CHM 115 Lab 12

Acids, Bases and Buffers

The purpose of this laboratory is to familiarize the student with acid/base titration curves and different properties of acid/base solutions. Students will learn how to use a pH meter and indicator materials to measure pH. Students will also gain experience with serial dilutions and how they affect the pH of acid/base solutions. In the third part of this experiment a sample corresponding to the half-way point on the titration curve is produced by splitting a solution into two equal portions, neutralizing one, and then recombining them. The K_a of an unknown acid will be determined.

Procedure

Caution: Remember that you are working with acids and bases, some of which may be strong acids and bases and are therefore, corrosive! Work in pairs for this experiment.

I. Titration Curves

A. Titration of a Strong Acid by a Strong Base

1. Pipet 25.0 mL of 0.100 M HCl in a 125 mL Erlenmeyer flask. Add a few drops of phenolphthalein indicator to this flask and stir well. Do **not** forget to add this indicator.
2. Rinse the buret with 0.100M NaOH solution and then fill the buret with this NaOH. Record the initial reading of the buret.
3. Rinse the electrode with deionized water from your wash bottle, pouring the rinse into the drain. Insert the electrode into the solution and swirl gently. Read the pH of the solution. Thoroughly rinse the electrode with deionized water from the wash bottle and gently shake the electrode to remove excess water. Record the initial pH reading.
4. Add 4.0 mL of NaOH, swirl the Erlenmeyer flask, and then measure and record the pH reading. Continue adding NaOH in 4.0 mL increments until you have added 40.0 mL of NaOH to your solution. Don't forget to swirl the flask and measure the pH after every 4.0 mL increment. Note where the color changes from clear to pink occurs.

Initial Reading of Buret:_____	Initial pH:_____
Volume of NaOH added:_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____

B. Titration of a Weak Acid with a Strong Base

1. Pipet 25.0 mL of 0.100 M acetic acid ($HC_2H_3O_2$) in a 100 mL beaker. Add a few drops of phenolphthalein indicator to this flask and stir well. Measure and record the initial pH reading.

2. Add 3.0 mL of 0.100M NaOH and swirl the Erlenmeyer flask and then measure and record the pH reading. Continue adding 3.0 mL increments of NaOH until you have added 30.0 mL of NaOH to your solution. Don't forget to swirl the flask and measure the pH after every 3.0 mL increment. Note where the color change from clear to pink.

Initial Reading of Buret:_____	Initial pH:_____
Volume of NaOH added:_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____
_____	pH:_____

II. Buffers

1. Each pair of students should obtain from the stock room a numbered unknown acid.
2. Dissolve about 1 g of your unknown acid in 100.0 mL of deionized water. Transfer **half** of this solution to a flask, add 1 or 2 drops of phenolphthalein, and titrate to the endpoint with 0.5 M NaOH. You do **not** need to record the volume of NaOH used.
3. Combine the neutralized half with the other half of the solution and measure the pH of the resulting buffer solution.
4. To about 30 mL of your buffer solution (from step 3), add 1 drop of 0.5 M HCl, mix and measure the pH. To a second 30 mL of buffer, add 1 drop of 0.5 M NaOH, mix and measure the pH.
5. Measure the pH of about 30 mL of deionized water. Then add 1 drop of 0.5 M HCl, mix and measure the pH. To a second 30 mL of deionized water, add 1 drop of 0.5 M NaOH, mix and measure the pH.
6. Measure the pH of about 30 mL of tap water. Then add 1 drop of 0.5 M HCl, mix and measure the pH. To a second 30 mL of tap water, add 1 drop of 0.5 M NaOH, mix and measure the pH.