During Class Invention
Common Ion Effect

Name_____

1a. Transfer the pH data you obtained earlier (Acids, Bases and pH) for 0.100 M $HC_2H_3O_2$ and for 0.100 M $NaC_2H_3O_2$ and add this data to the following table.

Solution	pH
0.100 M $HC_2H_3O_2$	**2.87**
0.100 M $NaC_2H_3O_2$	**8.9**
0.100 M $HC_2H_3O_2$ and 0.100 M $NaC_2H_3O_2$	**4.74**

b. Write the equilibrium expression for the hydrolysis (reaction with water) of the weak acid $HC_2H_3O_2$. What is the K for this reaction? Use Le Chatelier's Principle to predict what would happen if you add $NaC_2H_3O_2$ to the solution.

$$\mathbf{HC_2H_3O_2}\textit{(aq)} + \mathbf{H_2O}\textit{(l)} \rightleftharpoons \mathbf{H^+}\textit{(aq)} + \mathbf{C_2H_3O_2^-}\textit{(aq)}$$

$$\mathbf{K_a = \frac{[H^+][C_2H_3O_2^-]}{[HC_2H_3O_2]} = 1.8 \times 10^{-5}}$$

With a solution of just the weak acid the pH of the solution is 2.87. When we add the conjugate base, in the form of the salt, the amount of hydrogen ion that is formed will be surpressed, and the pH will increase to a more basic value.

c. Go to the web site http://introchem.chem.okstate.edu/DCICLA/pHbuffer20.html and complete the previous table for the 0.100 M $HC_2H_3O_2$ and for 0.100 M $NaC_2H_3O_2$. Compare the pH of this solution with your prediction in the previous question.

See the Table above.

d. Provide an example of an aqueous solution containing a weak base and the salt of the base.

NH_3/ NH_4Cl

e. How is the extent of dissociation of a weak acid or a weak base effected by the presence of the soluble salt?

The extent of the dissociation of the weak acid or the weak base is suppressed by the presence of the salt.

2. Calculate the pH of a solution which is 0.53 M $HC_6H_4NO_2$ and 0.50 M $NaC_6H_4NO_2$.

	$HC_6H_4NO_2(aq)$	⇌	$H^+(aq)$ +	$C_6H_4NO_2^-(aq)$	
initial	**.53**		**0**	**.50**	
change	**-x**		**+x**	**+x**	**x = $[HC_6H_4NO_2]_R$**
equilibrium	**.53 - x**		**x**	**.50 + x**	

$$K_a = 1.4 \times 10^{-5} = \frac{[H^+][C_6H_4NO_2^-]}{[HC_6H_4NO_2]}$$

$$1.4 \times 10^{-5} = \frac{(x)(.50 + x)}{(.53 - x)} \qquad x <<< .50$$

$$1.4 \times 10^{-5} = \frac{(x)(.50)}{(.53)}$$

$1.5 \times 10^{-5} = x$ = $[H^+]$ pH = 4.82

3. Calculate the pH of a solution which is 0.245 M NH_3 and 0.245 M NH_4NO_3.

	$NH_3(aq)$ +	$H_2O(l)$	⇌	$NH_4^+(aq)$ +	$OH^-(aq)$	
initial	**.245**	**----**		**0.245**	**0**	
change	**-x**	**----**		**+x**	**+x**	**x = $[NH_3]_R$**
equilibrium	**.245 - x**	**----**		**0.245 + x**	**+x**	

$$K_a = 1.8 \times 10^{-5} = \frac{[NH_4^+][OH^-]}{[NH_3]}$$

$$1.8 \times 10^{-5} = \frac{(0.245 + x)(x)}{(.245 - x)} \qquad x <<< .245$$

$$1.8 \times 10^{-5} = \frac{(x)(.245)}{(.245)}$$

$1.8 \times 10^{-5} = x$ = $[OH^-]$

pOH = 4.74

pH = 9.26