Acid – Base Titration

Lab 28

PRE-LAB DISCUSSION

It is sometimes necessary to determine experimentally the concentration of an acid solution or a base solution. In an acid-base titration, a solution with a known concentration, called standard solution, is used to neutralize a solution with an unknown concentration to which a few drops of an appropriate acid-base indicator is added. If the solution of unknown concentration is acidic, a standard base solution is added to the acid solution drop by drop until it is neutralized; and vice versa.

While doing an acid-base titration, you must be able to recognize when to stop adding the standard solution. A sudden change in color indicates that neutralization has occurred. At this point, the number of hydronium ions from the acid is equal to the number of hydroxide ions from the base. The point at which this happens is called the end point of the titration. When this point is reached, the volume of the standard solution used must be carefully determined. Then, measured volumes of the two solutions and the known concentration of the standard solution can be used to calculate the concentration of the other solution.

PURPOSE

To determine the molarity of a NaOH solution by titrating it with a standard HCl solution.

EQUIPMENT	burettes	burette stand	graduated cylinder	Erlenmeyer flask
	beakers	dropper pipette	pipette	
MATERIALS	0.1M standard solution	conc. NaOH solution	Phenolphthalein	distilled water

PROCEDURE

1. Wash the burettes with detergent solution. Rinse them thoroughly, first the tap water and with distilled water.
2. Pour about 10ml of acid into one burette and rinse the inside surface of the burette thoroughly. Allow the acid to run out the burette tip. Fill the burette with the acid. Be sure there are no bubbles in the tip. Figure 1
3. Place a 125ml Erlenmeyer flask under the acid burette as in the figure. Allow exactly a 10.0ml of acid to flow into the flask.

4. At exactly 10.0ml of distilled water to the flask. Then add three drops of phenolphthalein. Swirl the flask to mix all the ingredients.

5. Swirl the flask gently; begin the titration by adding NaOH to the flask drop by drop. Continue until the solution becomes pink. Figure 2

6. Note and record the exact final volume reading on the scale of the base burette.

7. If time is enough, repeat the steps 4 to 6.

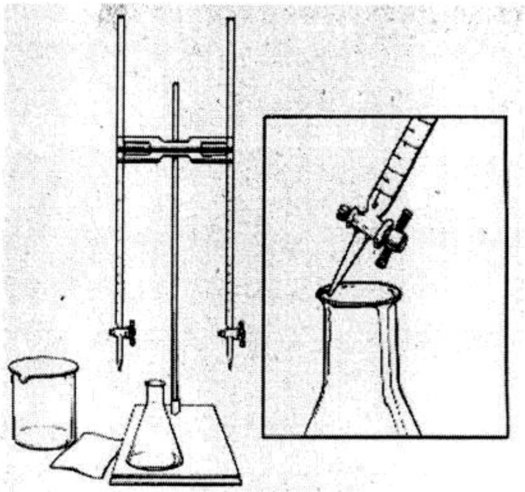

figure 1

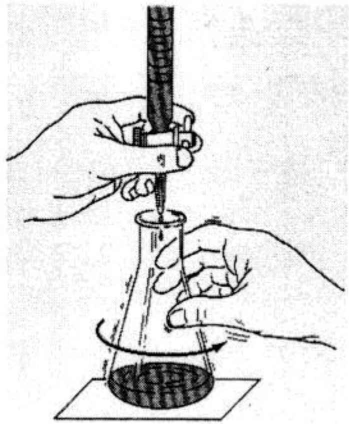

figure 2

OBSERVATION AND DATA

	Trial 1 (HCl)	Trial 2 (HCl)	Trial 3 (HCl)
Initial reading			
Final reading			
Volume used			

CALCULATIONS

For each trial, calculate the molarity of the NaOH solution using the relationship

$M_{base} = (M_{acid} \times V_{acid}) / V_{base}$

Trial 1 = ______________ Trial 2 = ______________ Trial 3 = ______________

CONCLUSIONS AND QUESTIONS

1. Define the following terms: standard solution, titration, end point, indicator

2. How were your results compared with those of your partner?

3. If 30.0ml of 0.5M KOH is needed to neutralize 10.0ml of HCl of unknown concentration, what is the molarity of the HCl solution?