

CHEMISTRY I LAB: INTRO TO TITRATION

What to turn in:	Data Table 1 Calculations #1-5	Data Table 2 Questions #1-5	Data Table 3
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Background info.

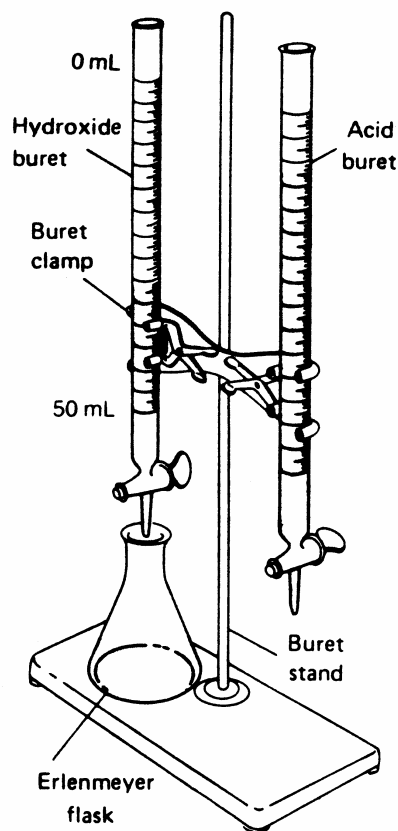
Titration is the process used to determine the volume of one solution that will react with a carefully measured volume of another solution. It is a quantitative technique based on mole relationships in a reaction and a type of volumetric analysis.

The titration in this experiment involves sodium hydroxide and hydrochloric acid. By determining the volume of one solution needed to neutralize a measured quantity of the other, the unknown molarity can be calculated.

The indicator used in this lab is phenolphthalein. PHTH is clear in acidic solution and dark pink/purple in basic solution. The equivalence point is a faint pink color. At the equivalence point (neutralization), moles acid = moles base, if the coefficients of the balanced equation are in a 1:1 ratio.

Procedure

- 1) Obtain 80 mL of acid in a clean beaker.
Obtain 80 mL of base in a clean beaker.
- 2) Set up ring stand and double buret clamp. Close the stopcocks (the faucet parts) of the two burets.
- 3) Designate one buret as the acid buret; pour in 5 mL acid. Open stopcock, rinse, repeat. Discard liquid.
- 4) Designate one buret as the base buret; pour in 5 mL base. Open stopcock, rinse, repeat. Discard liquid.
- 5) With both stopcocks closed, fill the acid buret with hydrochloric acid and the base buret with sodium hydroxide. Record both initial volumes to the nearest 0.01 mL.
- 6) Obtain a clean Erlenmeyer flask. Use a piece of white paper under the flask to see any color changes. Add about 10 mL of the acid, and add some distilled water to increase the volume. Add 1-2 drops of phenolphthalein (PHTH) indicator to the flask. The solution should be clear.
- 7) Add the base, sodium hydroxide, to the flask. Swirl constantly and wash the sides with distilled water. When the color of the solution begins to turn dark pink/purple near the added drops, begin to add the base more slowly, dropwise, until the last drop after swirling turns the solution a very light pink color. This is the equivalence point.
- 8) Add successive quantities of both acid and base, going over the equivalence point a few times, until it is well established (does not go away). Record the final volumes of both burets.
- 9) Rinse the flask thoroughly and repeat the titration procedure, steps 6-8. Be sure there is enough acid and base in the burets. Do at least two trials. (Chemists usually do 1-3 trials.)



Calculations (* = show numbers in lab)

- * 1) Calculate the volumes of acid and base used in each trial:
(*Final volume in mL*) – (*initial volume in mL*) Enter numbers in Data Table 2.
- * 2) The molarity of the base used is 1.00 M. Calculate the moles of base used in each trial.
Remember to change mL to L. Enter numbers in Data Table 2.
$$\text{moles} = \text{molarity} \times \text{volume in L: } \frac{\text{mol base}}{\text{L base soln}} \times \text{L base} = \text{mol base}$$
- * 3) Calculate the moles of acid used in each trial. Use the mole ratio from the balanced equation. Enter numbers in Data Table 2.
- * 4) Calculate the molarities of the acid solution for each trial. Enter numbers in Data Table 2.
$$\text{Molarity (M)} = \frac{\text{moles acid}}{\text{L acid}}$$
- * 5) Calculate the average molarity of the acid. Enter in Data Table 2.

DATA TABLES AND QUESTIONS ON NEXT PAGE →

DATA TABLE 1: VOLUMES

	Buret readings (mL)			
	BASE		ACID	
TRIAL	initial	final	initial	final
1				
2				
3				

DATA TABLE 2: VOLUME, MOLES, AND MOLARITY

	BASE			ACID		
TRIAL	Volume (mL)	Moles	Molarity (M)	Volume (mL)	Moles	Molarity (M)
1						
2						
3						
Average molarity (M) of ACID _____ M						

DATA TABLE 3

balanced chemical equation: _____

	<u>NAME</u>	<u>FORMULA</u>
acid reactant	_____	_____
base reactant	_____	_____
salt product (in solution)	_____	_____
liquid product	_____	_____

Questions

- 1) In your own words, describe a titration.
- 2) Why can you add distilled water to the titration solution without worrying about changing the results?
- 3)
 - a) What color is an acidic solution with PHTH indicator?
 - b) What color is a basic solution with PHTH indicator?
- 4) What is the "equivalence point"?
- 5) Why is it better to do three trials instead of only one?