

## Common Ion Effect

Buffers

## Common Ion Effect

- Sometimes the equilibrium solutions have 2 ions in common
- For example if I mixed HF & NaF
- The main reaction is  $\text{HF} \leftrightarrow \text{H}^+ + \text{F}^-$

## Common Ion Effect

- Which way will the reaction shift if NaF is added?
- What effect will this have on pH?

## Example

- What is the pH of a 0.10M solution of  $\text{HC}_2\text{H}_3\text{O}_2$  ( $K_a = 1.8 \times 10^{-5}$ )

### Example

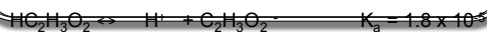


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### Example

- A mixture contains 0.10M  $\text{HC}_2\text{H}_3\text{O}_2$  ( $K_a = 1.8 \times 10^{-5}$ ) & 0.10 M  $\text{NaC}_2\text{H}_3\text{O}_2$ . Calculate the pH.

### Example



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### What are buffers?

- Buffers resist changes in pH
- They must have 2 parts...
  - ☞ Weak acid & a conjugate base **OR**
  - ☞ Weak base & a conjugate acid
- The concentrations of the 2 MUST be within a factor of 10!!!

## Buffers

[NaC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ]	[HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ]	Buffer?
0.10M	0.10M	
0.10M	1.0M	
0.01M	1.0M	

## Example

- What is the pH of a solution containing 50. mL of 0.50M NaC<sub>2</sub>H<sub>3</sub>O<sub>2</sub> & 25 mL of 0.25M HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>. (K<sub>a</sub> = 1.8 x 10<sup>-5</sup>).

## Example



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## Henderson Hasselbach Equation

- Really easy equation to use ONLY with buffer solutions!!!
- pH = pK<sub>a</sub> + log [B]/[A]

### The last example using HH

- $\text{pH} = \text{pK}_a + \log \frac{[\text{B}]}{[\text{A}]}$

### Example (ICE TABLE)

- What is the pH of a solution containing 25 mL of 0.150M HClO & 32mL of 0.45M KClO.  $K_a = 3.5 \times 10^{-8}$

### Example (ICE TABLE)



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### Example (HH)

- $\text{pH} = \text{pK}_a + \log \frac{[\text{B}]}{[\text{A}]}$

### Example (ICE TABLE)

- What is the pH of a solution containing 25 mL of 0.50M  $\text{CH}_3\text{NH}_3\text{NO}_3$  is mixed with 75 mL of 0.30 M  $\text{CH}_3\text{NH}_2$  ( $K_b \text{CH}_3\text{NH}_2 = 4.38 \times 10^{-4}$ )

### Example (ICE TABLE)



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### Example

- Calculate the mass of NaF that must be added to 1000.0 ml of 0.50M HF to form a solution with a pH of 4.00.  $K_a = 7.2 \times 10^{-4}$

### Example (ICE TABLE)



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