

LESSON
89

LAB

Drip Drop Titration

Name _____

Date _____ Period _____

Purpose

To use a neutralization reaction to figure out the concentration of a strong acid.

Materials

- well plate
- toothpicks
- set of five labeled dropper bottles:
HCl solution A, HCl solution B,
HCl solution C, 0.10 M NaOH, and
bromothymol blue indicator

Procedure

1. Place 20 drops of HCl solution A in a well of the well plate. Add one drop of bromothymol blue indicator.
2. Carefully add single drops of 0.10 M NaOH, counting them as you go. Stir the solution with a toothpick after adding each drop to mix well.
3. Keep adding drops of NaOH until a green color is observed. This color indicates that the solution has been neutralized. If the indicator changes to blue, you have added a bit too much base.
4. Record the number of drops required to reach the green color change in the table.
5. Use the number of drops of NaOH added to determine the molarity of the unknown HCl solution.
6. Repeat steps 1 through 5 for HCl solution B and HCl solution C.

HCl solution	Drops of 0.10 M NaOH added to neutralize	Calculated molarity of HCl
20 drops HCl solution A		
20 drops HCl solution B		
20 drops HCl solution C		

Questions

1. Which of the three HCl solutions has the highest molarity and is potentially the most toxic? Explain how you know.
2. What is happening in the solution as you add sodium hydroxide? Write a chemical equation to show the reaction.

3. What pH numbers do you predict for the final solutions?
4. Imagine that you have a 100 mL sample of hydrochloric acid, HCl. After adding 50 mL of 1.0 M NaOH, you detect a green color.
- How many moles of OH^- did you add?
 - The color of the indicator suggests that the solution is neutral. How many moles of H^+ were neutralized?
 - What is the concentration of the HCl solution?
5. Imagine that 0.20 L of 0.45 M HCl neutralizes the hydroxide ions in a 50.0 mL sample of NaOH.
- How many total moles of H^+ were added?
 - How many moles of OH^- were neutralized?
 - What is the concentration of the NaOH solution?
6. **Making Sense** Describe how you can determine the concentration of an unknown hydrochloric acid solution. What do you need to know?
7. **If You Finish Early** Assume that 20 drops equals 1.0 mL. Determine the number of moles of HCl in one drop of each of the three HCl solutions used in the lab.