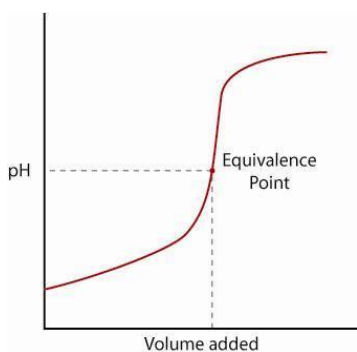


Pre-AP Chemistry I/Chemistry I  
Unit #12—Acids and Bases

Determination of the Molarity of a Strong Acid and Weak Acid

**Introduction**



Titration is a technique used in analytical chemistry to determine the concentration of an unknown acid or base. Titration involves the slow addition of one solution where the concentration is known to a known volume of another solution where the concentration is unknown until the reaction reaches a desired level. For acid/base titrations, a color change from a pH indicator is reached or a direct reading using a pH meter. This information can be used to calculate the concentration of the unknown solution.

If the pH of an acid solution is plotted against the amount of base added during a titration, the shape of the graph is called a titration curve. All acid titration curves follow the same basic shapes.

At the beginning, the solution has a low pH and climbs as the strong base is added. As the solution nears the point where all of the  $H^+$  is neutralized, the pH rises sharply and then levels out again as the solution becomes more basic as more  $OH^-$  ions are added.

The curve above shows a strong acid being titrated by a strong base. There is the initial slow rise in pH until the reaction nears the point where there is just enough base added to neutralize all the initial acid. This point is called the equivalence point. For a strong acid/base reaction, this occurs at  $pH = 7$ . As the solution passes the equivalence point, the pH slows its increase where the solution approaches the pH of the titration solution.

**Purpose**

For this activity, you will be creating a titration curve with a strong acid and strong base to determine the end point/equivalence point of the reaction.

**Pre-Laboratory Questions**

1. What is another name for an acid-base reaction?
2. What is a titration?
3. What is a titration curve?
4. What is the equivalence point/end point?
5. How do you know you have hit the equivalence point/end point in a titration?
6. What is an indicator?
7. What is the pH range for an acid?
8. What is the pH range for a base?
9. What are some characteristics of an acid?
10. What are some characteristics of a base?

**Link for Titration Simulation**

[http://www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/stoichiometry/a\\_b\\_phtitr.html](http://www.chem.iastate.edu/group/Greenbowe/sections/projectfolder/flashfiles/stoichiometry/a_b_phtitr.html)

**Procedure 1: Strong Acid versus Strong Base**

1. Select Strong Acid versus Strong Base.
2. Select Strong Acid in the Buret.
3. Select HCl as the Strong Acid; Select NaOH as the Strong Base.

4. Select Bromothymol Blue indicator. Record the color in the beaker.
5. Write down the molarity and volume of the base that was added to the beaker.
6. Place pH meter into the beaker. Record the pH and temperature.
7. Add Strong Acid drop wise to the Strong Base in the beaker. After each drop, record the volume of the Strong Acid, the pH, the temperature, and any color change in the beaker.
8. Continue Step 7 until you reach the end point/equivalence point. The end point/equivalence point is reached when the Bromothymol Blue indicator changes to a different color.
9. Write down the total volume of Strong Acid used to reach the end point/equivalence point, and record the color change of the indicator.
10. Plot the titration curve using the data collected for the experiment.

#### **Questions and Calculations.**

1. Write the balanced acid-base reaction with proper states of matter for the products.
2. Using the information gathered from the titration, calculate the molarity of the Strong Acid.