

Name: \_\_\_\_\_

Blk: \_\_\_ Date: \_\_\_\_\_

CHEMISTRY 12  
ACID BASES UNIT  
Lesson #13

**Calculations Involving  $K_b$  and pOH**

Recall that Strong BASES IONIZE 100 %, therefore the concentration of the strong base will equal the concentration of  $\text{OH}^-$  in solution!!

HOWEVER, Weak bases DO NOT IONIZE 100% in water, therefore we must use an \_\_\_\_\_ to determine the  $[\text{OH}^-]$  that is actually present in solution!

Generic Equation for a WEAK BASE in water:



There are THREE types of problems that you can solve associated with a weak base:

**Type 1.** Given the concentration of the weak base, solve for the pH (or pOH)

**Example 1.** What is the pH ( and pOH) for a 0.10 M solution of  $\text{NH}_3$ ?

Step 1 . Write out the ionization equation with water

Step 2. Write out the  $K_b$  expression, identify the  $K_b$  value

Step 3. Set up an ICE TABLE for  $\text{NH}_3$

Step 4. Plug values into  $K_b$  and solve for x

Step 5. Use x to solve for pH

**Type 2.** Given the pH (or pOH) and the initial concentration of the weak base, solve for the  $K_b$  value.

**Example 2.** If the pOH of a 0.50 M solution of an unknown weak acid is 10.64, determine the  $K_b$  for  $A^-$

Step 1 . Write out the generic ionization with water

Step 2. Set up an ICE TABLE for the weak acid

Step 3. Use the pOH to determine pH and then fill in the values of the ICE TABLE

Step 4. Use the equilibrium values to calculate the  $K_a$

Step 5. Use the  $K_w = K_a (\text{conjugate acid}) \times K_b(\text{conjugate base})$  to solve for  $K_b$

**Type 3.** Given pH (or pOH) , determine the initial concentration of the weak base.

**Example 3.** What concentration of  $SO_3^{2-}$  is required to produce a pH of 9.69?

Step 1 . Write out the ionization with water

Step 2. Write out the  $K_b$  expression, calculate  $K_b$  value

Step 3. Set up an ICE TABLE for  $SO_3^{2-}$

Step 4. Use pH to determine pOH and fill in the table

Step 5. Use  $K_b$  to solve for initial concentration

**Seatwork/Homework:** Exercises 84-87 , 89 + 91

**PLO's:** Part of M3 and M5 for  $K_b$