Strong Acid/Base Inquiry Titration Lab

You have located a bottle of an unknown concentration hydrochloric acid and want to determine the **Molarity**. To do so, you will need to do a **titration** with a strong base of known concentration. You have chosen **0.5 M** sodium hydroxide for the titration.

PRELAB: Remember to site any resources you use.

Watch the video, "What is a titration and how is it performed?" and answer with these questions in your lab notebook.

1) Define: rough titration, titrant, analyte, endpoint, indicator, equivalence point, and titration standard.
2. Write a balanced chemical equation for the reaction of sodium hydroxide and hydrochloric acid.
3. What is another name for "conical flask?"
4. How do you deliver the titrant to the analyte if you are right-handed (watch video)?
5. Why is it important to thoroughly clean your burets before you titrate?
6. In your procedure, what is the analyte? Titrant?

Safety: Wear goggles, gloves, & aprons – both acids and bases are corrosive and can cause eye and/or skin damage.
Do not pour the NaOH above eye level. Lower the buret below eye level before filling it.
Disposal: Pour the contents of the Erlenmeyer flask down the drain. Follow your teacher's directions for any remaining acid or base.

Materials:

Ring stand	1 Erlenmeyer flask	phenolphthalein
Buret	DI water	0.5 M NaOH
double buret Clamp		unknown acid
2 beakers	funnel	

Procedure:

1. Set up the ring stand, buret, and double buret clamp. Make sure that the buret remains vertical at all times.

2. Add some DI water to the buret to check for leaks. If there are no leaks, drain the DI water completely from the buret.
3. Carefully add the NaOH to the buret. You will need to drain some of the NaOH from the buret to fill the tip. Fill the buret so that the meniscus of the NaOH is sitting on the 1.00-2.00 mL mark with the tip filled.

4. In the other buret, fill with your unknown acid in the same manner as step 3.

5. From the filled HCl buret, add exactly 10.00 mL of the unknown acid to the Erlenmeyer flask.

6. Add 2 – 3 drops of phenolphthalein to the acid solution in the Erlenmeyer flask.

7. ROUGH Titration: You are trying to figure out, roughly, how much volume of the base needs to be added to the acid to reach end point. Record your initial volumes of both acid and base in each buret. Also, record that you have exactly 10.00 mL of unknown acid in your Erlenmeyer.

Place the Erlenmeyer under the buret. Place a sheet of white paper under the Erlenmeyer. Remember, don't go past the 50.00 mL mark on the buret. You cannot read anything in the buret past that mark! THIS IS NOT YOUR 1st trial.

8. 1st trial: Rinse your Erlenmeyer flask and get ready for your first trial. Start again just as you did in step 5 and 6. Note your initial volume of NaOH. Because you did a rough titration, you'll know about how much volume to add of your base. Don't splash. You can wash (with DI water) the sides of your E flask occasionally to get any titrant into the solution. The pink color should appear briefly and then quickly disappear. As you near the endpoint, the pink color should stay longer.

9. If you over titrate, UGH- you'll see a fuschia color and need to back titrate. Begin adding HCl slowly from the other buret....recording the initial volume. You are close to equivalence point. Remember to swirl the flask after each drop by drop addition of HCl. The longer the pink color stays, the smaller your next increment of HCl should be. You want to eventually be adding the NaOH **one drop at a time** until the palest pink color appears and stays.

10. When the pale pink color appears and stays you have reached the endpoint. Record the buret reading to the nearest 0.01 mL. If you go past the endpt, back titrate again. Lots of patience!

11. Clean out the Erlenmeyer flask and repeat steps 4 – 10 twice more (the Erlenmeyer does not need to be dry, only clean). The solution in the Erlenmeyer can be poured down the drain. Before you start the third trial, make sure that you have enough NaOH and HCl in the buret to complete the titration (use your values from the first and second trials to estimate the amount needed for the third trial).

12. Clean out the Erlenmeyer and dispose of any remaining acid or base by mixing together to neutralization, turn on the water, and drain into the sink.

Data

Initial Observations:

Table:

	Rough titration	Trial 1	Trial 2
Initial NaOH Buret Reading (mL)			
Final NaOH Buret Reading (mL)			
Initial HCl Buret Reading (mL)			
Final HCl Buret Reading (mL)			
Volume of Base (mL)			
moles of base			
Molarity of Base (M)			
Volume of Acid (mL)			
moles of acid			
Molarity of Acid (M)			
Average Molarity of Acid (M)		xxxxxxxxx	xxxxxxxxxx

Postlab questions: (Discussion)

1. Calculate the molarity of the acid. Show all work.
2. What does standardizing a known base mean?
3. We did not use the volume of the water added initially to the Erlenmeyer in our calculations.
4. Describe the apparent relationship between $[H_3O^{+1}]$ and $[OH^{-1}]$ when the endpoint is reached in an acid-base titiration.
5. Draw your particulate diagram of what remains in the Erlenmeyer flask at equivalence point?