TITRATION: CONCENTRATION OF ACETIC ACID IN VINEGAR

OBJECTIVES

The student will be able to:

1. write or identify the definitions of ***titration, standard solution***, ***titrant*** and ***equivalence point***.
2. experimentally determine the concentration of an acid by doing a titration.
3. write a description of the function of acid/base indicators like phenolphthalein in an acid base titration.
4. do calculations using molarity as a conversion factor.

BACKGROUND

Titration involves measuring the volume of a solution of known concentration that is required to react with a measured volume of a solution of an unknown concentration.

The solution of known concentration is called a ***standard solution***. It is usually added from a buret to allow you to measure the amount of solution added. Your instructor will demonstrate the use of the buret. This solution added from the buret is also called the ***titrant***. You will use a sodium hydroxide solution as the standard solution. You will be given the concentration.

The ***equivalence point*** in a titration is the point at which an equal amount of base and acid are in the system. Acid/base indicators like phenolphthalein show when this point has been reached. They show this by changing colors. Phenolphthalein changes from colorless to pink at the equivalence point.

You will be titrating a vinegar sample to determine the concentration of acetic acid in the vinegar. The following equation describes the reaction.

$$HC_2H_3O_2(aq) + NaOH(aq) \rightarrow H_2O(l) + NaC_2H_3O_2(aq)$$

You will measure the volume of vinegar titrated and the volume of the NaOH solution needed to neutralize the acetic acid in the vinegar. With these and the given concentration of NaOH, you will calculate the molarity of the acetic acid in the vinegar.

PROCEDURE

1. Fill the buret found at your bench to just above the zero line with 0.2 M NaOH. The accurate molarity of the NaOH will be found on the bottle. Be sure to record it on your data sheet.
2. Run enough solution through the tip of the buret to bring the level down to the zero line. Be sure the tip is full of liquid.
3. If the level falls below the zero line, record the initial volume on the data sheet to 0.1 mL. Otherwise record 0.0 mL for the initial volume.
4. Pipet 5.00 mL of vinegar into a clean 125-mL Erlenmeyer flask. (The flask need not be dry.)
5. Add two drops of phenolphthalein.
6. Place the flask under the buret and titrate the vinegar with the NaOH. Your instructor will demonstrate the correct technique.
7. Pour the solution in the flask into the sink and rinse it with deionized water.
8. Repeat steps 4-6. Add more NaOH to the buret if necessary.
9. Calculate the volume of NaOH added in each of the first two trials. If they differ by more than 5%, repeat steps 4-6.
10. For each trial, calculate the concentration of the acetic acid in the vinegar.
11. Find the average concentration of acetic acid from your two or three trials.

NAME _____

DATA SHEET
TITRATION OF ACETIC ACID IN VINEGAR

Molarity of NaOH _____

	Trial 1	Trial 2	Trial 3
Initial buret reading			
Final buret reading			
Volume of NaOH soln added			
Molarity of the acetic acid in vinegar			

Average molarity of acetic acid in vinegar _____

Show your calculations here.