

Chemistry CP

Name: _____

Lab: Acid-Base Titrations

Section: _____

The neutralization of an acid by a base can be done very precisely using the technique of titration. In titration, a solution of known concentration is gradually added to a solution of unknown concentration. When the unknown solution is exactly neutralized, as shown by the color change of an acid-base indicator or by the reading on a pH meter, the number of moles of acid is in the stoichiometric ratio to the base as determined by the balanced equation.

In titration, the solutions are dispensed from burets. The volume used of each solution is calculated by subtracting the volume read before the titration begins from the volume read after the titration is complete. The volume in a buret can be read accurately to ± 0.01 mL. This makes possible a very accurate determination of the unknown solution, provided that the concentration of the known solution is accurately known. In this experiment, you will use a solution of approximately 0.1 M NaOH to titrate an unknown solution of HCl.

Objectives

- Learn the technique of titration.
- Determine the concentration of an unknown acid solution.

Materials

Safety goggles	Erlenmeyer flasks
Graduated cylinder	0.100 M NaOH
Buret	unknown solution of HCl
Buret clamp	phenolphthalein
Small funnels	

Roles

Project Manager _____

- Reads instructions, keeps group on task

Quality Control Manager _____

- Checks significant figures in measurements, monitors data recording

Materials Manager _____

- Ensures proper use of equipment, makes sure lab area is clean

Safety

Wear your safety glasses. Sodium hydroxide is caustic and can cause severe burns to skin and body tissue. If any sodium hydroxide comes into contact with your skin, flush with running water for at least 10 minutes. Eye burns caused by sodium hydroxide are particularly severe and become more damaging with time. If any sodium hydroxide comes into contact with your eye, flush the eye with running water continuously for at least 15 minutes. Notify your teacher immediately.

Procedure

1. Fill your buret with NaOH solution. Release some base from the buret to remove any air bubbles and to lower the volume to the calibrated portion of the buret. Record the volume of the buret.
2. Record the initial volume on the class acid buret. Transfer approximately 10 mL of hydrochloric acid from the class acid buret into a clean, dry Erlenmeyer flask. Record the final volume to the nearest 0.01 mL. Calculate the actual volume of acid used and record this value in your data table.
3. Add 3 drops of phenolphthalein solution to the flask.
4. For optimal results, dilute the acid in the flask by adding distilled water.
5. Place the Erlenmeyer flask under your buret.
6. Record the initial volume of your buret.

- Slowly release base from the buret into the flask while constantly swirling the contents of the flask. Slow to dropwise addition when you think you are nearing the endpoint.
- The equivalence point is reached when a very light pink color remains after 30 seconds of swirling. Record the final volume of the buret.
- Calculate the volume of base used and record this value in the data table.
- Repeat the titration three times.

Data

Actual Concentration of Base _____

Be sure to record your data to the correct number of significant figures!

	Titration 1		Titration 2		Titration 3	
	Acid	Base	Acid	Base	Acid	Base
Initial Volume (mL)						
Final Volume (mL)						
Volume Used (mL)						

Analyze and Apply

- Write the balanced equation for this reaction.
- Why is it necessary to conduct three trials of the titration?
- How could you tell if you overshot your endpoint?
- Calculate the average concentration of the acid solution from all three trials. Show all your calculations.
- A 12.7 mL sample of H_2SO_4 was titrated with NaOH to the endpoint. It took 24.2 mL of .204 M NaOH. Calculate the concentration of the acid.

Conclusion

Compare your calculated concentration with the results of at least two other groups. Restate/summarize your findings and discuss possible sources of error.