Standardization of acid base

Environment, Water

STANDARDIATION OF ACID AND BASE Eunice Ivy B. Gamboa ABSTRACT Solutions of known concentration are prepared by dissolving measured masses of standard acids in distilled water. The concentrations of unknown solutions of sodium hydroxide are determined by titration. An acid solution reacts with a base solution in a " neutralization" reaction. Titrations permit the concentrations of unknown acids/bases to be determined with a high degree of accuracy. In order to analyze unknown acids/bases, we must have a " standard" solution to react with the unknowns. A standard solution is one in which the concentration is known accurately. We will first prepare a standard solution of NaOH. One way to prepare a standard solution is to dissolve an accurately massed amount of the substance and dilute it to a measured volume. In this way; the concentration can be calculated exactly. However, it is usually impossible to obtain NaOH of sufficient purity to use it as a primary standard. An indirect method is more practical for obtaining a standard solution of NaOH. We will prepare a solution of an approximate molarity and standardize it against a primary standard of known purity. KEYWORDS STANDARD ACID NEUTRALIZE CONCENTRATION MOLARITY COLOR CHANGE Jeanett Daza Leones Galicia I. INTRODUCTION This experiment will introduce you to the analytical method of volumetric titration. This method is a quantitative analysis of liquid or solution by comparing the volumes that react with known values of standard chemical solution. Solid sodium hydroxide is hygroscopic, which means that it absorbs moisture from the Bmls-2A September 24, 2012 atmosphere. Once it has a little moisture it also absorbs carbon dioxide which is always present in air. Standardization is the process of determining the exact concentration

(molarity) of a solution. Titration is one type of analytical procedure often used in standardization. In a titration, an exact volume of one substance is reacted with a known amount of another substance The point at which the reaction is complete in a titration is referred to as the endpoint. A chemical substance known as an indicator is used to indicate (signal) the endpoint. The indicator used in this experiment is phenolphthalein. Phenolphthalein, an organic compound, is colorless in acidic solution and pink in basic solution. This experiment involves two separate acid-base standardization procedures. In the first standardization the molarity of a sodium hydroxide solution (NaOH) will be determined by titrating a sample of potassium acid phthalate (KHP; HKC8H4O4) with the NaOH. In the second procedure the standardized NaOH will be used to determine the molarity of a hydrochloric solution (HCl) II. EXPERIMENT METHODOLOGY A. Standardization of NaOH H20 1L bottle 17ml NaOH 0. 4 g 2-3 drops of phenolphthalein B. Determination of purity of KHP * Repeat steps 1-5 for impure KSP C. Standardization of HCL Measurement | 1st trial V-of titrant(ml) | 2nd trial V-of titrant(ml) | 3rd trial V-of titrant(ml) | Average(ml) | Pure KHP | 16. 70 | 14. 70 | 18. 10 | 16. 50 | Impure KHP | 16. 10 | 12. 10 | 15. 80 | 14. 66 | HCl | 12. 90 | 12. 20 | | 12. 55 | Given units/initial values | M | ml | G | | KHP | | | 0. 40 | | NaOH | 0. 60 | 17. 00 | | | HCl | 0. 10 | 15. 00 | | | 25ml HCl Distilled h20 III. Data and Results STANDARDIZATION OF NaOH (g) of KHP__ = ___mol_____ = M Mwt. Of KHP (L) of used titrant Trial 1 0. 4 g_____ = 1. 9607 10-3mol = 0. 1188 M 204g/mol 0. 0165 L STANDARDIZATION OF IMPURE KHP (g) of KHP = (M)(V)-titrant Mwt. Of KHP = (0. 1188 M) (0. 0146 L) x 204 g/mol = 0. 3538 g %purity = g KHP_____ x 100 (g) impure KHP = 0. 3538g x 100 = 88. 45 % 0.

4g STANDARDIZATION OF HCl M1 = (M2) (V2) V1 = (0. 1188 M) (0. 0125L) 0. 015ml = 0. 0990 M STANDARD DEVIATION OF PURE AND IMPURE KHP S= âˆšâˆ‘ (x-MEAN) n-1 PURE IMPURE IV Discussion In this experiment, you will use indicator-based titrations to standardize the stock NaOH solution. Solid sodium hydroxide is hygroscopic, which means that it absorbs moisture from the atmosphere. Therefore solid reagent grade sodium hydroxide is not pure enough to weigh directly. Furthermore, the Carbonate ion interferes in acid-base titrations because 1) it is a base, and 2) it tends to make the color change at the end point less sharp. This reaction also takes place in the aqueous phase, where sodium hydroxide in solution is converted to sodium carbonate. This can change the concentration of standard. solutions if steps are not taken to minimize the carbon dioxide uptake. It is therefore necessary to prepare sodium hydroxide solutions in such a way that they are free of carbonate impurity. The most convenient method takes advantage of the fact that sodium carbonate is insoluble in 50 % NaOH solution. Carbonate free solutions can be obtained simply by diluting 50 % NaOH. The concentration of the 0. 6 M NaOH solution provided to you will not be known accurately. It is therefore necessary to measure the concentration of a diluted solution by using it to titrate a known amount of acid. This is called standardization of the solution. A primary standard should: be of high purity, remain unchanged in air during massing and remain stable during storage, have a high molar mass to reduce massing errors, react with the solution to be standardized in a direct, well-defined reaction Potassium acid phthalate will serve as our primary standard. This is a large molecule (KHC8H4O4) with a molar mass of 204 g/mol. V. Answer to Quesution 1) Standard solution of

NaOH cannot be prepared by weighing the solid and then dissolved in an appropriate amount of water. Why? * Sodium hydroxide (NaOH) is a hygroscopic solid which means it absorbs water from the air. A weighed quantity of NaOH therefore contains an unknown mass of water. Because of this, a solution of known molarity cannot be prepared by merely dissolving a known mass of solid NaOH in water. The concentration of an unknown NaOH solution must be determined experimentally using a method called standardization. Furthermore, the presence of carbon dioxide is one reason why we cannot weigh out pure NaOH and use it as a primary standard. Water which is in contact with the atmosphere can readily absorb carbon dioxide. Dissolved carbon dioxide acts as a weak acid in aqueous solutions. 2) What is the purpose of boiling the water to make the NaOH solution? * Boiling point is described as the point at which vapor pressure is equal to atmospheric pressure. Adding sodium hydroxide into boiling water would increase the boiling point of the solution (it would be a solution if you add the NaOH into it). This is due to the addition of ionic particles. The addition of ionic particles blocks the path for water molecules to escape from the solution. Therefore, it would take longer for vapor pressure to equal atmospheric pressure. 3) What is the difference between Primary and secondary standard? Give example of each. * Primary standard is a chemical entity available with highest purity and stability with high molecular weight. e. g. KHP, NaCl, Calcium salt used in standardization of volumetric solution. Secondary standards are compounds used in analysis after evaluation against primary standards. e. g.- NaOH VS, Sodium thiosulphate. 4) Why it is better to use a 50% NaOh solution, instead of solid NaOH, to prepare the 0.

1M NaOH solution? * If you use the solid NaOH it can absorb moisture in the atmosphere because it is hygroscopic. Once it absorbs moisture it will also absorbs carbon dioxide which is always present in air. Therefore solid reagent grade NaOH is not pure enough to weigh directly. In addition the carbonate interferes in acid base titration because it is a base. 5) If you had to weigh out solid NaOH of an analytical balance, how would you do it? * If you had to weigh out solid NaOH of an analytical balance you should weigh the anhydrous NaOH in water free environment under normal condition, you will observe the mass of NaOH increase as you weigh it in analytical balance. The problem is you should dissolve the carbon dioxide from the water used. IV. Conclusion In an acid-base titration the idea is to carry out a neutralization reaction between an acid solution and a base solution in order to determine the concentration of either an unknown acid or base solution. This requires that you know the concentration of the other solution as accurately as possible. Determining the precise concentration of a solution just by volumes is not very accurate due to the error involved in reading the scales. It is far more accurate to weigh a solid material with a scale and then use that accurately known quantity to determine the concentration of the test solution. The test solution is then used to carry out the acid-base titration. It is how the NaOH solution has been standardized, and can subsequently be used to accurately determine. the concentration of an acid solution. References: http://web. pdx. edu/~atkinsdb/teach/321/NAOH. pdf http://www. chem. latech. edu/~deddy/chem104/104Standard. htm http://homepages. ius. edu/dspurloc/c121/week11. htm http://dwb4. unl. edu/chemistry/dochem/DoChem102. html http://chem. lapeer.

org/Chem2Docs/AcidBaseTitration. html I herby certified that we make substantial contribution to this report. Eunice Ivy B. Gamboa Jeanett Daza Leones Galicia