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English 202

Rhetorical Analysis of Lab Reports

In this rhetorical analysis, I will compare and analyzed the structure of two scientific lab reports that talk about the determination of K_a (Acid dissociation constant, useful to measure the strength of any acid). The first study's target is to obtain the K_a (Acid dissociation) of a weak acid, and identify the identity of the unknown acid solution. As the first lab report, the second focus on figure out the K_a of a weak acid, acetic acid (CH_3COOH) or commonly known as vinegar, also find the concentration of acetic acid in an unknown solution; this concentration was obtained by titration with sodium hydroxide (NaOH) (titration is a technique when you use a substance with a known concentration to determine the concentration of an unknown substance) (Byjus,2022). The structure of a lab report is compound for eight different sections which are: title, abstract, introduction material and methods, discussion, results conclusion, and references. I will compare and study every section of both lab reports.

Title

The title of the first lab report is "Lab Report on Determination of The K_a Value of a Weak Acid". The title of the second lab report is "Determination of Acid Constant K_a ". The title of the first lab report is more informative than the title of the second one, since it gives to the reader a little more detail. These details help to describe clearer the main goal of the scientific paper. The second lab report's title ("Determination of Acid Constant K_a ") is weak, it needs some keywords to save the time of the readers.

Abstract

The author of the first lab report thought in the audience while writing the abstract of this study because the author writes a brief definition of K_a in it. It does state that an acid is considered strength according to its capacity to donate proton to the bases, moreover K_a is a constant that shows with a quantity how strong an acid is. And we can notice that this definition is important to understand the study without reading the whole report as good abstract are supposed to be, due to the fact, the problem, or question displays in this abstract was to find K_a of a weak acid and find the identity of unknown acid using the K_a of the other substance which in this period of time, already had a known K_a . Although, in this abstract the author achieves to do brief and clever summary of the process that was used to complete the purpose of this experiment, process was divided in method 1 (manual titration) and method 2 (volumetric titration). Also, he or she identified all substances and quantities used in this experiment. According to this abstract the procedure used to obtain the results was titration, then the data obtained was plotted in a graph. This abstract also shows a nice description of the resultant of this experiment. In other words, this abstract is understandable, and it summarizes the interesting part of the lab report without being too long.

The abstract of the second lab report shows us the main goal of the experiment, and it is practically the same as the first lab report. It also has a short but consistent summary of what was used and done to get the experiment's target, and reading that I realized that three different procedures were used to determine K_a of both acids: one was titration (manually), the other was analysis of titration curves, and by half-titration to midpoint (It is the point at which half of the analyte is neutralized by the added substance used to titrate and, it is known as the midpoint of titration). It also summarizes the result of every method used and final conclusions. According to this abstract, the resultant of this study supports the base-acid theory and titration theory and the manual titration got some errors. This abstract shows

enough details and information; however, it is written just for a specific audience, for example scientists, engineers, or chemists; It is not so clear that a general audience could understand it easily.

Introduction

In the introduction of the first lab report, the author explains the importance behind this study. The author explains that it is really necessary to know the relative acidity of substance or system, since it can affect our life in many ways, the quality of the drinking water, soil condition, food preservation, and psychological functions are great cases in point that can be affected negatively for poor management of acidity. This introduction also contains theoretical background information which comes from other researches (Lewis's theory) and that contributes to this lab report. The author indicates that K_a is a feature of an acid, useful to identify an unknown acid, and the bigger K_a , the stronger the acid. Furthermore, the author displays all the formulas and reactions needed to calculate K_a of an acid. One of the formulas is $K_a = 10^{-pK_a}$, pK_a is the negative base-10 logarithm of the acid dissociation constant K_a (Thoughtco., 2019). The author had to explain about the constant pK_a to make the introduction more specific and understandable. In addition, this introduction contains an explanation about titration defined in the first paragraph, it is one of the methods used to get to the results.

The second lab report's introduction also includes theoretical background information, and it has the explanation of some important terms as titration, pK_a , and K_a . The author expresses that there are acids and bases in different degrees of strength, which it relates to the quantity of dissociation that the acid or base will pass through when they are in aqueous solution. If the acid or base is strong will dissociate in water, but if the acid or base is weak, the acid will dissociate just to a certain degree. Acids and bases belong to the most common set of substances in nature. As in the first lab report introduction, the author explains in the

introduction that the acid dissociation constant, K_a , (or acidity constant, or acid ionization constant) is a measure of the strength of a weak acid (which does not completely dissociate). Also, the author add that HA is a generic acid that dissociates into A^- (the conjugate base of the acid), and the hydrogen ion or proton, H^+ . The dissociation constant K_a is written as the ratio of the equilibrium concentrations: $K_a = \frac{[A^-][H^+]}{[HA]}$. In this laboratory report the author also relied on the Lewis theory.

Materials and Methods

The first lab report has this section as two different sections, one call materials and the other section is calling methodology. In the material sections it has a list which includes all materials use and another list with all apparatus use. The lists have the details that people need to identify every material and equipment, and it allows other people to perform the same experiment. The materials are 0.1 M sodium hydroxide solution ($NaOH_2$), 0.1 M unknown acid solution, distilled water (H_2O). Some of the apparatuses are a PH meter, 50 ml burette, and 10 ml volumetric pipette. In the methodology's section, the author made a description in order of every step that must be do it to get the experiment goals, moreover this section was written in active voice, this fact makes this section report more interesting to the audience.

The second lab report does not have a list of the materials and apparatus, but it does have a section calls experimental, where the author describes the process of this experiment and mentions some materials and apparatus necessary to perform the experiment. The author divided the procedure in four parts: Part 1: Preparation and Standardization of the NaOH Solution, Part 2: Determination of the Molarity and pH of the Acetic Acid Solution, Part 3: Developing a Titration Curve to Determine the Molarity and K_a , and Part 4: Performing a Half-Titration to Determine the K_a of Acetic Acid. Each part is explained chronologically and in a clear way, but the author forgot to mention some of the apparatus used.

Results

The result's section of the first lab report displays us three different tables, table 1 contains each numerical value obtained by titrating Sodium hydroxide, table 2 get each value obtained before the titration between dilute unknown acid solution and NaOH solution, and table three which has the percentage error for the unknown acid solution. Every table is named correctly, but they are not explained. The author also includes tables which contain the result of every method (method 1, method 2) used to calculate Ka. The experimental Ka value for method 1 is 6.3096×10^{-6} and for method 2 is 1.7136×10^{-7} . The unknown acid is pyridine, which has a theoretical value Ka of 5.90×10^{-6} , and it has a percentage error of 6.9424% for method 1. The author was able to show the relevant and important numerical data and without interpreted any of them.

In the second lab report, the author shows us the resultants in three parts. The part one displays all calculations and values obtained to get the average of molarity for the standardized NaOH solution which was 0.09338 M. In part two, we can see a Serie of quantity values that are necessary to calculate Ka (The calculated Ka was 1.0011×10^{-4}). The author also summarized the data, leaving out all data that were not relevant to this experiment. In addition, the data is organized, and he helped his ideas with graphs. These graphs were constructed by the author using data obtained in the experiment.

Discussion

In this section, the author of this report explains and analyzed the resultant obtained. In this discussion's section, I find a graph which displays what happen when the unknown acid was titrated with NaoH, the writer of this paper expresses that the graphs teach us that when certain amount of NaoH was put into the unknown which is acid, the pH of the unknown acid increases about 6. Then, 13.8 mL of NaOH was adding to the unknown acid solution, the pH

increases fast and it past neutral pH. Although, in this section was discuss that due to some raw data, Ethylenediamine was considered to be the identity of the unknown acid solution, but the unknown solution is pyridine because it gets the lowest percentage error.

In the discussion section of the second lab report, the author just analyzed the most important part of the resultants obtained. He or she starts writing numerical values and magnitudes, then the writer bases this discussion in comparing all values of K_a get in the three parts of the experiment. The different between some results indicates that some errors were committed, especially doing the manual titration.

Conclusion

In the first lab report, the author summarizes all the data and resultants obtained, he or she sums up saying that the experiment was a success since all goals was achieved, he or she writes important values obtained in the graph, the author also shows that the experimental value of K_a for method 1 and method 2 are 6.3096×10^{-6} and 1.7136×10^{-7} respectively.

In the second lab report, the author does not add new information and summarizes the values already obtained, but this author supports the numerical values with other researches that really impact this study by saying that each experimental values of K_a (dissociation constant) are consistent with the acid- based theory and Lewis's theory, in this conclusion the author indicates again that the theoretical K_a acetic acid is 1.76×10^{-5} .

References

The first lab report, all the sources where the author find interesting information were well cited and are alphabetical organizations. The second lab report does not have any reference.

Conclusion

Both lab reports are easy to understand and has clever information that are related with the title and main objective of these scientific reports. The title of the first lab report has all the keywords that can help readers to save time, moreover each section of both report although some of them have some errors contain information that can lead people to learn and understand what are the important point of both lab reports, and also this information able them to perform the same experiment. In addition, showing a summary of all the data, using graphs to explain some results and getting support on significant theories and research give more credibility to both lab report. One negative thing is that the second lab report needs a reference section.

References

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