

Instructions and Guiding Questions for Formal Report for Experiment 4 – Determination of Acid Constant, K_a

Abstract

- Describe in 2-3 sentences the type of experiment that was performed, what was measured, and why.
 - What are the final, most important results/findings of the experiment? Identify them and state them in the abstract.
 - Did the important results differ by method? If so, note that.

Introduction

- Provide the reader with a discussion of what a weak acid is, what titrations are and why they are done, the underlying theory of this experiment, what is being studied in this experiment, and what is expected to be observed.
 - What is a weak acid, and what are its defining characteristics?
 - What particular concepts and theories of acid-base chemistry are being investigated in this experiment and how do they explain at the molecular level the macroscopic observations made in this experiment (endpoints, titration curves, etc.)? (Refer to your Experiment 4 handout and your text.)
 - What are the chemical equations for the reactions that occur?
 - What is the purpose of standardizing NaOH with KHP?
 - Why are three different methods for determining K_a being used? Are there advantages and disadvantages to the different methods?
 - What are the mathematical equations relevant to theory underlying this experiment?
 - Based on how this experiment is performed, what is expected to be observed? Why?

Experimental

- Provide the reader with a description of the important aspects of the experimental procedure.
 - What different methods were used for each part of the experiment?
 - What reagents were used for each part of the experiment?
 - How many trials were performed for each part?
 - Were there any deviations from the procedure described in the handout for Experiment 4? Why?

Results

- Provide the reader with a summary description of the observed data and overall results of this experiment, including for the standardization of NaOH. Include tables and graphs in this section. Report all numerical results to the proper number of significant digits. Always start with an introductory paragraph. Never start with a table or graph!

- What are the most relevant data tables that need to be provided?
- What graph do you need to provide, and what information is obtained from that graph?
- What trends and relationships between experimental data are you able to observe? Describe them in your narrative.
- What similarities and differences are observed between methods for the final results, such as K_a ?
- Are there any anomalies or inconsistencies? If so, describe them.

Conclusion

- Provide the reader with a thorough explanation(s) of your results, based on the underlying theory for this experiment. The basis of your discussion is what you have learned about acid-base chemistry, the acid constant, different models of acids and bases, and the effect of molecular structure on acidity.
 - Are the results observed in all parts of the experiment consistent with the underlying concepts and theories being studied and the experimental procedures you performed? If so why?
 - What molecular-level explanations can you provide that explain the macroscopic observations of reaction rate? (Hint: remember the Bronsted-Lowry and Lewis models of acids and bases, and the nature of conjugate bases.)
 - Are there differences in the values of K_a obtained from the three different methods? If so, what are possible explanations?
 - Are there anomalies or inconsistencies between your results and the predictions of the models of acids and bases? If so, explain why.

Sample Calculations

- Provide neatly handwritten (not typed!) sample calculations on separate pages for the following:
 - The molar concentration of your standardized NaOH
 - The molar concentration of your unknown acetic acid solution
 - The K_a for acetic acid for each method used (parts II, III and IV)