MOLAR MASS OF AN ACID

Chem 1A Lab

GETTING STARTED

Objectives:
• To determine the molar mass of an unknown solid acid.
• To gain experience in writing experimental procedures and organizing data.

• Equipment and Reagents:
  A 50-mL buret (check out from stockroom, rinse before using and rinse with your NaOH solution)
  3 - 250mL Erlenmeyer flasks
  Standardized NaOH(aq) (from previous experiment)
  phenolphthalein
  Unknown Solid Acid (check out from stockroom)
FLOWCHART FOR PROCEDURE

Set up buret, rinse and then fill w/ standardized NaOH solution. Record initial reading

Weigh out 1≈0.8 g sample of your unknown acid into 250 mL erlenmeyer flask; dilute to 100 mL with dionized water, add indicator

Slowly add NaOH solution to acid solution, swirling carefully
You don’t what the final volume will be today

Add NaOH dropwise and swirl when the pink color starts to stay around
Aim for a pale pink endpoint and try for the same color each time
Record final reading

If you need < 15 mL for titration, weigh out a little more acid for your trials
If you need 35 mL for titration, weigh out less acid for your 2nd and 3rd trials (=1/2 or 1/3 as much acid)

Once again, you need 3 good trials

THE ENDPOINT

• If you are patient and careful, you will add one drop and see the color change to very light pink and stay, even after swirling. This is success!!
• Dark pink means you overshot the endpoint and will have to repeat the titration 😞
• Record the final buret reading to 2 decimal places
• Pour the solution in the flask into your waste beaker
• If necessary, add additional 0.2 M NaOH to the buret; read the initial value (2 DPs) and repeat procedure for your second KHP sample; Ditto for the 3rd sample
TYPICAL CALCULATIONS

• We want to determine the molar mass of the unknown acid. We will have this information:
  • Whether it is a mono-, di- or tri-protic acid
  • The mass of the acid in each trial (you will weigh out samples)
  • The volume of standardized NaOH used for each acid sample

• At the equivalence point; mol H⁺ = mol OH⁻, so

  \[
  \text{# mol acid} = \text{# mol NaOH} \times \frac{1 \text{ mol acid}}{X \text{ mol NaOH}}
  \]

• Molar mass of acid = \frac{\text{mass of acid in flask}}{\text{# mol acid from titration data}}

TO ENSURE SUCCESS

• Work alone using your standardized NaOH solution
• Only weigh out one ≈0.8 g acid sample for your first titration; adjust weights for 2nd and 3rd titration if needed
• Tare your weighing paper (re-zero the balance)
• **Gently** heat the acid mixture, if needed, to dissolve acid
• Don’t overshoot your endpoint!! Patience is key.
• Accuracy and precision will be used in grading
• You need 3 good trials
**DIRE WARNINGS**

- Do **not** use 6 M NaOH in your buret!! Only your 0.2 M NaOH goes in your buret.
- Use a funnel to fill your buret, fill over sink if necessary
- Use a waste beaker for NaOH rinses and titrated acid
- You will be neutralizing your waste today
- Dispose of waste into proper container in the hood
- **Keep the balance area clean** – I will be checking! Throw away used weighing papers, brush balance pans clean

**LOOKING AHEAD**

- Turn in Solubility Lab if you haven’t already
- Standardization of NaOH lab report due Tuesday
- Prelab for Heats of Reaction Lab due Tuesday
- Next Lab Quiz is Next Thursday, May 14