

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Acid/Base Titration

Objective: To use a standardized acid solution to determine the concentration of a base solution.

Equipment:

burets	buret clamp	ring stand	stir plate
magnetic stir bar	volumetric flasks		

Materials:

Acid: \_\_\_\_\_

Base: \_\_\_\_\_

Phenolphthalein/bromothymol blue

distilled water

Procedure:

1. Rinse two burets thoroughly with distilled water before beginning the titration.
2. Obtain about a volumetric flask of standard base solution from under the hood. Obtain the same amount of acid in a volumetric flask. Record the letter of the base in your lab book.
3. Partner one: Pour about 5 mL of acid into one of the burets and rinse the inside of the surface thoroughly. Allow the acid to run out of the buret tip. Fill the buret to slightly above the 0 mL mark. Turn the stopcock until the volume is just below this mark. Record the volume as "Trial 1 initial volume of acid."
4. Partner two: Pour about 5 mL of base into one of the burets and rinse the inside of the surface thoroughly. Allow the base to run out of the buret tip. Fill the buret to slightly above the 0 mL mark. Turn the stopcock until the volume is just below this mark. Record the volume as "Trial 1 initial volume of base."
5. Position the burets in the clamps. Label them appropriately as "acid" and "base."
6. Place a stir plate underneath the stopcock of the acid buret.
7. Place an Erlenmeyer flask (the smaller the volume, the better) under the acid stopcock. Add approximately 10.00 mL ( $\pm 0.01$  mL) to the flask. Record the volume in the acid buret as "Trial 1 final volume of acid."
8. Add approximately 10 mL of distilled water to the flask and three drops of phenolphthalein. **DO NOT FORGET THE INDICATOR!**
9. Place the flask on top of the stir plate under the base buret. Slide a magnet into the flask, try not to splash acid solution on the sides. Hold a piece of white paper behind the flask so a color change will be easily noticed.
10. Turn on the stir plate. Allow the magnet to freely turn, but not so much that the solution splashes. Dropwise, slowly add base from the buret into the flask. Allow the base to be added until a change in color is obtained. The color **MUST** be permanent. This means that it will not go away after moderate shaking, and remains changed for at least 30 seconds.

\* IF THE COLOR IS TOO DARK, ASK FOR ASSISTANCE ON WHAT TO DO NEXT!

11. Record the volume on the base buret as “Trial 1 final volume of base.”
12. Discard the solutions and repeat the titration until time is called. Note that the final volumes of trial one will become the initial volumes of trial two. If the burets look like they may run out during the next trial, refill and record the volume of the refilled buret as the initial volume.

Calculations:

1. Write the balanced equation for this acid/base reaction.

For EACH trial:

2. Determine the volumes of acid and base used. This is found using the initial and final volumes.
3. Determine the number of moles of acid used.
4. Use the equation to determine the number of moles of base used.
5. Calculate the molarity of the base solution.

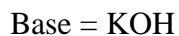
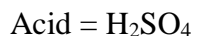
After all trials are complete:

6. Perform a Q Test to determine if the outermost piece of data is an outlier. Use a 95% confidence level.
7. Report a final average of all concentrations that remain.

Conclusion:

Comment on anything that may have caused a deviation from the “true value.” Since you do not know what the “true value” is, you will want to report all significant errors and possible errors.

$$M_{acid} = 0.6524$$



$V_{\text{initial}}$ Acid (mL)	$V_{\text{final}}$ Acid (mL)	$V_{\text{initial}}$ Base (mL)	$V_{\text{final}}$ Base (mL)
0.12	10.25	0.25	8.52
10.25	20.85	8.52	16.94
20.85	31.14	16.94	25.51
31.14	41.97	25.51	33.78
2.35	13.84	33.78	42.01
13.84	24.15	3.19	11.48
24.15	35.25	11.48	19.78