Analyze a solution of potassium hydroxide using standard hydrochloric acid theory...

Introduction:

Titration is a procedure used in chemistry in order to determines the molarity of an acid or a base. In the other words, it is also consider as acid-base neutralization reaction (Darrell D. Ebbing 1976). A chemical reaction is set up between a know volume of a solution of unknown concentration and a known volume of a solution with a known concentration. The relative acidity or basicity of an aqueous solution can be determined using the relative acid or base equivalent. An acid equivalent is equal to one mole of , and an base equivalent is equal to one mole of . When the solution of known concentration are reacted to the point where the number of acid equivalent equals the number of base equivalents , the equivalent point is reached . For example, the reaction between potassium hydroxide and hydrochloric acid : KOH + HCl . The equivalent point of a strong acid or strong base will occur at pH7 . However, for the weak acids and bases , the equivalent point will usually no occur at pH 7 . The indicator can be used to estimate the equivalent point by observing the colour change of solution.

Objective:

To analyze a solution of potassium hydroxide using standard hydrochloric acid theory .

Materials:

potassium hydroxide

distilled water

methyl orange

hydrochloric acid

Apparatus:

measuring cylinder

graduated flask

pipette

beaker

conical flask

burette

glass rod

filter funnel

Procedure:

1) 40. 00 of the solution of potassium hydroxide is placed into a 250 graduated flask make up to the mark with deionized water . The mixing solution is shade well to obtain a homogenous solution. 2) 25. 0 of the diluted potassium hydroxide solution is pipetted into a conical flask . 1-2 drops of methyl orange is added into conical flask . The solution with the hydrochloric acid is titrated by using burette . 3) The amount of 0. 1 mol of hydrochloric acid is required to neutralise 25. 0 of the diluted potassium hydroxide is recorded . 4) The experiment of titration is repeated to get a consistent results.

Result:

Titration number

Rough

Accurate

1

2

Final reading of burette /

18. 75

18. 80

18. 70

Initial reading of burette /

40. 00

40. 00

40. 00

Volume of HCL used/

21. 25

21. 20

21. 30

Calculation:

1) Calculate the number of moles of potassium hydroxide in 1 of diluted solution. M1 V1 = M2 V2

(0. 1)(40)= (M2)(250)

M2 = 0. 016 mol

number of moles of KOH= 0. 016 mol x 1

= 0. 016 mol

2) Calculate the number of moles of potassium hydroxide in the original undiluted solution. number of moles of KOH in undiluted solution= (MV / 1000)

=(0. 1 mol x 40. 0) / 1000

= 0. 004 mol

3) Calculate the mass of potassium hydroxide in 1 of the original solution .

Mass of KOH= number of moles KOH x Molar mass

= 0. 004 mol x (39. 1 + 16+ 1)

= 0. 2244 g

4) Calculate the mass of the potassium ions , , in 1 of the original solution .

Mass of = 0. 004 mol x (39. 1)

= 0. 1564 g

Discussion:

In this experiment , a accurately known concentration solution /standard solution (0. 1 mol of hydrochloric acid) is added gradually to solution of unknown concentration(diluted potassium hydroxide solution) until the solution become neutralise. The final and initial reading of hydrochloric acid is recorded . Based on the results, 25. 0 of the diluted potassium hydroxide solution required 21. 25 of 0. 1 mol of hydrochloric acid. It is because the hydrochloric acid is more concentrated than diluted potassium hydroxide solution , so less hydrochloric acid is used to neutralise the diluted potassium hydroxide. The methyl orange, a orange colour solution is act as indicator to estimate the end point or equivalent point (Raymond Chang, 1994) . It is added into the base solution(diluted potassium hydroxide) in conical flask and become yellow colour solution. When the equivalent point is reached, the colour of solution in conical flask will turn form yellow to pale orange , which mean the base solution is being neutralise to neutral solution .

During the experiment, all the apparatus should be cleaned by using separately solution. It can prevent all the residue would not remain in the apparatus . Usually an air bubble is present in the nozzle of the burette , it must be removed before taking the initial reading. It is because there should not be any leakage from the burette during titration. Not only that, remember always keep your eye in level with the liquid surface while taking reading to prevent parallax error (Robinson, 1986) . In addition, during the titration process, the hydrochloric acid is added drop by drop into the diluted potassium solution and the conical flask must be shaken well . It can make sure all the hydrochloric acid will react completely with diluted potassium hydroxide . The conical flask should be removed as soon as the indicator changes colour to prevent excessive acid is added . Therefore , a accurate results can be obtained.

Conclusion:

25. 0 of the diluted potassium hydroxide solution required 21. 25 of 0. 1 mol of hydrochloric acid to reach the equivalent point. At the equivalent point, the light orange colour of solution is obtained .

References:

Gillespie. Humphreys. Baird . Robinson, 1986, Chemistry, London: Allyn And Bacon , INC. Raymond Chang, 1994, Chemistry Fifth Edition, Sydney:

Williams college. Darrell D. Ebbing, 1996 General Chemistry Fifth Edition.

United States of America: Houghton Mifflin Company