Exp. 7

Prelab

What is the major purpose of this experiment?

List the Equiptment used in this experiment.

	Name	Size	#
1.	Graduated cylinder	10-mL	1
2.			
3.			
4.			
5.			

Are there any safety concerns or Caustions stipulated?

Write the equations (formulars) used in this experiment.

1.

2.

3.

4.

Answer the following questions regarding the experimental Procedures.

1. What is the phenolphthalein indicator ? Why do we use it ?
2. Where can the molarity (M) of the NaOH solution be found?
3. The buret should be rinsed with what solution?
4. When do you stop adding NaOH ?
5. For each repeat of steps 1~4, how many buret readings should you record?

Using your own words, write down the experimental procedures in sequential order.

7

CONCENTRATION OF ACETIC ACID IN VINEGAR

Objective: To determine the percentage of acetic acid in vinegar.

Procedure:

1) Using a 10-mL graduated cylinder, place 5.0 mL vinegar into a 250-mL Erlenmeyer flask. Record this volume. Record the brand of vinegar.

   Add 25 mL of water to increase the volume of the solution for titration. This will not affect your results. Add 2-3 drops of the phenolphthalein indicator to the vinegar solution in the flask.

2) Rinse a buret with 10 mL of approximately 0.10 M NaOH. Fill the buret above the zero mark with the NaOH solution. Run the volume of NaOH down to the zero mark or starting mark by draining the buret into an extra beaker. The tip should now be full of solution and free of bubbles. Record the molarity of the NaOH solution. See Figure 1.

3) Record the initial reading of the NaOH in the buret. This titration involves adding a base, NaOH, to an acid (in the flask) until the point of neutralization is reached. Begin adding NaOH to the vinegar solution in the flask. As you add the NaOH, swirl the solution in the flask to completely mix the acid and the base. At first, the red streaks produced by the reaction will disappear quickly. As you approach the end point of the neutralization, the red or pink streaks will disappear more slowly. Slow down the addition of the NaOH at this time. Add a drop at a time.

   Eventually, one drop of NaOH will cause the entire solution to turn a permanent pink color. This should be a <u>faint</u> pink, not a vivid pink color. Stop adding NaOH. You have reached the end point of the titration. See Figure 2.

4) Record the volume reading in the buret, which will be your final reading.

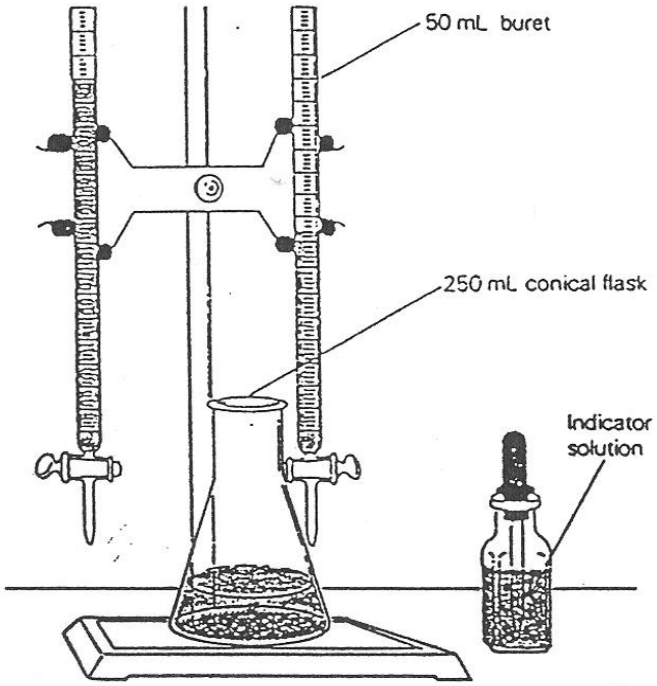

Figure 1. Apparatus for Acid-base titration.

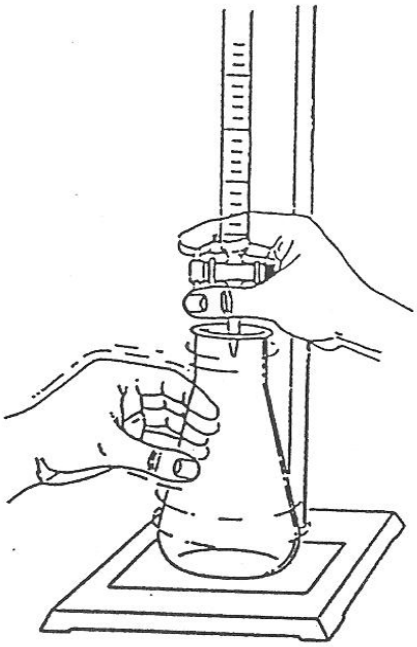

Figure 2. Solution in flask is swirled as sample is titrated.

5) Repeat Steps 1 to 4 two more times.

NAME _____ SECTION _____

Instructor's Initials ____

REPORT SHEET

1. Brand of vinegar: _____
2. Advertised % acetic acid: _____
3. Volume of vinegar added to flask (mL):

   Flask #1 _____ Flask #2 _____ Flask #3 _____
4. Molarity (concentration) of NaOH (sodium hydroxide): _____
5. Initial buret reading (mL):

   Flask #1 _____ Flask #2 _____ Flask #3 _____
6. Final buret reading (mL):

   Flask #1 _____ Flask #2 _____ Flask #3 _____
7. Volume of NaOH used (6-5):

   Flask #1 _____ Flask #2 _____ Flask #3 _____

CALCULATIONS: Complete the following calculations for each titration.

1. Calculate the volume of NaOH used to neutralize the vinegar sample.

2. Calculate the moles of NaOH using the volume and molarity of the NaOH.

$$\text{moles NaOH} = \text{volume (L) NaOH} \times \left(\frac{\text{M}}{\text{L}}\right)$$

3. Record the moles of acid present in the vinegar (equal to the number of moles of NaOH).

$$\text{moles HAc} = \text{moles NaOH}$$

4. Calculate the number of grams of acetic acid (HAc) in the vinegar sample. The molecular mass of HAc ($HC_2H_3O_2$) is 60 g/mol.

$$g\ \text{HAc} = \text{moles HAc} \times \frac{60\ \text{g}}{\text{mol}}$$

5. If we assume that the density of the vinegar sample is the same as for water, 1.0 g/mL, we can say that the 5.0 mL sample of vinegar has a mass of 5.0 g. Then we can calculate the percentage of acetic acid (HAc) in the vinegar sample.

$$\%\ \text{HAc within vinegar} = g\ \frac{\text{HAc}}{5.0\ \text{g sample}} \times 100\%$$

6. Calculate the Average % Acetic Acid.