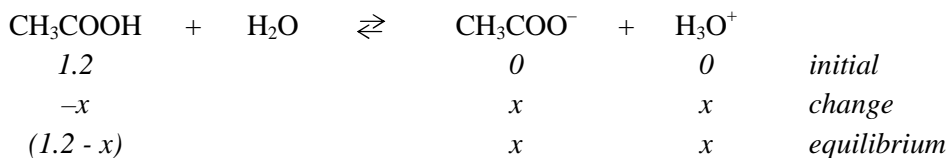
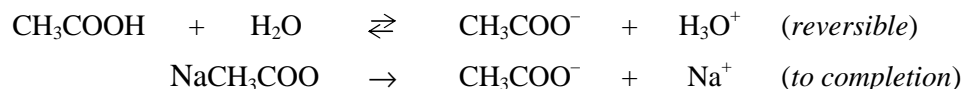


**Part 3. The Ionization Constant of Acetic Acid****Solution: 10 ml of 1.2 M CH<sub>3</sub>COOH**

pH – measured

K<sub>a</sub> – ?**Calculations:** 1.  $[\text{H}_3\text{O}^+] = 10^{-\text{pH}} = x$ 2. Determine  $[\text{CH}_3\text{COO}^-]$  and  $[\text{CH}_3\text{COOH}]$  from the following:

$$3. K_a = \frac{[\text{H}_3\text{O}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]} = \frac{x^2}{(1.2 - x)}$$

**Solution: 25 ml of 1.2 M NaCH<sub>3</sub>COO + 10 ml of 1.2 M CH<sub>3</sub>COOH**

pH – measured

K<sub>a</sub> – ?**Calculations:** 1.  $[\text{H}_3\text{O}^+] = 10^{-\text{pH}}$ 2. Determine  $[\text{CH}_3\text{COO}^-]$  in a new volume of 35 ml3. Determine  $[\text{CH}_3\text{COOH}]$  in a new volume of 35 ml

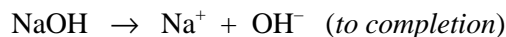
$$4. K_a = \frac{[\text{H}_3\text{O}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

**Part 4. Buffering Capacity****Solution: 30 ml of DI H<sub>2</sub>O + 2 ml of 2.0 M HCl**

pH – measured

pH (calculated) – ?

**Calculations:** 1. Determine  $[\text{HCl}]$  in a new volume of 32 ml2.  $[\text{H}^+] = [\text{HCl}]$ 3.  $\text{pH}_{\text{calc}} = -\log [\text{H}^+]$

**Solution: 30 ml of DI H<sub>2</sub>O + 2 ml of 2.0 M NaOH**

pH – measured

pH (calculated) – ?

**Calculations:** Use the same approach as shown above for the (H<sub>2</sub>O + 2.0 M HCl) solution.Remember, that  $[\text{H}^+] \times [\text{OH}^-] = 10^{-14}$ **Solution: 30 ml of 1.2 M NaCH<sub>3</sub>COO + 30 ml of 1.2 M CH<sub>3</sub>COOH = 60 ml of the buffer**

pH – measured

pH (calculated) – ?

**Calculations:** 1. Determine  $[\text{CH}_3\text{COO}^-]$  in a new volume of 60 ml2. Determine  $[\text{CH}_3\text{COOH}]$  in a new volume of 60 ml

$$3. \text{pH} = \text{pK}_a + \log \frac{[\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]} \quad \text{Use } K_a = 1.76 \times 10^{-5}$$

**Solution: 30 ml of the buffer (prepared previously) + 2 ml of 2.0 M HCl**

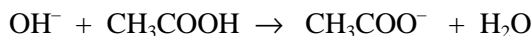
pH – measured

pH (calculated) – ?

**Calculations:** 1. Determine the number of moles of CH<sub>3</sub>COOH in solution: *a*2. Determine the number of moles of CH<sub>3</sub>COO<sup>-</sup> in solution: *b*3. Determine the number of moles of HCl added: *x*

<i>x</i>	<i>b</i>	<i>a</i>	<i>initial</i>
- <i>x</i>	- <i>x</i>	<i>x</i>	<i>change</i>
0	( <i>b</i> - <i>x</i> )	( <i>a</i> + <i>x</i> )	<i>equilibrium</i>

$$5. \text{pH} = \text{pK}_a + \log \frac{\text{moles of } \text{CH}_3\text{COO}^-}{\text{moles of } \text{CH}_3\text{COOH}} \quad \text{Use } K_a = 1.76 \times 10^{-5}$$

**Solution: 30 ml of the buffer (prepared previously) + 2 ml of 2.0 M NaOH****Calculations:** Use the same approach as shown above for the (buffer + 2.0 M HCl) solution.