# Titration 1: HCl Titrated with NaOH

**Titration 1:** Acid is HCl, phenolphthalein as the indicator

1. Obtain about 60 mL of the standardized (≈ 0.1 M) NaOH solution. **CAUTION:** *Sodium hydroxide solution is caustic.*
*Avoid spilling it on your skin or clothing. Rinse with water if it comes in contact with skin or clothing.*

2. Obtain a 50-mL buret and rinse the buret with a few mL of the NaOH solution. Fill the buret to above the 0.00-mL mark then drain to the 0.00-mL mark.

3. Obtain about 30 mL of the ≈ 0.1 M acid solution. **CAUTION:** *Avoid spilling the acid on your skin or clothing. Rinse with water if it comes in contact with skin or clothing.*

4. Pipet 25.00 mL of the acid solution into a clean, dry 250-mL beaker.
   - Add two to three drops of the assigned indicator.
   - Use a utility clamp to suspend the pH electrode on a ring stand as shown n Figure 1. Situate the pH electrode in the acid solution and adjust its position toward the outside of the beaker so that the stirring bar does not strike it.
   - Turn on the magnetic stirrer

5. Set up the PASCO software and hardware as directed in pre-lab. Make sure you can see the graph and table during the titration

6. Press the START button to begin recording and titrate until the end point is reached

**Record the volume, pH and indicator color in your notebook.**
• Continue adding NaOH solution until the buret reaches the 50.00 ml mark. **Do not go below this mark!**

8. Press STOP to stop when you have finished collecting data. Examine the data points along the displayed graph of pH vs. time.

**9. Print the graph as you will need it to complete this lab.**

10. Continue with DATA ANALYSIS and POSTLAB

**Clean-up**
1. Collect all rinse, left over and titrated solutions in a 600-mL beaker and discard in the appropriately labeled waste container.

2. Rinse the pH electrode, place it back in its storage solution.

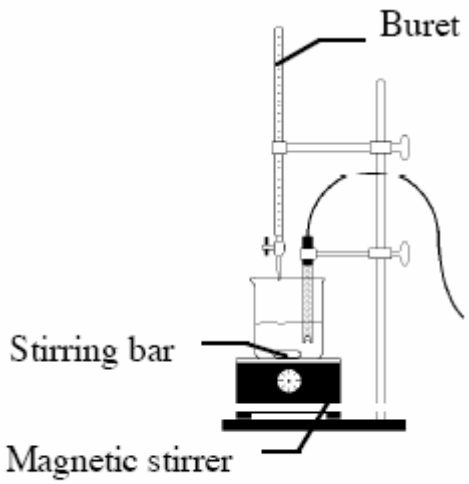


*Figure 1*

# DATA ANALYSIS
# Titration #1 HCl with NaOH

1. Using the titration curve, find the equivalence point for the titration. This occurs at a pH of 7.00 since this is a strong acid–strong base titration. (Mathematically, this should occur at the inflection point of the curve.) **Clearly mark and label the equivalence point on the graph.**

Record the volume of NaOH used to reach the equivalence point. _____ml NaOH

2. Using the equivalence volume of NaOH and precise molarity of NaOH, calculate the molarity of the HCl solution you titrated. Use $M_{acid}V_{acid} = M_{base}V_{base}$

Molarity of HCl _____ M

3. The equivalence point for this titration occurs at a pH of 7. *Why will* an acid-base indicator that changes color between pHs 5 and 9 work just as well to accurately determine the equivalence point for this titration as one that changes color at a pH of 7?

4. Which of the indicators tested could be used to accurately determine the equivalence point for this titration? List a few.

## Staple the graph to this paper