Lab report: titration lab

Science, Chemistry

Lab Report: Titration Lab Prepare a solution of a given concentration; understand titration including acid-base reactions, pH, stoichiometry and molar equivalence. Chemicals and equipment: NaOH pellets close to purity, HCl 3M, phenolphtalein Beckers, flasks, burette, magnetic or manual stir pHmeter Waste management: The waste disposal will be handled through neutralization of your excess reactant to a pH between 4. 0 and 10. 0 and disposal with abundant rinsing. As a preparation for the lab you may want to practice with The experiment: We will do a titration in which the reaction type is acid-base. The equivalence point is characterized by a sharp change of pH which can be followed with a pHmeter. A graph of pH versus concentration will indicate the molar equivalence at the inflexion point of the curve. The point observed experimentally is never exactly the molar equivalence but a “ best estimate" and is given the name “ end point". It is easier and cheaper to identify the end point with an indicator instead a pHmeter. Some chemicals such as phenolphthalein will change color when the pH changes sharply between two given values called the indicator’s range. The range of phenolphthalein is 8. 3 to 10. 0. The shape of a pH curve varies widely with the type of reactants and needs to be taken into account when choosing an indicator. We will titrate a strong base (NaOH) of unknown concentration with a strong acid (HCl). The objective is to find the purity of NaOH pellets. The pellets are close to purity but not 100 % because NaOH is very hydrophilic and the pellets are likely to be slightly hydrated. The procedure: The first part of the laboratory experiment will be the preparation of the reactants and the choice of an indicator. You will need to prepare the analyte, a solution of NaOH, of a chosen concentration and volume and

prepare a solution of HCl, the titrant, accordingly. Accordingly means that the end point should be reached after the delivery of manageable volume. If a 50. ml burette is used the volume to be delivered should be between 15. ml and 40 ml. The chosen concentration of NaOH means the concentration of NaOH that you would obtain if the tablets were pure, with the understanding the objective of the titration is to give you a more accurate measurement that you will use to calculate the purity of the tablet. Acid-base chemistry tells us that the reaction between the hydronium and hydroxide ions is extensive and that the pH of the equivalence point should be close to 7. You will design a titration procedure indicating the reactants, the equipment, the data to be collected and the calculations. You will then proceed with two or three measurements depending on the precision of the first two. Your report will review the chemical background, present the data and the result and justify in your error analysis the number of significant figures of your reported concentration. Trial 2 | | Initial Volume of HCL in burret 0. 1M | 50. 00 ml | Drops of phenolphtalein | 2 | Volume of NaOh in beaker 0. 1M | 15. 0 ml | Final measurement after titration | 24. 4 | Initial PH | 12. 8 | Final PH | 6. 8 | Data: Trial 1 | | Initial Volume of HCL in burret 0. 1M | 50. 0ml | Drops of phenolphtalein | 2 | Volume of NaOh in beaker 0. 1M | 15. 0ml | Final measurement after titration | 24. 3 | Initial PH | 12. 9 | Final PH | 6. 5 | Calculations HCl + NaOH â†’ NaCl + H2O moles HCl = moles NaOH MHCl x volumeHCl = MNaOH x volumeNaOH MHCl = MNaOH x volumeNaOH / volumeHCl MHCl = 25. 00 ml x 1. 00 M / 50. 00 ml MHCl = 0. 50 M HCl Conclusion A titration was performed using 50ml of 0. 1M HCl and appropriate amount of NaOH solution. Titration was repeated 2 times to find

the amount of NaOH used to achieve endpoint. 24. 2 And 24. 5 is final measurement. The average of the trial is 24. 3 mL. The molarity of NaOH was found by using the M1V1 = M2V2 equation, resulting in 1. 1 M of NaOH. Discussion In the Titrations Lab, 50. 0 mL of 0. 1 M HCl and appropriate amount of NaOH were titrated to find the molarity of NaOH and the pH of the solution after x mL of NaOH has been added. The lab discussed the difference between equivalence point, the point at which the reaction between titrant and unknown is complete, and the endpoint, the point where the indicator turns color. The color change occurs when the concentration of more dominant form is ten times as great as the less dominant. However, color changes in a solution does not necessarily equal to the equivalence point. Equivalence point can be found by observing the indicator, or using a pH meter and finding midpoint of vertical line in the titration curve. Endpoints can be found by observing the color change of the indicator. The titration lab also involved indicators. Indicators are substances which undergoes a color change in the pH interval of the equivalence point, allowing physical observation of pH change. Most indicators are weak acids, so protons shift from acid to conjugate base. The concentrations of indicators in a solution do not change molarity value.