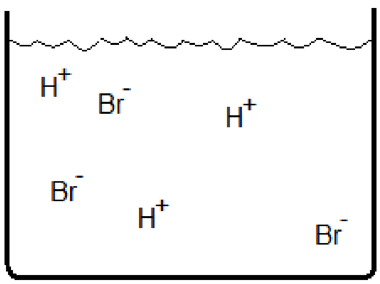
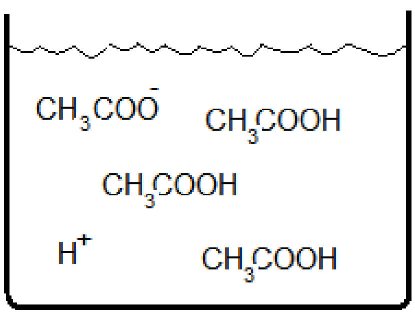
Acid Base Key

1. Write the formula for the conjugate acid of the following bases:
   a. CN^- conjugate acid is _____HCN____
   b. HCO_3^- conjugate acid is __________H_2CO_3____________
   c. NH_3 conjugate acid is ___ NH_4^+_________
   d. PO_4^{3-} conjugate acid is _____ HPO_4^{2-}___________

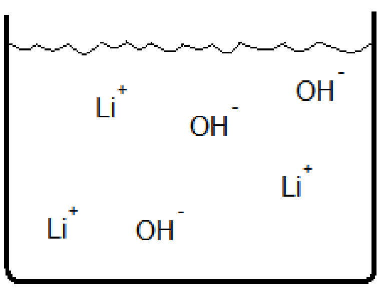
2. Write the balanced reaction for what happens when hydrobromic acid is put in water. Draw the resulting solution in the beaker. **$HBr(aq) + H_2O(l) \rightarrow Br^-(aq) + H_3O^+(aq)$**



3. Write the balanced reaction for what happens when acetic acid is put in water. Draw the resulting solution in the beaker. **$CH_3COOH\ (aq) + H_2O(l) \leftrightarrows CH_3COO^-\ (aq) + H_3O^+(aq)$**



4. Write the balanced reaction for what happens when lithium hydroxide is put in water. Draw the resulting solution in the beaker. **$LiOH\ (s) \rightarrow Li^+(aq) + OH^-(aq)$**



5. If the pOH of a solution is 4.52, calculate the pH, the $[H^+]$ and the $[OH^-]$.
   Is this solution acidic or basic? ____**basic, more OH^- than H^+**____

   pH = 9.48 **$[H^+] = 3.3 \times 10^{-10}$ M** **$[OH-] = 3.0 \times 10^{-5}$M**

6. Calculate the pH for a 1.55 M solution of pyridine, an amine, (C_5H_5N). $K_b = 1.7 \times 10^{-9}$

	$C_5H_5N(aq)$	+ $H_2O(l)$	$\leftrightarrows$ $C_5H_6N^+(aq)$	+ $OH^-(aq)$
I	1.55	---	0	0
C	-x	---	+x	+x
E	(1.55-x)	---	(x)	(x)

$1.7 \times 10^{-9} = x^2 / 1.55$ (with approximation)
$x = 5.133 \times 10^{-5} = [OH^-]$ check approximation = good ☺
pOH = 4.29 and pH = 9.71

7. Calculate the concentration for a solution of hydroiodic acid that has a pH of 2.583.

So 2.583 = -log[H+] thus [H+] = 2.61×10^{-3}M
Since all the HI acid ionizes, the original [HI] also = 2.61×10^{-3}M

8. Identify the following as strong or weak acids, strong or weak bases, neutral salts, basic salts or acidic salts.

$HClO_4$ ___ **strong acid** ___, NH_3____ **weak base** ______, NH_4NO_3___ **acidic salt** _____,
H_2SO_4___ **strong acid** ____, $Ba(OH)_2$____ **strong base** ____, $LiCH_3COO$___ **basic salt** ____,
HF_____ **weak acid** ___, NaF_______ **basic salt** ______, KOH_______ **strong base** ________,
$AlBr_3$____ **acidic salt** ____, K_2CO_3_____ **basic salt** ____, $Ba(NO_3)_2$____ **neutral salt** _______.

9. A 0.125M weak monoprotic acid solution has a pH of 4.25. What is the solution's % ionization?

% ion = [H+] / [acid initial] x 100
% ion = (5.6234×10^{-5}M / .125) x 100 = .045 % ionized

10. Do this problem on the back of this page. Show all your work including the reactions. Calculate the pH if 3.33 grams of potassium acetate is dissolved in 3.50 liters of water. K_a for acetic acid is 1.8×10^{-5}

3.33 g KCH_3COO (mol / 98.144g) (1 / 3.50L) = 9.6942×10^{-3} M

KCH_3COO is a soluble salt: $KCH_3COO \rightarrow K^+(aq) + CH_3COO^-(aq)$ K+ ion is neutral, acetate is basic

Because all the salt dissolves, the [acetate ion] = 9.6942×10^{-3} M

$CH_3COO^-(aq) + H_2O(l) \leftrightarrows CH_3COOH(aq) + OH^-(aq)$ Kb = Ka / Kw = (base in water needs Kb)

I	**.0096942**	**---**	**0**	**0**
C	**-x**	**--**	**x**	**x**
E	**(0.0096942-x)**	**--**	**x**	**x**

Kb = $5.5556 \times 10^{-10} = x^2 / 0.0096942$ (approximation) then check approximation good ☺
$x = 2.3207 \times 10^{-6}$ M = $[OH^-]$ (IF this was the final answer it would have 2 sig cause Ka had 2 sig)
pOH = 5.63 so pH = 8.37 Ka has 2 sig fig so pH has 2 decimal places