Buffers!

I. First, the
   A. This is the
      1. Example: In a solution of HF, you have this:
         a.
      2. If NaF were added these this would occur first:
         a.
         b. Then,

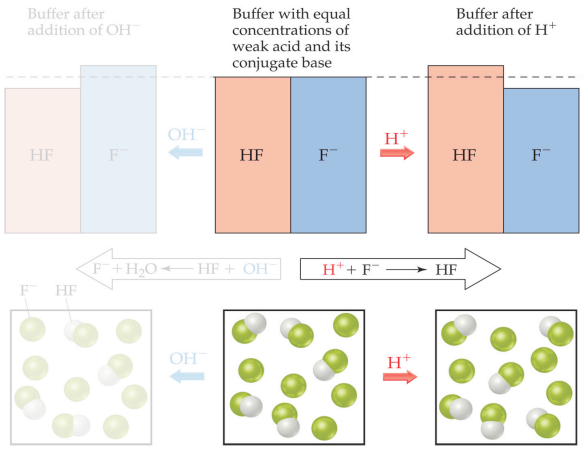
   B. In a mixture of two substances that would dissociate into a common ion,

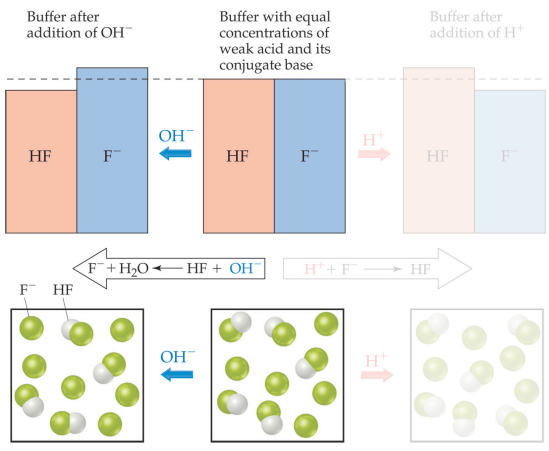
      1. The reaction will shift accordingly,
      2. Be careful when writing your equations for these problems!
   C. Example:
      1. What is the pH of a 0.10M soln. of acetic acid?

      2. What is the pH of a mixture of 0.10M acetic acid and 0.10M of sodium acetate?

II. What is a buffer?
   A. A buffer solution
   B. How to make a buffer:
      1. You must have significant quantities of:
         a.
         b.
   C.

III. Calculating the pH of buffers
   A. Every buffer problem involves
   B. Afterwards, the calculation is the same as usual.
   C. Example: What is the pH of a solution where 50. mL of 0.50M $NaC_2H_3O_2$ is mixed with 25mL of 0.25M $HC_2H_3O_2$?





IV. A shortcut!

A.

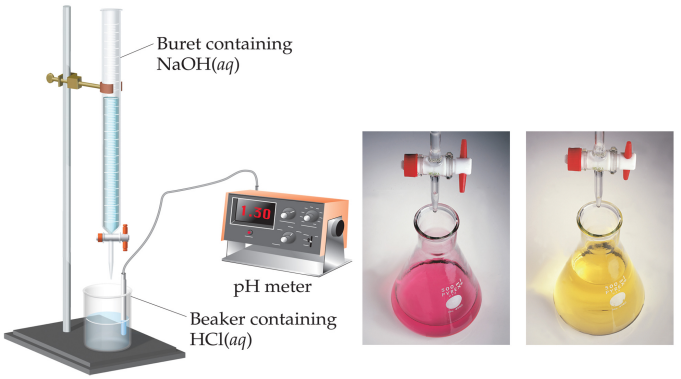
1.

2.

3. Let's repeat our example and see what we get…

B. Example: Calculate the pH of the following solution: 25 mL of a 0.150M solution of hypochlorous acid (HOCl) and 32mL of a 0.45M potassium hypochlorite (KOCl).

C. Example: Calculate the pH when 25.0mL of 0.50M methylammonium nitrate is mixed with 75.0mL of 0.30M methylamine



D. When adding other items to a system:

1.

2.

a. if so,

b. if not,

E. The pOH version:

Titrations

I.

A. To do so, you must titrate to the

B. This is the point where

C.

D.

II. Two ways to reach the equivalence point:

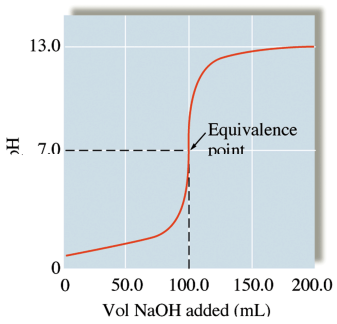
A. Colorimetrically:

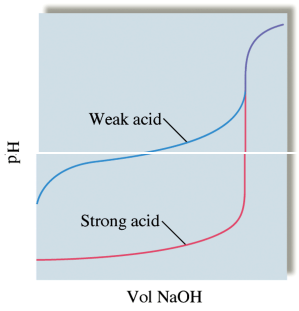
B. Titration curve:

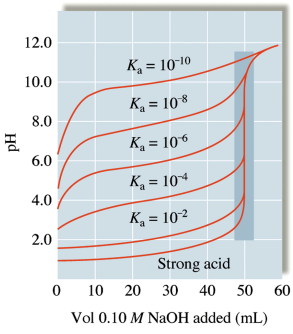
III. Titration curves

A. Refer to titration handout.

B.







D. Titration Calculations

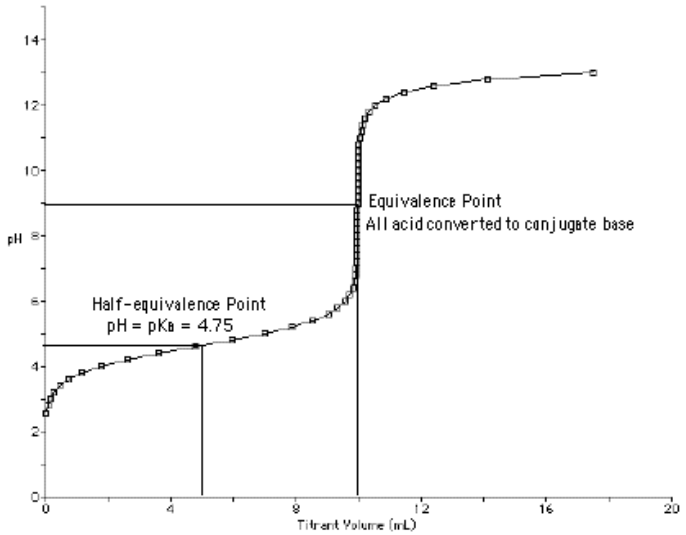
1. Acids and bases COMPLETELY REACT!!!
2. Steps:
   a. Write the equation:
      i. The titrant ALWAYS yields a reactant - usu. H^+ or OH^-.
      ii. The other reactant will be whatever reacts with it.
         a. If a strong acid is used (H^+), the other reactant will be the base.
         b. If a strong base is used (OH^-), the other reactant will be the acid.
   b. Convert all given quantities to mols (mmol is easier to deal with)
   c. When titrating with a strong acid/base, that substance is going to completely react with the other substance.
      i. subtract the reactants from each other until at least one of them equals zero.
      ii. add that same amount to the products.
   d. Analyze what you have left and ask, "is it a buffer?":
      i. if it is, use HHB equation
      ii. if not, use ICE chart (may require writing a hydrolysis equation and solving for the opposite K). NOTE: if using ICE chart, change mmol BACK to M!!!

IV. A special point:

A.

1.
2.

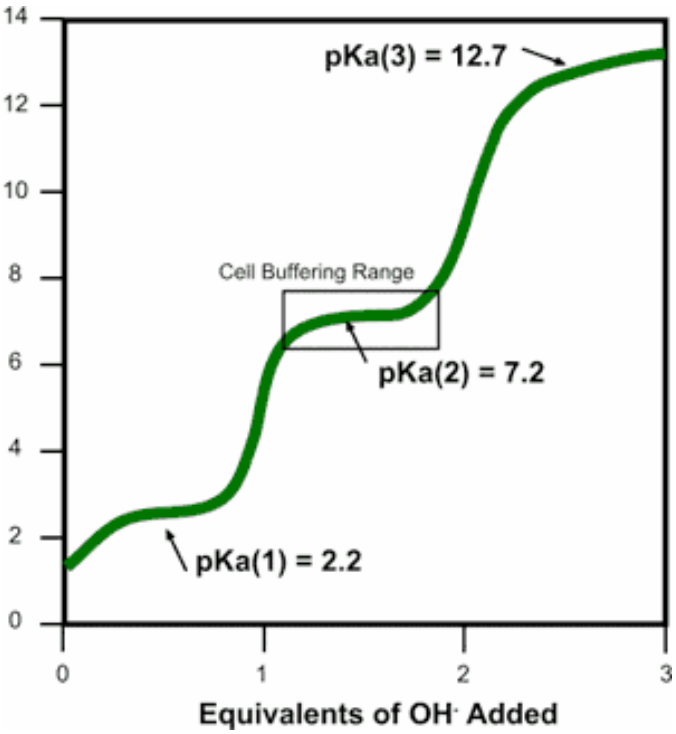
B.



V. Polyprotic acid curves ( )

A. They have

B. There are several points that you could use to find the the K_a.



Indicators

I. Indicators are

A.

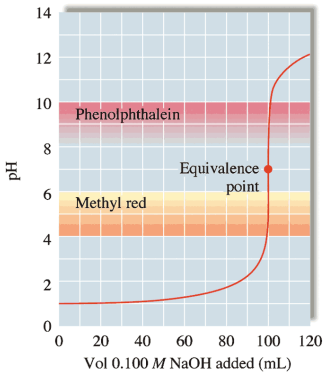
B. Picking an appropriate indicator:

1.

2.

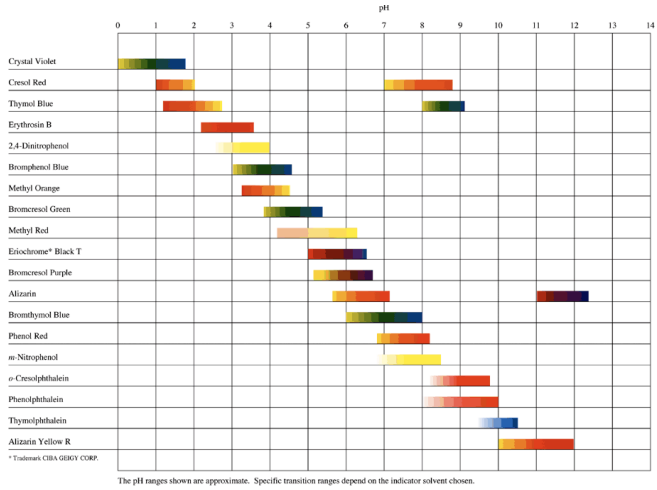
C.

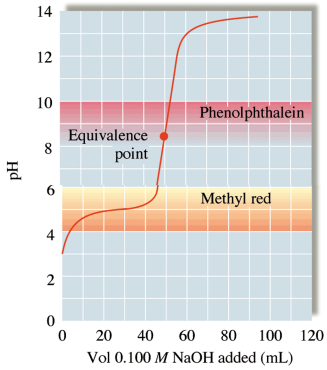
D. Therefore,



E. The equivalence point of a titration is 4.3: Which of the following indicators would be a good choice? Explain your choice.

Indicator	K_a
Thymol Blue	2.3×10^{-2}
Eriochrome Black T	5.4×10^{-5}
Alizarin	6.6×10^{-6}
m-Nitrophenol	8.3×10^{-8}
Thymolphthalien	2.5×10^{-9}
Alizarin Yellow R	4.3×10^{-11}





Review…

I. Toolbox:
- A.
- B.
- C.
- D.

II. Types of problems:
- A.
- B.
- C.
- D.

III. Know…
- A.
- B.
- C.