

Chemistry 201

Acid-base mixtures

NC State University

Acid/Base Mixtures : Reactions

- How do you calculate pH after an acid/base reaction occurs?
- Systematic approach:
- Strong-strong
- Strong-weak
- Weak-weak

Acid/Base Mixtures

- Cases with no reaction
 - acid + acid
 - base + base
 - both halves of conjugate pair
- Cases with reactions
 - acid + base

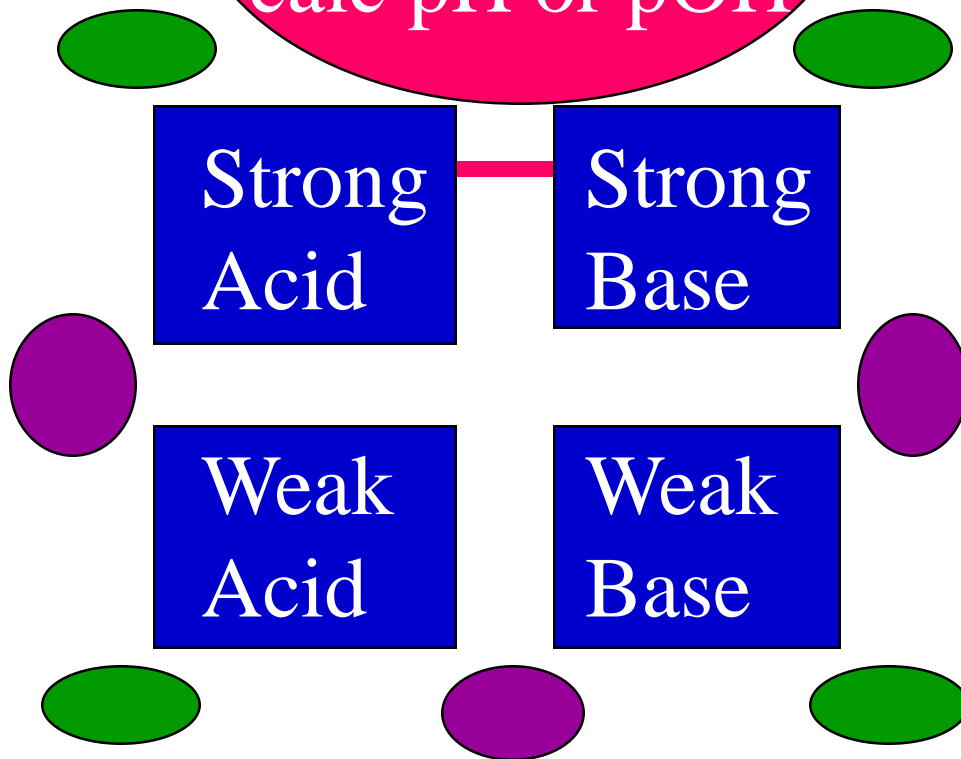
use rxn table
goes 100%
calc pH or pOH

Strong
Acid

Strong
Base

Weak
Acid

Weak
Base



use rxn table
goes 100%
calc pH or pOH

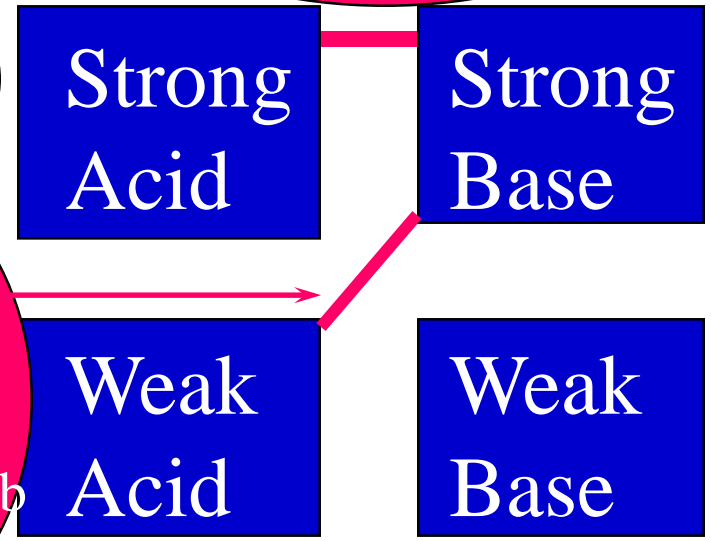
Strong
Acid

Strong
Base

Weak
Acid

Weak
Base

use rxn table
goes 100%
Endpoint : pK_b
base : pOH



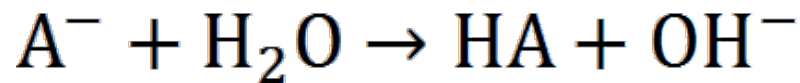
Strong base exceeds weak acid

The key point of the previous problem is that we are no longer in the buffer range. We cannot use H-H in this case. Since:

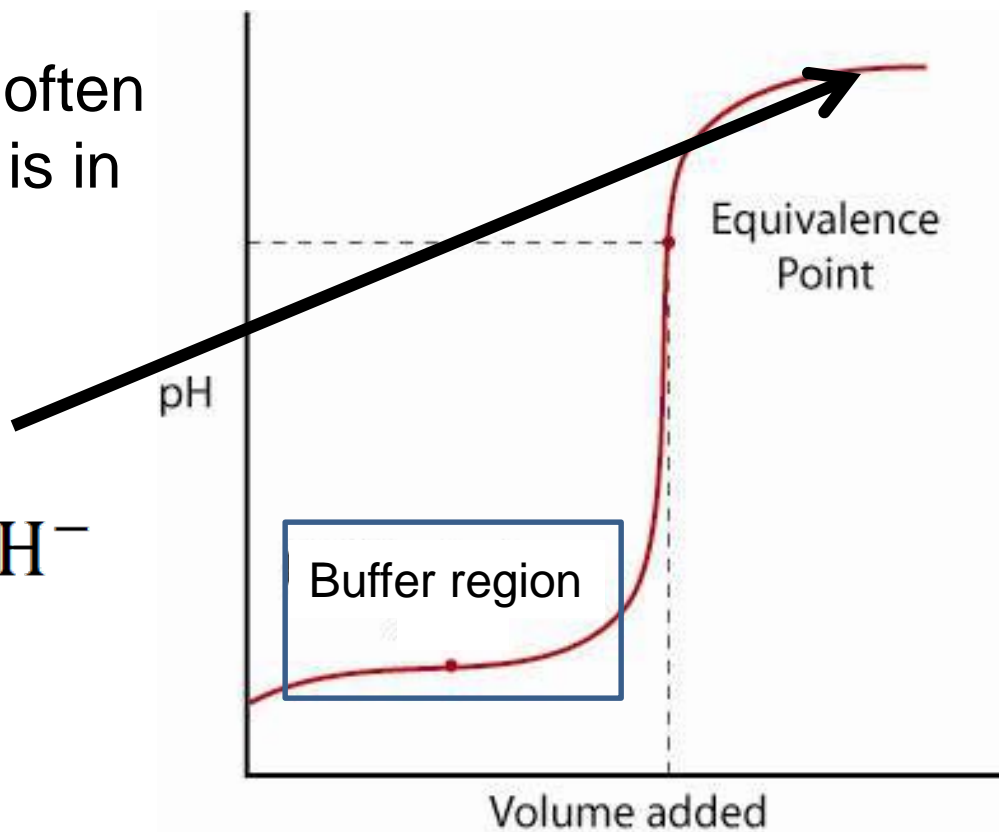
$$[\text{OH}^-]_0 > [\text{HA}]_0$$

While K_b still applies it is often unnecessary since $[\text{OH}^-]$ is in excess.

If you need to use K_b then use:



$$K_b = \frac{[\text{HA}][\text{OH}^-]}{[\text{A}^-]}$$



use rxn table
goes 100%
calc pH or pOH

Strong
Acid

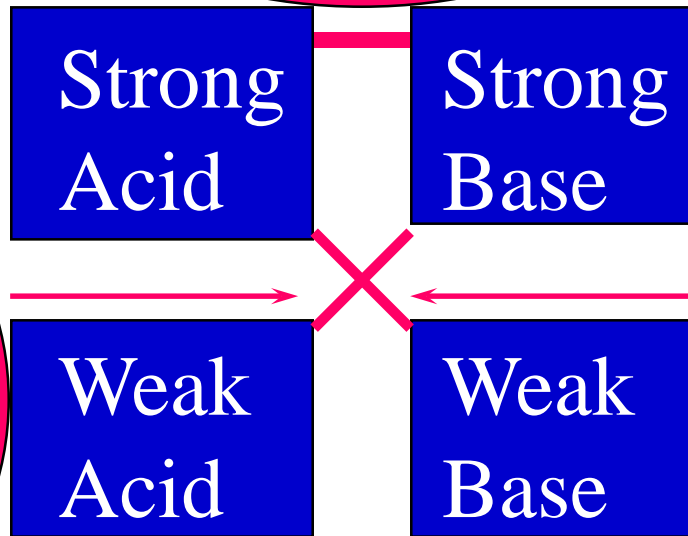
Strong
Base

use rxn table
goes 100%
Endpoint: pK_b
base : pOH

Weak
Acid

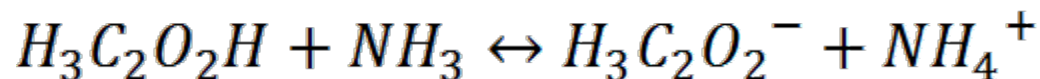
Weak
Base

use rxn table
goes 100%
Endpoint: pK_a
acid : pH

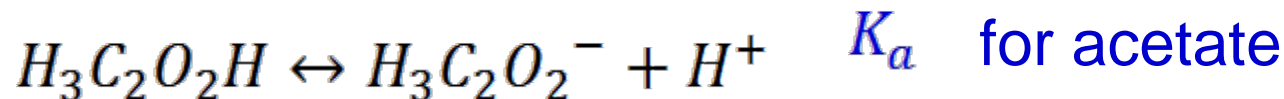


Examples: Weak acid and weak base

For a reaction of a weak acid and a weak base we need to calculate the equilibrium constant from the known K_a 's. We take the example of ammonium acetate.

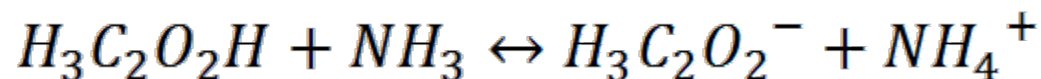


We see that the overall reaction is composed of two acid-base equilibria



Examples: Weak acid and weak base

Therefore, the overall equilibrium constant for the reaction is



$$K = \frac{K_a \text{ for acetate}}{K_a \text{ for ammonia}}$$

Now, that we can see how to calculate the Equilibrium constant, we can solve any acid-base Reaction problem using the standard methods That we have used.

Step. 1. determine dilutions

Step. 2. set up the reaction table

Step. 3. solve for the unknown and then calculate pH

