

Instructions for ChemCollective Virtual Lab

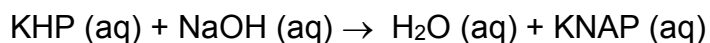
You will carry two different chemcollective experiment

1. Standardization of NaOH with a KHP solution: calculate concentration of NaOH and find equivalence point by forming titration curve
2. HCl (Acid)-NaOH (Base) Titration to find equivalence point by forming titration curve

Background: NaOH is not an expensive, is highly soluble and easy to use base for simple titrations; however, solid NaOH absorbs water from the air so accurately weighing a sample during the preparation of a solution is not possible. Solution of NaOH also absorbs atmospheric CO₂, which is a weak acid. The reaction between the CO₂ and NaOH partially neutralizes the NaOH solution, which means that the 0.100 M solution of NaOH is prepared might change over time. For this reason it is standardize NaOH solutions to be used in titrations.

Standardization is typically carried out by titrating the NaOH solution with a primary standard, and ultra-pure soluble acid such as potassium hydrogen phthalate (KHP). KHP can be used to prepare a solution whose concentration is known with a high degree of precision. The only way to evaluate the molar concentration of a previously prepared NaOH solution is to titrate it with a solution such as KHP. Once the NaOH solution has been standardized and its concentration is well-known and can be used to titrate other solutions.

In this week's experiment, the concentration sodium hydroxide will accurately be determined by titrating it against a known concentration of a monochromatic acid, potassium hydrogen phthalate (KHP). The equation for this reaction is as follows:



Each mole of KHP yields 1 mole of hydronium ion (this is a monoprotic acid). From the molarity of KHP (0.500 M) used for titration, you can determine the number of moles of hydronium ion produced and thus the number of moles of NaOH required for neutralization. The concentration of base can be determined.

Instructions:

Part 1: Instructions:

1. Virtual Lab experiment can be found the link provided below:

(<http://www.chemcollective.org/chem/fau/gc30n.html>) .

2. Choose the appropriate glassware (appropriate glassware for titrations is Erlenmeyer flask) from the drop down menu of glassware icon on the left sidebar and bring to the workbench to carry out the titrations.
3. Under Tools and Transfer bar select "Precise transfer" mode.
4. Transfer 25.0 mL of KHP to the Erlenmeyer flask and prepare your burette by using a pipet and fill up a buret with the sodium hydroxide, max, is 50.0 mL.. Add 0.50 mL of your indicator to the acid sample with a disposable pipet, and record the starting color and pH of your solution in the Erlenmeyer flask.
5. Titrate small volumes (0.5 mL or less) of NaOH from the burette into the KHP until a color change occurs (end point). Every addition record your pH, and total amount of NaOH (mL) added, and color of the solution; calculate total amount NaOH needed to see the color change, you will need total volume of the NaOH added at the equivalence point to calculate exact concentration of NaOH.
6. After observing color change, continue adding 0.5 mL of NaOH (4-5 times) to see if there is an additional color change. Record the added volume of NaOH, the color and pH for each addition, but do not use additional amount of NaOH to calculate concentration, you only need extra data points for plotting the graph.

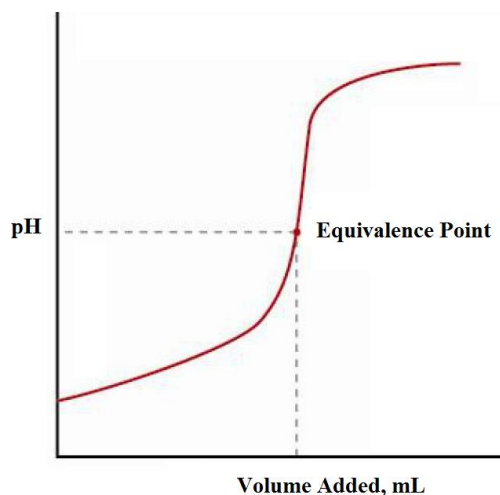
Your Experimental Set up:



Buret: NaOH solution

Erlenmeyer Flask: KHP Solution

Your graph should be similar to this:



Part II. Titration of HCl with NaOH

1. The link for the virtual lab: <http://www.chemcollective.org/chem/fau/gc17n.html>
2. There are four indicators for this experiment, but you will use only methyl red and methyl orange. Select your indicator and record the names of all indicators on your lab report. You will titrate a 10.00mL sample of a 0.1M HCl solution against 0.1M NaOH solution.

3. Choose the appropriate glassware from the drop down menu of glassware icon on the left sidebar on the workbench to carry out the titrations.
4. Under Tools and Transfer bar select "Precise transfer" mode.
5. Prepare the first 10.00 mL acid sample in an Erlenmeyer flask using a pipet and fill up a buret with the sodium hydroxide. Add 0.20 mL of your indicator to the acid sample with a disposable pipet, and record the starting pH and color of your solution. (Remember you will repeat this experiment for different indicators)
6. Record the initial volume added to the Erlenmeyer flask containing the HCl from the buret reading and include in your volume the amount of indicator added.
7. Begin adding the sodium hydroxide solution, start with larger increments, such as 0.50 mL. Use smaller increments (e.g.: 0.10-0.01 mL) when the pH of the solution approaches 2 - 3. Each addition of NaOH, record, pH and color of solution.
8. Record the added volume of NaOH at the equivalence point from the buret and the color of the solution at that pH.
9. Continue adding small increments of NaOH to see if there is an additional color change. Record the added volume of NaOH if the indicator undergoes a color change.
10. Record the pH value at the equivalence point, plot your results in the excel and show your equivalence point in the graph.