

Strong Acid, Strong Base: Titration Lab

Purpose To illustrate the equivalence point and end point of a Brønsted Lowry acid base reaction

Materials $\text{HNO}_{3(\text{aq})}$ (unknown concentration)
 $\text{NaOH}_{(\text{aq})}$ (1.0 mol/L)
Burettes
Pipettes
Volumetric flask
Beakers, stir rods,
Erlenmeyer flasks
Indicator

Prelab:

1. Calculate the mass of $\text{NaOH}_{(\text{s})}$ necessary to make 100 mL of 1.0 mol/L basic solution
2. Write the Bronsted Lowry reaction for the titration of a 10.0 mL sample of $\text{NaOH}_{(\text{aq})}$ with sufficient $\text{HNO}_{3(\text{aq})}$. Label the base, acid, conjugate acid and conjugate base.

-
- The base used in this lab is (monobasic, dibasic, polybasic) _____
 - The acid used in this lab is (monoprotic, diprotic, polyprotic) _____
 - The expected graph of titrant / pH will start at a (high or low) pH, will have (one, two, three) bumps, and will end at a (high or low) pH.

3. List the indicator you wish to use for this lab _____
4. Predict the initial colour _____ and the equivalence point colour _____.
5. What will the expected pH be at the equivalence point? _____. Justify this choice.
6. When the acid becomes the excess reagent, what colour will the indicator become? _____

Procedure:

1. Using correct procedure, make 100 mL of 1.0 mol/L $\text{NaOH}_{(\text{aq})}$ solution.
2. Using correct rinsing procedure, pipette 10 mL of this basic solution into a clean Erlenmeyer flask.
3. Add the indicator. Record the color
4. Rinse and fill the burette with the unknown concentration of $\text{HNO}_{3(\text{aq})}$ solution provided by your instructor. Record the initial volume in the burette.
5. Slowly titrate the basic solution until the end point is reached.
 - Record the color.
 - Record the volume in the burette.
6. Keep this sample as a reference point .
7. Refill the burette with $\text{HNO}_{3(\text{aq})}$ and repeat steps 5 & 6 until you get three concurrent values for the volume of acid added.

Observations:

Trial	Volume of base	Volume of acid	Initial colour : Indicator is _____	Equivalence point colour	End point colour
1	10 mL				
2	10 mL				
3	10 mL				
4	10 mL				
5	10 mL				
6	10 mL				

Analysis:

- Use your observations to calculate the concentration of the unknown acid. Be sure to use only concurrent values in your calculations
- Calculate the initial pH for the base solution
- Sketch the general shape of the titration graph for this titration. Clearly mark the equivalence point of the graph.