

## AP LAB 04EF: Acid versus hydroxide titration

**Aim** To standardize a solution of HCl with a NaOH solution

**Apparatus** Buret, 25.00 mL pipet, pipet filler, Erlenmeyer flask, funnel, stand, weighing boat, electronic balance, 250.0 mL volumetric flask

**Chemicals** NaOH pellets, hydrochloric acid (approx. 0.0100 M), phenolphthalein, deionized water

### **Method**

#### PART A. Preparing the standard sodium hydroxide solution.

1. Calculate the exact mass of solid NaOH required to make 250.0 mL of a 0.0100 M solution.
2. Place a weighing boat on the balance and record the mass.
3. Using a spatula, add approximately the mass of NaOH calculated in 1. Record the mass accurately. **(It does not need to be exactly the same mass as calculated in 1., but must be close, AND it must be measured accurately).**
4. Using great care transfer the entire solid to the volumetric flask.
5. Add approximately 100.0 mL of deionized water to the solid in the volumetric flask, replace the stopper and swirl the flask gently to dissolve the solid. When the entire solid has dissolved, make up to the mark taking great care when approaching the mark. Near the mark, add the deionized water drop by drop using a teat pipet.
6. Calculate the exact concentration of the solution you have prepared.

#### PART B. Performing the titration.

1. Pipette exactly 25.00 mL of the NaOH solution into an Erlenmeyer flask.
2. Add a few drops of phenolphthalein indicator.
3. Rinse the buret with HCl and with the aid of a funnel, carefully fill it with HCl. Fill the tip and note the initial reading. (Record to two decimal places, making the final decimal place either a 0 or a 5).
4. Carefully add HCl from the buret to the sodium hydroxide solution with swirling.
5. Add HCl drop by drop near the end point, using the white base of the stand to help observe a sharp color change.
6. Record the final buret reading.
7. Repeat as necessary until three consistent titres have been recorded.

## Results

### PART A

Mass of weighing boat + solid in grams	
Mass of weighing boat in grams	
Mass of solid in grams	

### PART B

	Titration					
	Rough	1	2	3	4	5
Final buret reading in mL						
Initial buret reading in mL						
Titre in mL						

Average titre = \_\_\_\_\_ mL

### Conclusion/Calculation

1. Write an equation for the reaction of aqueous NaOH with aqueous HCl.
2. Use your data to calculate an accurate concentration for the hydrochloric acid solution.
3. Sketch an expected titration curve for the titration. Label carefully.

4. Explain the difference between 'end point' and 'equivalence point'.

5. Assuming the experiment to be carried out at 298 K, explain why the equivalence point is at pH 7 in this titration. Under what circumstances is the equivalence point not found at pH 7? Explain.

6. What would be the effect on the calculated molarity of the HCl, if the solid NaOH had contained a non-basic impurity? Explain.