

## Lab Activity 20: ACID-BASE TITRATION LAB

### PURPOSE

1. To employ the titration equation,  $(M_A)(V_A) = (M_B)(V_B)$  where  $M_A$  is the molar concentration of the acid,  $V_A$  is the volume of the acid sample you use in the lab,  $M_B$  is the base molarity and  $V_B$  is the base volume.
2. To see the role of an indicator.
3. To use the burette, the most accurate instrument for measuring and dispensing volume.
4. To introduce an analytical chemistry lab.

### SAFETY

1. GOGGLES, aprons and gloves.

### MATERIALS

-burette	-burette clamp	-small funnel	-ring stand
--unknown base	-0.10 M NaOH	-0.10 M HCL	-unknown acid
-small Erlenmeyer flasks	-phenolphthalein	-white paper	-index card

### PROCEDURE #1 - TITRATION

1. Obtain a burette, place it on a burette clamp. Place the clamped burette on the ring stand and fill it with water. **DO NOT FILL OVER YOUR HEAD** – this is a good way to titrate your face -- Place the ring stand and burette on a stool that is covered with paper towels, using the funnel, fill with water to the 0.0 ml mark and practice using the valve (stopcock).
  - Observe that the numbers of the burette go from 0.0 at the top to 50.0 at the bottom, never let the level go below the 50.0 line in a titration.(FIG#1)
  - The stopcock is closed when the valve is horizontal and open fully in the vertical position. (FIG#2)
  - Adjust the stopcock to deliver one drop, or you can quickly spin the valve one cycle to dispense a drop of water.
  - Place the index card behind the burette such that you can read the bottom of the meniscus, which should line up with the calibration lines. Allow the water to run out of the burette.

Run the following procedures for each of the titrations listed:

- a) 0.10 M HCL w/ 0.10 M NaOH – Determine percent error
- b) Determine molarity of unknown base
- c) Determine molarity of unknown acid.

1. Fill the burette with about 10.0 mL of NaOH, let this run out of the burette to flush out any water. Then fill the burette to the 0.0 line with the NaOH. Obtain 15.0 mL of HCL sample ( $V_A$ ) in a small Erlenmeyer flask, add 3 drops of phenolphthalein and swirl. Place the sample under your burette.

2. Add the NaOH to the sample from the burette, *swirling after each drop*, it is important to mix the reagents.
  - a. When you begin to see the reaction “blush” pink temporarily you should slow down your rate of adding base.
  - b. This can be tedious--add a drop, swirl, and look at the color then repeat.
  - c. When the pink color remains, you are done. Record the level of the base in the burette at this point, subtract the level when you began (0.0 ml) from where you ended, this is the ( $V_B$ ).
  - d. Be certain to record the levels of base in the burette before and after each titration trial. If you went from 0.0 mL to 10.0 mL in your first titration, you will start your second titration at 15.0 mL and go to about 30.0 mL. Then from 30.0 mL to 45 mL.
3. You were given the ( $M_B$ ) and you know ( $V_B$ ) from your burette date and you measured ( $V_A$ ). You can use these to calculate the molarity of the acid.
4. You should repeat the titration 3 times or until they agree.
5. You will be asked to repeat the procedure with a coded unknown acid, and an unknown base.

### **PROCEDURE #2- TITRATION CURVE**

1. Obtain a strip of universal indicator paper. With gloved hands cut 20 small pieces and arrange on a piece of weighting wax paper.
2. Perform a titration as in procedure #1.
3. After each 0.50 mL of base added, wet on of the pH paper pieces with a very small drop of sample, read the pH against the color scale.
4. Plot the volume of base added against the pH.



Figure 1

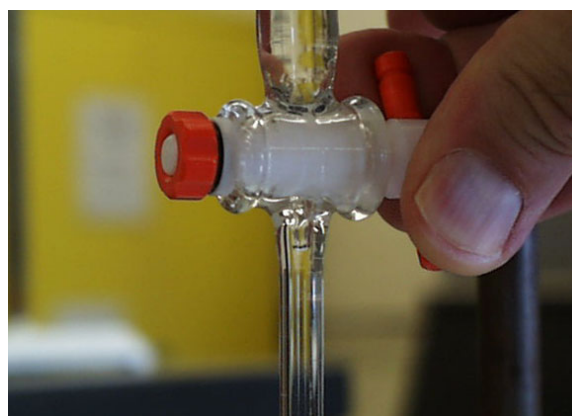


Figure 2