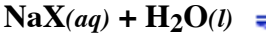
During Class Invention
Salts II

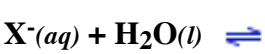
Name_____

1. Write a general chemical equation which describes how the salt of a weak acid and strong base behaves in aqueous solution.

**The salt of a weak acid and a strong base has the general formula NaX.**



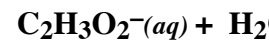
**$NaX_{(aq)} + H_2O_{(l)} \rightleftharpoons HX_{(aq)} + NaOH_{(aq)}$**



**$X^-_{(aq)} + H_2O_{(l)} \rightleftharpoons HX_{(aq)} + OH^-_{(aq)}$**

2.. Calculate the pH of a 0.700 M $NaC_2H_3O_2$. $K_a(HC_2H_3O_2) = 1.8 \times 10^{-5}$

| | $NaC_2H_3O_2(s) \rightarrow Na^+(aq)$ | + | $C_2H_3O_2^-(aq)$ |
|---|---|---|---|
| **initial** | **0.700** | **0** | **0** |
| **change** | **-0.700** | **+0.700** | **+0.700** |
| **equil** | **0** | **+0.700** | **+0.700** |



**$C_2H_3O_2^-(aq) + H_2O(aq) \rightleftharpoons HC_2H_3O_2(aq) + OH^-(aq)$**

| | | | | | |
|---|---|---|---|---|---|
| **initial** | **0.700** | **---** | **0** | **0** | |
| **change** | | **-x** | **---** | **+x** | **+x** $x=[C_2H_3O_2^-]_{Reac}$ |
| **equil** | **0.700 - x** | **---** | **0 + x** | **0 + x** | |

$$K_b = \frac{1.0 \times 10^{-14}}{1.8 \times 10^{-5}} = \frac{[HC_2H_3O_2][OH^-]}{[C_2H_3O_2^-]}$$

$$5.56 \times 10^{-10} = \frac{(x)(x)}{0.700 - x}$$

**assume (.700 - x) = .700**

**$5.56 \times 10^{-10}(0.700) = x^2$**
**$3.89 \times 10^{-10} = x^2$**
**$1.97 \times 10^{-5}$ M= x = $[OH^-]$**
**pOH = 4.71 and the pH = 9.29**

3. Write a general chemical equation which describes how the salt of a weak base and strong acid behaves in aqueous solution.

**The salt of a strong acid and a weak base has the general formula BHX.**

$$\mathbf{BHX}_{(s)} \rightarrow \mathbf{BH^+}_{(aq)} + \mathbf{X^-}_{(aq)}$$

$$\mathbf{BH^+}_{(aq)} \text{ ä } \mathbf{B}_{(aq)} + \mathbf{H^+}_{(aq)}$$

4. Calculate the pH of a 0.392 M $CH_3NH_3NO_3$. $K_b(CH_3NH_2) = 4.4 \times 10^{-4}$

| | $CH_3NH_3NO_3(s)$ → | $CH_3NH_3^+(aq)$ + | $NO_3^-(aq)$ |
|---|---|---|---|
| **initial** | **0.392** | **0** | **0** |
| **change** | **-0.392** | **+0.392** | **+0.392** |
| **equil** | **0** | **+0.392** | **+0.392** |

| | $CH_3NH_3^+(aq)$ ä | $CH_3NH_2(aq)$ + | $H^+(aq)$ | | |
|---|---|---|---|---|---|
| **initial** | **0.392** | **0** | **0** | | |
| **change** | | **-x** | **+x** | **+x** | **x=$[CH_3NH_3^+]_{reacting}$** |
| **equil** | **0.392 - x** | **0 + x** | **0 + x** | | |

$$\mathbf{K_a = \frac{[CH_3NH_2][H^+]}{[CH_3NH_3^+]}}$$

$$\mathbf{K_a = \frac{1.0 \times 10^{-14}}{4.4 \times 10^{-4}}}$$

$$\mathbf{2.27 \times 10^{-11} = \frac{(x)(x)}{0.392 - x}}$$

**assume (.392 - x) = .392**

$$\mathbf{2.27 \times 10^{-11}(0.392) = x^2}$$

$$\mathbf{8.90 \times 10^{-12} = x^2}$$

$$\mathbf{2.98 \times 10^{-6}\ M = x = [H^+]}$$

**pH = 5.52**