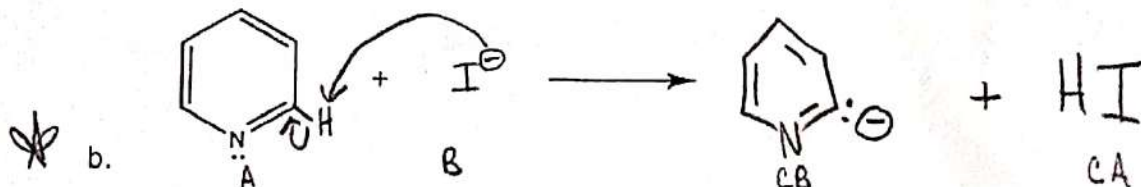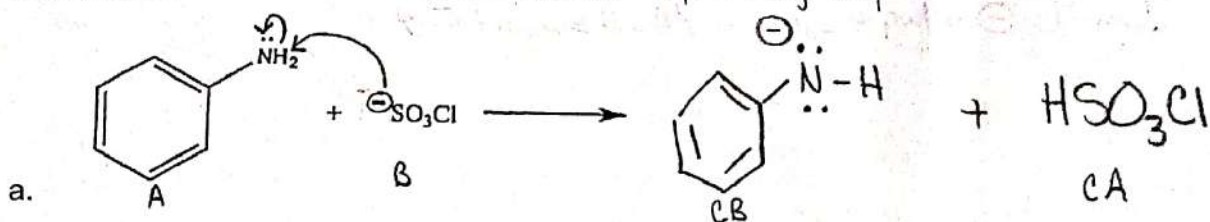d. $H_3C\text{—}\overset{\overset{H\diagdown\overset{\oplus}{O}:}{||}}{C}\text{—}CH_3$ + Cl^- [   ] $H_3C\text{—}\overset{\overset{:O:}{||}}{C}\text{—}CH_3$ + HCl
    $pK_a = -2.9$ $pK_a = -7.0$

e. $H_3C\text{—}\overset{\overset{:O:}{||}}{C}\text{—}CH_3$ + $\overset{\ominus}{:}\ddot{N}H_2$ [   ] $H_3C\text{—}\overset{\overset{:O:}{||}}{C}\text{—}\overset{\ominus}{C}H_2$ + $\ddot{N}H_3$
    $pK_a = 26.5$ $pK_a = 38$

f. $H\ddot{S}:^{\ominus}$ + H_3O^+ [   ] $H_2\ddot{S}$ + $H_2\ddot{O}$
    $pK_a = -1.74$ $pK_a = 7.0$

g. HCN + H_2O [   ] CN^- + H_3O^+
    $pK_a = 9.3$ $pK_a = -1.74$

Scanned with CamScanner
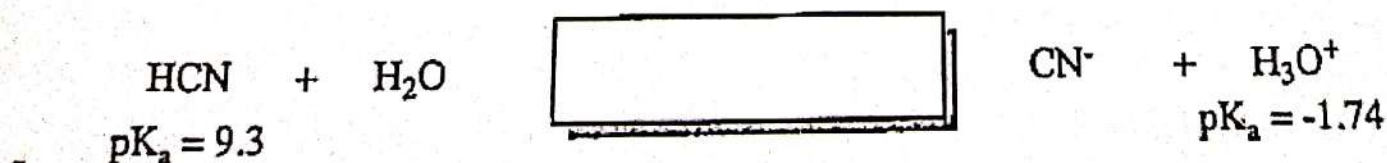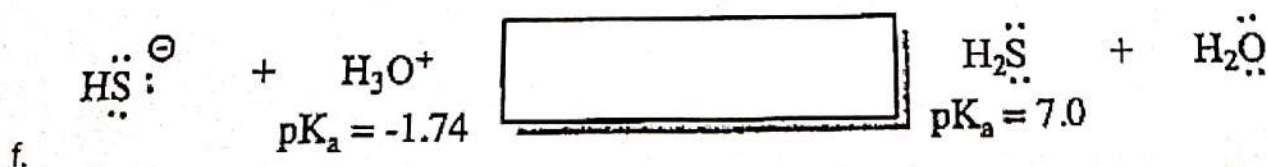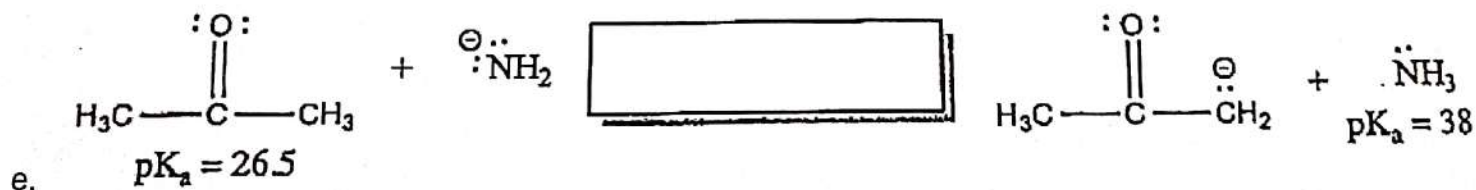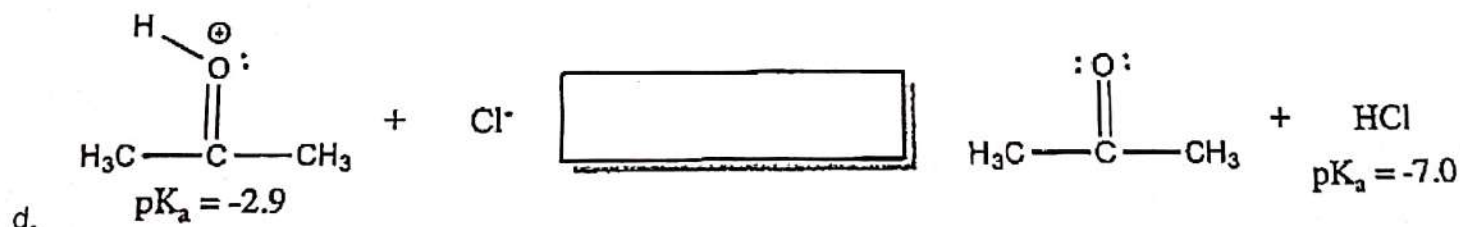
3. Predict and draw mechanism and the structures of the conjugate acid and conjugate base produced for the reaction. Label the structures as A, B, CA, CB. *predict/justify the direction of the Rxn's

a.

b.

c.

d.

e.

f.
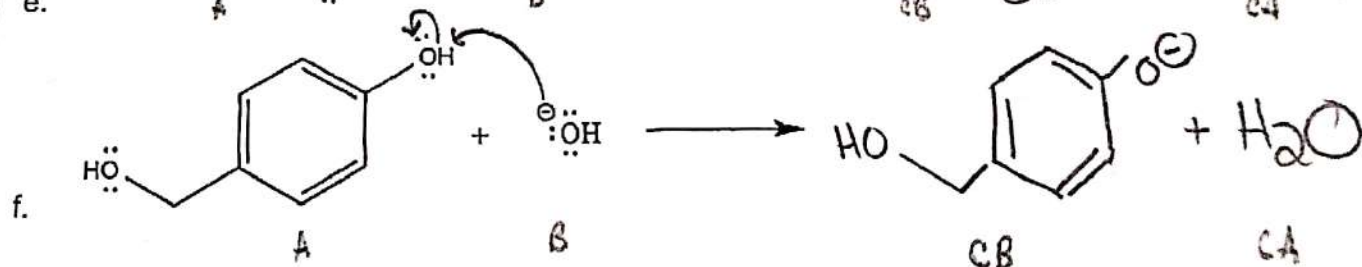
Have to pick most Acidic Hydrogen

4. Draw the orbitals in order of single, double, and triple bonds, respectively from left to right. include the hybridization of each.

Single
sp^3

double
sp^2

triple
sp

* most stable
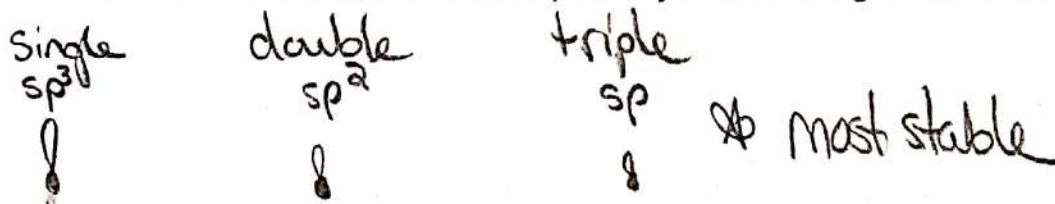
5. Explain the parts of **ARIO** below, it might be helpful to make it into a chart/table.

A	I
R	O