

ANALYSIS of DRAIN CLEANERS

LAB PH 3

From Juniata College SIM

INTRODUCTION

Most common household cleaners contain acids or bases. Acidic cleaners, such as toilet bowl cleaners, often contain hydrochloric acid or sodium bisulfate to remove alkaline deposits or stains. Basic cleaners are designed to dissolve grease, hair, and food. In this experiment, you will use a pH probe to monitor the titration of a drain cleaner. This kind of reaction is referred to as a potentiometric titration and does not require the use of an acid-base indicator.

When the data has been plotted, two endpoints will be determined. Since sodium hydroxide is a stronger base, it will expend the acid first. Therefore, the first endpoint will allow the determination of the amount of sodium hydroxide in the sample. The second endpoint indicates the amount of sodium hypochlorite in the sample. When the titrations are completed, results can be compared with the package or literature values.

PURPOSE

The purpose of this experiment is to determine the percentages of sodium hydroxide and sodium hypochlorite in a commercial drain cleaner.

EQUIPMENT / MATERIALS

drain cleaner	stirring bar
5 mL graduated pipet	10 mL graduated cylinder
LabPro with calculator	stirring rod
250 mL beaker	50 mL buret and clamp
pH probe	0.10 M HCl
balance	pH buffer solutions (pH 7, 10)
magnetic stirrer	distilled water

PROCEDURE

1. Rinse a buret with distilled water. Use 5 mL of the 0.10 M HCl solution to rinse the buret three times. Fill the buret with the acid solution. Record the initial reading.
2. Measure the mass of a clean, dry 250-mL beaker and record the value. Using the pipet, add 3.0 mL of drain cleaner to the beaker. Remass the beaker and record the value.
3. Standardize the pH probe as described below:
 - a. With pH probe connected to LabPro and Datamate application running
 1. Select Set Up
 2. Select Calibrate
 3. Select Calibrate Now
 - b. Place probe in buffer #7-Follow screen directions to enter pH value (7)
 - c. Remove and rinse probe then place in buffer #10
 - d. Repeat Procedure
 - e. Select 1) o.k. to return to main menu
4. Add about 75 mL of distilled water to the beaker and stir gently with a stirring rod. Place the pH probe in the beaker and record the initial pH on the data sheet. The volume of acid added is 0 mL.
5. Place the magnetic stirrer in the beaker and turn on the stirrer slowly, making sure that the bar does not hit the electrode.
6. Begin titrating, stopping to record the volume of acid and the pH on the data sheet at intervals of about 0.2 to 0.3 pH units or 1 mL, whichever comes first. Continue to add acid until a pH of less than 3.0 is obtained.
7. Plot the pH (y-axis) versus milliliters of acid (x-axis). There will probably be two inflection points on the graph. The midpoints of these regions represent two different endpoints, the first for NaOH, and the second for NaOCl.

Analysis of Drain Cleaner

Name _____

Name _____

Period _____

Date _____

DATA TABLE:

Brand name of drain cleaner _____

Information from product label _____

Mass of dry beaker _____

Mass of beaker and drain cleaner _____

Mass of drain cleaner _____

Initial reading HCl _____

HCl concentration _____

mL acid	pH

mL acid	pH

mL acid	pH

CALCULATIONS:

Using:

1. the volume of acid used to reach each endpoint
2. the concentration of the hydrochloric acid
3. the formula weights of the components (NaOH and sodium NaOCl)

calculate the percentage by weight of NaOH and NaOCl in the drain cleaner. Show your work in the space provided below.

% NaOH _____

% NaOCl _____

QUESTIONS

1. Why is water added to the beaker containing the drain cleaner?
2. Why does the volume of the water added not have to be exact?
3. What volume of acid is needed to neutralize the drain cleaner solution?