Name _____ Date _____ Period _____

Acid Base Chemistry

Part 1: The "Basics"

Strong Acids

1.
2.
3.
4.
5.
6.
7.

Example:

Strong bases

1.
2.
3.
4.
5.
6.
7.
8.

Example:

Definitions:

	Acid	Base
Arrhenius		
Bronsted-Lowry		
pH		

Acid Ionization Constant (K_a)

Example 1:

HF

Example 2:

HCl

Part 2: Titration

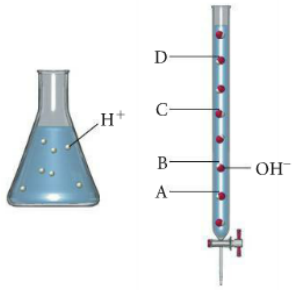
Titration: Also known as acid-base titration; a laboratory procedure by which a solution of known concentration (titrant) is combined with a solution of unknown concentration (analyte) in order to determine the unknown concentration.

During an acid-base titration, the pH of the analyte solution is constantly being measured and recorded.

- An appropriate indicator must be chosen based on the strengths of acid and base
  - Indicators are weak acids, and therefore have a small K_a value and will establish equilibrium
  - The indicator/weak acid is one color and the conjugate base is another color
  - Each indicator has a specific pH range in which it changes color. Choose an indicator that has a pH range that includes the pH at the equivalence point.
- The endpoint is the point at which the indicator changes color
- The equivalence point is the point at which the $[H_3O^+]=[OH^-]$ in the combined solutions
- The buffer region is the range in which the pH of the solution stays constant despite adding more titrant
- A graph showing how the pH of the analyte solution changes in relation to the amount of titrant added is called a titration curve.

Example:

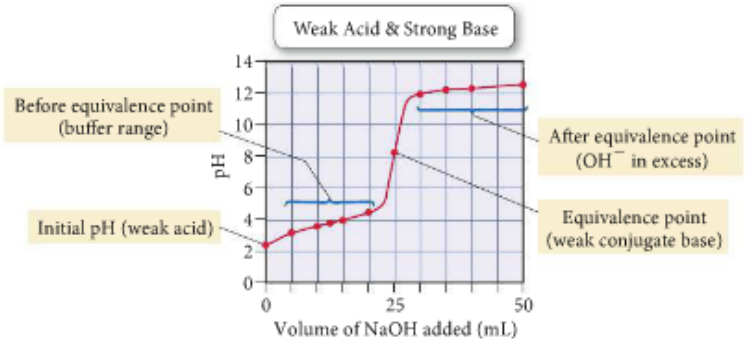
The analyte in the flask is an acid that will be titrated with a strong base. Which mark on the burette indicates the amount of base required to reach the equivalence point?



Example:

Write the Bronsted-Lowry equation for phenol red indicator. Use the equilibrium to predict which way the equilibrium will shift when a strong base is added. What observations would you see?

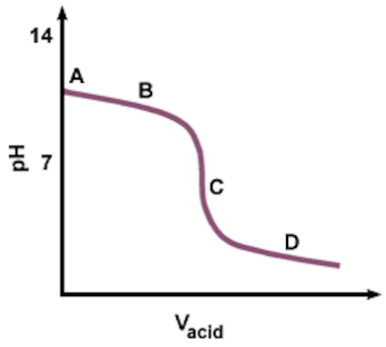
Part 3: Titration Curves



Graph Information	Location on Graph
Analyte Type	
Titrant Type	
Equivalence Point	
Buffer Range	

Example:

The figure below represents a titration of ammonia with hydrochloric acid.



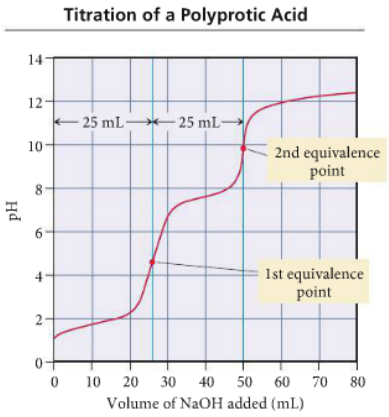
a) Write the balanced chemical equation for this titration reaction. Label the acid/conjugate base and base/conjugate acid pairs.

b) Match points A, B, C, and D on the curve with the appropriate description below:

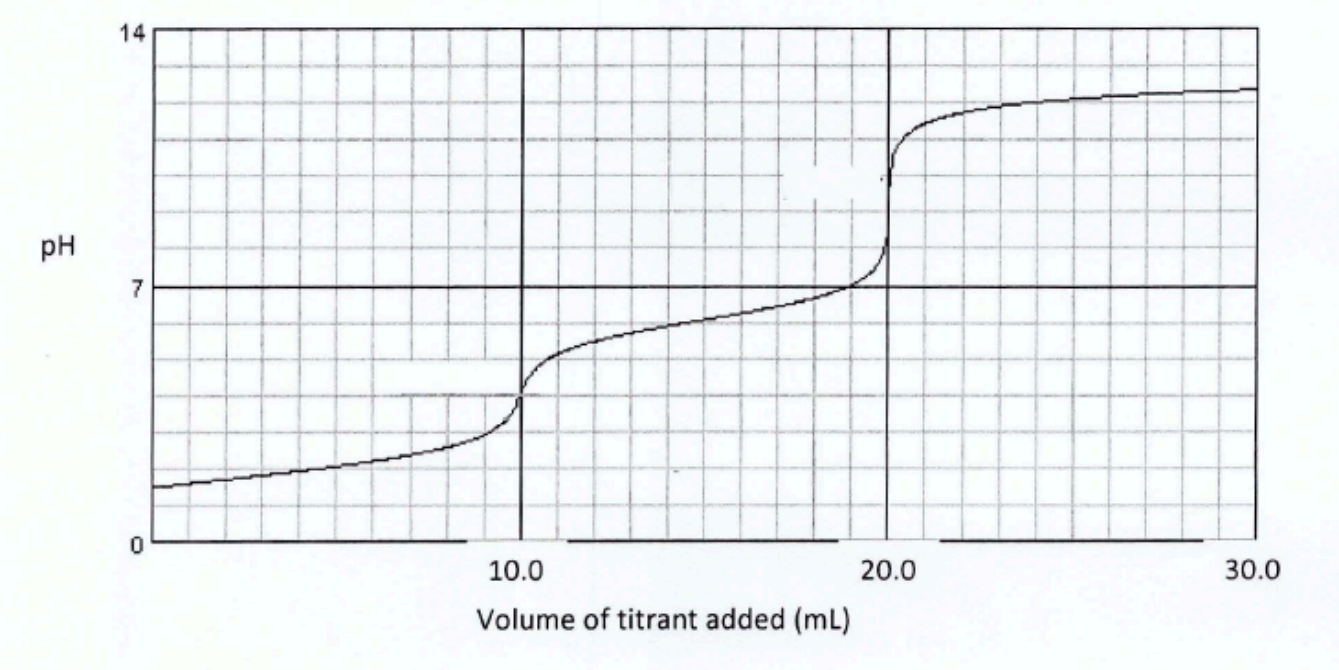
- NH_4^+; At the equivalence point, all of the NH_3 has been protonated and the water molecules begin to take up acidic protons
- NH_3 has yet to be acidified
- NH_4^+ and more acid in solution (H_3O^+)
- NH_3 and NH_4^+ present; buffering region

Polyprotic substances can also be titrated with a strong acid/base and can produce titration curves that can be analyzed in the same manner. The only difference is that since polyprotic substances can lost or gain more than one hydrogen ion (H^+), the curve will have two or more equivalence points.

The following curve represents the titration of 25.0 mL of 0.100M H_2SO_3 with 0.100 M NaOH



Example:



a. The pH of the analyte is _____ and it is a (weak/strong) (acid/base)

b. The titrant is a strong (acid/base)

c. What is the pH at the equivalence points? _____

d. What is an appropriate indicator to use for this titration at each equivalence point?

e. Identify the regions on the graph where a buffer exists