

Weak Acid, Strong Base Titration Lab

Purpose to illustrate the equivalence point and end point of a Brønsted Lowry reaction using both indicators and pH probe

Materials Weak acid (unknown concentration) Acetic Acid
Strong base (1.0 mol/L) Barium hydroxide
Burettes
Pipettes
Beakers, stir rods, Erlenmeyer flasks

Prelab:

1. Use $\text{Ba}(\text{OH})_{2(s)}$. Calculate the mass of the strong base necessary to make 100 mL of 1.00 mol/L hydroxide solution. Be sure to write a dissociation reaction or you will be tricked!!
2. Write the Brønsted Lowry reaction for the titration of a 10.0 mL sample of $\text{CH}_3\text{COOH}_{(aq)}$ with sufficient $\text{Ba}(\text{OH})_{2(aq)}$. Label the base, acid, conjugate acid and conjugate base.

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- The base used in this lab is (monobasic, dibasic, polybasic) _____
 - The acid used in this lab is (monoprotic, diprotic, polyprotic) _____
 - The expected graph will start at a _____ number. The graph will have (one, two, three) _____ bump(s), and will end at a _____ number.
 3. Choose an indicator you wish to use for this lab _____
 4. Give the color before _____ and after _____ the equivalence point.
 5. Predict the volume of base that will bring you to the equivalence point of the reaction.
_____ mL
 6. What will the expected pH be at the equivalence point? _____. Justify your answer
 7. When the base becomes the excess reagent, what new colour will you see? _____

Procedure:

1. Using correct procedure, make 100 mL of 1.0 mol/L $\text{Ba}(\text{OH})_{2(aq)}$ solution.
2. Using correct rinsing procedure, pipette 10 mL the unknown acid into the flask
3. Add the appropriate indicator. Record the color _____
4. Rinse and fill the burette with the base.
5. Slowly titrate the acid solution until the end point is reached. Record the color.

6. Keep this sample as a reference point and repeat the steps again.
7. During a minimum of one trial, use the pH probe and record the pH after each addition of titrant. (Take the solution past the equivalence point to see how the pH scale reacts to the excess reagent)
8. Using a pH probe, take the pH of a sample of the unknown acid. Record.

Observations:

Make tables to hold all the required observations.

Analysis:

1. Use the information gathered in the lab to calculate the concentration of the acid.
2. Using the concentration of the acid, calculate the pH of the acid. Compare this to the pH measured using the pH probe. Account for any similarities or differences in the two values. Remember that CH_3COOH is a weak acid. You will need to use the K_a for the acid.
3. Plot a titration curve using the observations made with the pH probe. Mark the equivalence point. Compare this value to your prediction in the prelab. Do they agree? Why or why not?