BASIC TITRATION TECHNIQUE

AP CHEMISTRY A. Collins 2013/14

Introduction: Titration is an extremely important technique used for determining the molarity of an unknown solution. In this lab, you will be graded on your ACCURACY, so it is really important that you read the lab very thoroughly and exhibit proper titration technique. It is imperative that your technique is very good because you will use a titration to analyze a redox reaction at a later date. A percent error ≥ 3.00% will result in a 15% deduction in your lab grade!

Purpose: You know what to do!

Pre-lab questions:

1. Why do we place the reagent with the well-known molarity in the buret?

2. Why do we specifically use phenolphthalein? What is phenolphthalein? What pH value makes phenolphthalein turn pink?

3. If a student took a 23.54 mL sample of HBr solution and placed it in a beaker beneath the buret. What would be the molarity of the HBr solution if 17.54 milliliters of 0.1584 M NaOH solution were used to turn the phenolphthalein pink? (please show all work)

4. When performing a titration, the measurement of the volume of a solution using a buret can be tricky. State two issues that are associated with the measurement in volume.

5. What if you had not rinsed your buret with titrant before beginning the titration in step 4b? What effect would this have on the result of your lab?

6. What if you read your volume readings at the top of the meniscus instead of at the bottom? Be specific for all pieces of equipment.

Create an Illustrated Procedure from the following:

1. Record the letter of the unknown acid solution to which you've been assigned. Measure out about 30 mL of an HCl solution of unknown molarity. Record the volume in the data table.

2. Add 2-3 drops of phenolphthalein to the acid solution. Swirl the mixture to reach homogeneity. Remember: Phenolphthalein is an acid/base indicator. It is colorless in an acidic medium and pink when in a basic medium.

3. Obtain approximately 60 mL of NaOH in a beaker. No need to measure precisely, just measure the base in a beaker. You will need to get the exact molarity of the base from your instructor.

4. Obtain a 50 mL buret. Prepare it for titration:
    a. Rinse buret with about 5 -20 mL of distilled water. If water does not flow, see your instructor.
    b. Rinse the buret with about 10 mL of titrant (NaOH in this case). Make sure to rinse all of the inner walls of the buret thoroughly.

5. Using a plastic funnel, fill the buret slightly above the zero line with NaOH solution. Never add base to a buret above eye level (do not pour it in your face!). Drain some base through the tip to clear out any air bubbles that may reside in the buret tip.

6. Clamp the clean buret to a buret clamp and check that the buret is straight (vertically).

7. Observe the meniscus on the buret at eye level and record an initial buret reading in your data table. It is ok if the initial buret reading is not at the zero line. You will find $\Delta V = V_f - V_i$

8. Place the flask with acid and indicator under the buret. The buret tip should be down about 1 cm inside the mouth of the flask to avoid any outside loss of base. [If using a magnetic stir-bar, place the flask on the stirring plate and place a clean magnet in the flask.]

9. Drip the base into the flask *while swirling* the flask (If using a magnet this will be done for you.).
   *** You can add base quickly at first, but as the pink color starts to last longer, slow the drip rate considerably. When the whole flask flashes pink before turning clear again, add only one or two drops at a time until the flask is clear again before adding more.

10. When the faintest pink color persists, STOP, and record the final volume of the buret in your data table. *You have reached the end point.*

11. You may want to perform a few more trials.

12. Pour any excess titrant (NaOH in this case) and neutralized acid down the sink with water running.

13. Clean the buret. Perform steps in the following order:
    i. Rinse w/ tap water
    ii. Rinse w/ dilute acid
    iii. Rinse again w/ tap water
    iv. Rinse w/ distilled water.
    v. Turn buret upside down, open valve and clamp to buret stand to air dry.

14. Clean up area and wash hands before leaving.

<u>Lab Safety Data/Inquiry Ideas:</u>
Be sure to include at least 3 chemicals and 4 safety facts.

<u>Data Table:</u>
Only include things that you measure.

<u>Observations:</u>
Make some! What do you think are the most important things to observe? Remember subtle things can be really important.

<u>Calculations:</u>
Show all work.

<u>Conclusion:</u>
What is yours?

<u>Discussion of Error:</u>
Your grade on this lab will be determined by how close you came to the *actual* molarity of your unknown. Here is your opportunity to explain any major errors that may have influenced your data. Be sure to quantify any errors that are significant.

<u>Post Lab Questions:</u>
None!