5. Repeat Preparation steps 3 and 4 for the second pipet. Label this pipet "Base." **Do not use this pipet for the acid solution.**
6. Make sure that the three trials produce data that are similar to one another. If one is greatly different from the others, perform Preparation steps 3–5 again.
7. Remove the beaker containing the eggshell from the oven. Cool them in a desiccator. Record the mass of the entire eggshell in the second table. Place half of the shell into the clean mortar, and grind the shell into a very fine powder.

PROCEDURE

1. Measure the mass of a piece of weighing paper. Transfer about 0.1 g of ground eggshell to a piece of weighing paper, and measure the eggshell's mass as accurately as possible. Record the mass in the second data table. Place this eggshell sample into a clean, 50 mL micro solution bottle (or Erlenmeyer flask).
2. Fill the acid pipet with 1.00 M HCl acid solution, and then empty the pipet into an extra 100 mL beaker. Label the beaker "Waste." Fill the base pipet with the 1.00 M NaOH base solution, and then empty the pipet into the waste beaker.
3. Fill the acid pipet once more with 1.00 M HCl. Holding the acid pipet vertically, add exactly 150 drops of 1.00 M HCl to the bottle or flask that contains the eggshell. Swirl the flask gently for 3 to 4 min. Observe the reaction taking place. Wash down the sides of the flask with about 10 mL of distilled water. Using a third pipet, add two drops of phenolphthalein solution.
4. Fill the base pipet with the 1.00 M NaOH. Slowly add NaOH from the base pipet into the bottle or flask that contains the eggshell reaction mixture, counting and recording the drops added. Stop adding base when the mixture remains a faint pink color, even after it is swirled gently. **Be sure to add the base drop by drop, and be certain the drops end up in the reaction mixture and not on the walls of the bottle or flask.** Record in the second data table the number of drops of base used.

CLEANUP AND DISPOSAL

5. Clean all equipment and your lab station. Dispose of chemicals and solutions as directed by your teacher. Wash your hands thoroughly before you leave the lab.

ANALYSIS AND INTERPRETATION

1. **Organizing Ideas:** The calcium carbonate in the eggshell sample undergoes a double-displacement reaction with the HCl in step 3. Write a balanced chemical equation for this reaction. (Hint: The gas evolved was CO_2.)
2. **Organizing Ideas:** Write the balanced chemical equation for the acid/base neutralization of the excess unreacted HCl with the NaOH.
3. **Organizing Data:** Calculate the volume of each drop in milliliters. Then convert the number of drops of HCl into volume in milliliters. Record this volume in your data table. Repeat this step for the drops of NaOH.
4. **Organizing Data:** Using the relationship between the molarity and volume of acid and the molarity and volume of base needed to neutralize it, calculate the number of moles of the HCl solution that was neutralized by the NaOH, and record it in your table. (Hint: This relationship was discussed in Section 2.)
5. **Analyzing Results:** Calculate the number of moles of HCl that reacted with the $CaCO_3$ and record both in your table.

CONCLUSIONS

1. **Organizing Data:** Use the balanced equation for the reaction to calculate the number of moles of $CaCO_3$ that reacted with the HCl, and record this number in your table.
2. **Organizing Data:** Use the periodic table to calculate the molar mass of $CaCO_3$. Then, use the number of moles of $CaCO_3$ to calculate the mass of $CaCO_3$ in your eggshell sample. Record this mass in your data table. Using the mass of $CaCO_3$, calculate the percentage of $CaCO_3$ in your eggshell and record it in your data table.