Sample report on tittle: determine the concentration of a solution of potassium i...

Sociology, Social Issues

AIMS AND OBJECTIVES

INTRODUCTION

Titration is a volumetric analysis used to determine the quantity and concentration of an unknown or known substance. Redox titration involves the use of reducing and oxidising agents as the reactants. Some redox reactions can be performed without necessarily adding an indicator since the reagents used change in colour at the end point: they are self-indicating.

Potassium iodate is an ionic compound whose molecule is made of the atoms of potassium, iodine, and oxygen. Its chemical formula is KIO3 and its mass number is 214 g mol-1 (Clark, 2000, P. 79). It is also a strong oxidising agent hence it can cause fire if it gets into contact with other materials. In addition, it can explode if put near flame or heat.

Potassium iodate is applied in medicine where it is used as a drug. Besides, it can be added to food to supplement dietary iodine. Initially, salts were commonly iodised by adding potassium iodide. However, potassium iodate is commonly added instead currently. Being an oxidising agent, potassium iodate reacts with reducing agents in a Redox reaction

Basically, determination of the concentration of iodate involves firstly reacting the iodate with a solution containing iodide in the presence of an acid in order to obtain iodine.

$IO_3^- + 5I^- + 6H \rightarrow 3I_2 + 3H_2O$ Equation 1

The iodine produced from the reaction is then titrated with thiosulfate:

$I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-}$ Equation 2

CHEMICALS AND EQUIPMENT

- Potassium iodate solution (KIO3) (unknown concentration)

- 1M Potassium iodide solution (KI)

- 2. 0 M HCL

- 0. 1M sodium thiosulfate solution (Na2S 2O3)

- Starch suspension

- Two 100 mL Burette

- 3 conical flasks

- Funnel

PROCEDURE

CALCULATIONS AND EVALUATION OF DATA

- The average volume of sodium thiosulfate (Na2S2O3) = 60 mL

- Moles of Na2S2O3 = (molarity*volume)/1000) = (0. 1*60)/1000 = 0. 006 moles

- Moles of I2 : based on the molar ratio of I2 to Na2S2O3 in equation 2, the number of moles of I2 can be calculated as; moles of I2 = moles of Na2S2O3/2 = 0. 006/2 = 0. 003 moles

- Moles of IO3- = Based on molar ratio of IO3- to I2 in equation 2;

Moles of IO3- = 0. 0033= 0. 001 moles

- Molarity of IO3- = (Moles ofIO3-volume)*1000

0. 0015*1000

Molarity = 0. 2M

Therefore, the concentration of the potassium iodate solution is 0. 2M

DISCUSSION AND RESULTS

This experiment can be useful in determining the concentration of potassium iodate in iodised food substances fortified with iodine. Unlike in the past, iodine fortification is currently commonly done using potassium iodate. In this experiment, potassium iodate of unknown concentration was first reacted with potassium iodide under acidic conditions in order to liberate iodine. The reaction between potassium iodate and potassium iodide is possible because potassium iodate is a stronger oxidising agent. It is first reacted with the iodide since it is a strong oxidising agent hence can be explosive when reacted with most other reducing agents. The dark colour formed during the reaction between potassium iodate and potassium iodide indicates the presence of iodine. The colour disappeared as potassium thiosulfate was being added since the iodine was converted to iodide. The starch suspension was added to ensure that all iodine was reacted.

ERROR ANALYSIS

Some of the marks on one of the burettes were not clear. This could have led to slightly inaccurate volume of the thiosulfate consumed.

PRECAUTIONS

- The experiment was performed under adequate ventilation.
- Gloves were worn to prevent contact with the chemicals

CONCLUSION

The experiment was performed successfully since the students made the expected observations during the reaction between iodate and iodide and the reaction between iodine and the thiosulfate. For instance, in the former case, the solution in the conical flask turned dark as the potassium iodate was being added. The dark colour indicates that iodine was being formed since iodine is dark in colour. However, the experiment can still be improved through the use of relatively more clearly calibrated apparatus.

References

Clark, Jim. Calculations in As/a Level Chemistry. Harlow, Essex [England: Longman, 2000. Print.