LAB 28. WATER

Question
How does water influence the chemical and physical properties of substances dissolved in it?

Supplies
Recrystallization activity: hot plate; beaker; distilled water; copper(II) chloride, alum, or magnesium sulfate; stirrer; tongs; ceramic tile; watch glass or other beaker cover; filter paper, funnel, flask, spatula, rubber "policeman"

pH activity: 1M HCl solution, 1M NaOH solution, graduated cylinder, Erlenmeyer flask, buret, ring stand, buret clamp, glass funnel, glass stir rod, pH strips, graph paper

Safety
Observe all chemical laboratory safety rules: secure loose clothing, wear closed footwear, tie back long hair and beards, wear protective eyewear.

Activity 1. Recrystallization
1. Measure and record the mass of the beaker.
2. Place about 10 grams solid in the beaker. Record the mass of the beaker with solid. Subtract to find the exact mass of solid.
3. Add distilled water to cover.
4. Place the beaker on the hot plate. Turn the hot plate to a medium setting and stir while heating the mixture. If the water begins to boil, turn down the setting. It should at most boil gently.
5. Gradually add distilled water until all the solid is dissolved.
6. Using tongs, remove the beaker from the hot plate and place it onto a ceramic tile to cool. Cover the beaker and allow to cool.
7. When the beaker is cool, label it with your names and move it to a location where it can stand undisturbed.
8. Record your steps in your notebook.
9. Check your beaker periodically over several days and record your observations.
10. To harvest your crystals, place a fluted filter paper in a funnel over a flask. Filter the water and solids through the paper, scraping solids from the mixture into the filter. Allow the filter residue to dry.
11. Weigh a weighing boat and record its mass. Place the solid filter residue into the weighing boat and measure the mass of the boat + residue. Record the mass. Calculate the percent recovery.
12. Record your observations of the crystals and filtrate.

Activity 2. pH

1. Set up a table in your notebook to record volume of NaOH solution added, test strip color, and pH. Allow room for at least 25 rows.
2. Measure out 10.0 mL 1M HCl solution and add it to the Erlenmeyer flask. Rinse the graduated cylinder with distilled water and add the rinse to the flask.
3. Dip the end of a glass stir rod into the solution in the flask and touch a drop of the solution to a small strip of pH paper. Match the color of the strip to the color key to assign the pH. Record the volume of NaOH added (zero), the color, and the pH into the table in your notebook.
4. Pour NaOH solution into the buret to at least 20 mL volume. Record the starting volume.
5. Place the flask of HCl solution under the buret. Dispense solution from the buret, 0.50 mL at a time, into the flask. After each addition, swirl the flask to mix the solution. Dip the end of a glass stir rod into the solution in the flask and touch a drop of the solution to a small strip of pH paper. Record the volume added, the color of the pH paper, and the pH into the table in your notebook.
6. Continue adding NaOH solution until you have added 15 mL, or until the pH of the solution is over 12.
7. Dispose of your titration solution down the sink with water. Dispose of the pH test strips in the solid waste. Leave excess NaOH solution in the buret.
8. Graph your titration on graph paper. Place pH on the vertical axis and volume of NaOH solution added on the horizontal axis. Scale your graph to use at least half the vertical and horizontal extent of your graph paper.

Lab Report

Narrative: In your own words, briefly recount what you did, and report your qualitative observations along the way.

Calculations: Explain your calculations of initial solid mass and final mass of recovered crystals.

Graph: This is your graph of pH of the solution vs. volume of NaOH solution added.

Scoring (30 points)

Observations in lab 10 points, notebook 5 points, Lab report narrative 5 points, calculations 5 points, pH graph 5 points.