


Experiment 13

Lab Practical

OUTCOMES

During the course of this lab, the student should be able to demonstrate:

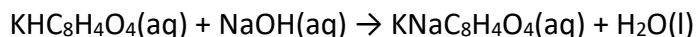
- accurate and precise measurements using proper glassware and techniques.
 - how to prepare a solution of a certain molarity.
 - how to operate a pH probe.
 - how to calculate the concentration of an unknown solution.
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DISCUSSION


Having completed a full year of general chemistry, we have practiced a variety of lab skills that will be used in future science classes. This lab practical is designed to assess your competency with a number of those skills including use of proper glassware and techniques, accuracy and precision of measurements, preparation of solutions, operation of instrumentation, and analysis and reporting of results.

The lab practical will be completed during lab near the end of 1062. You will sign up for a time slot to come in and complete it during your lab. Six students will be allowed into the laboratory at a time. You will have up to 120 minutes to complete the laboratory practical. Depending on the number of students, there may be additional times during the week for completing the practical. You will be working independently to complete the data collection and report the results.

In this practical, you will be doing a titration of a known solution of the weak, monoprotic acid potassium hydrogen phthalate ($\text{KHC}_8\text{H}_4\text{O}_4$, also known as “KHP”) with an unknown solution of NaOH. You will first need to make your known solution of KHP and determine its pH using a pH probe. You will then do up to three titrations with an unknown solution of NaOH and determine its concentration. For each titration, phenolphthalein will be used as the indicator to determine when the equivalence point is reached. Phenolphthalein is colorless in acidic/neutral solutions and pink in basic solution. For the titration, the balanced equation is



When reporting all of your results, make sure to include correct units and significant figures.



PROCEDURE

⚠ ***Wear safety glasses or goggles at all time for this practical.***

⚠ ***Avoid skin contact with the chemicals in this practical.***

⚠ ***Never pipet by mouth.***

1. After going to your station, fill in the station letter on your report sheet. Choose a card for your KHP concentration and volume and fill that in on your report sheet. Show your calculations on your report sheet for making the desired KHP solution. Prepare the solution using the appropriate materials at the station.
2. While waiting for your KHP to totally dissolve, log into the computer and open up LoggerPro. Attach the pH probe and calibrate it using pH 4.00 and 7.00 buffers. Obtain an unknown acid solution and record the letter on your report sheet. Pour a small amount of the acid into a 50 ml beaker. Determine the pH of your acid solution and fill it in on your report sheet. Dispose of the acid solution in the proper waste container.
3. Titrate your KHP solution with the unknown NaOH solution at your station. You may do the titration up to three times. For each trial, use 20 mL of your KHP solution. The indicator will be phenolphthalein. To see what the endpoint looks like with phenolphthalein, [check out this video](#). Note that in order to shorten the video, it only shows the first couple of drops and the last couple of drops of the titration.

On your report sheet, fill in the starting volume and ending volume of NaOH in the burette, the volume of NaOH used and the molarity of NaOH. You will need to show your calculations for at least one trial. You may fill the burette to any desired starting volume between 0 and 5 mL using the stock solution of NaOH provided at the station. For your final titration, you must have the instructor come to compare your recorded final volume with the volume of the burette.

4. When you have completed your titrations and calculations, make sure to return the station to the condition it was in when you arrived. Log off of the computer. Make sure that the pH probe is returned to its box. Dispose of all chemicals in the proper waste container. You may leave the NaOH in the burette. Make sure that all glassware that you have used has been properly cleaned and returned to where it was obtained and that the benchtop has been wiped off.
5. Once the station has been cleaned, turn your report sheet in to your instructor.

⚠ ***Dispose of all chemicals in the proper waste container.***

Your grade on this lab practical is based on both technique and accuracy. Twenty five percent of your score is dependent on how close your average molarity is to the correct value. Seventy five percent of your score is based on the technique: choosing appropriate equipment to use in the experiment, using equipment and reading glassware correctly, correct calculations, and reporting results with proper units and significant figures.