

Vitamin c water- soluble essay sample

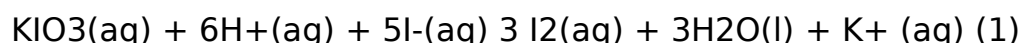
[Environment](#), [Water](#)



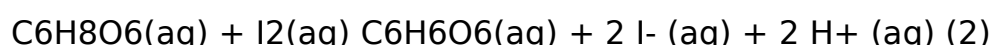
Vitamin C is a water-soluble vitamin that is naturally found in citrus fruits, tomatoes, and leafy green vegetables. It is a well known fact that Vitamin C is extremely vital in the human diet. Vitamin C is known for its numerous health benefits such as prevention against immune system deficiencies, eye diseases, skin wrinkling and much more. It was discovered that scurvy is primarily caused by a deficiency of this vitamin.

The needs of Vitamin-C vary per person but the RDA (Recommended Daily Allowance) for Vitamin-C put forward by the Food and Nutrition Board of the National Research Counsel is 60 mg/day for adults and an additional 20 mg/day is recommended for pregnant women. Women who are lactating are strongly advised to take an additional 40 mg/day so that adequate of the vitamin will be present in the breast milk.

Due to the unstable nature of ascorbic acid, it oxidizes overtime, hence, reducing the amount of Vitamin-C contained. This experiment will analyze a Vitamin-C tablet to determine the amount of Vitamin-C actually present in the tablet as opposed to how much the manufacturers claim. This will involve the use of dilute potassium iodate solution and excess iodide to generate iodine.



Then the iodine is used to oxidize the ascorbic acid in the following reaction:



Excess iodine is added to the ascorbic acid. One mole of this iodine reacts with one mole of the Vitamin C. The excess iodine is then titrated against

standardized sodium thiosulphate. This process is called back titration. The number of moles of Vitamin C is then determined using the difference between the initial moles of iodine and the moles of iodine leftover.

Procedure:

The procedure given in the First Year Chemistry Lab Manual for Experiment G was followed with the modifications described below. In the previous lab, a Concentrated KIO_3 primary solution was prepared by dissolving about 1.0g of potassium iodate in a 100 mL beaker and then quantitatively transferred into a 250.0 mL volumetric flask after the iodate was completely dissolved. This concentrated standard iodate solution was stored and used in the Lab G experiment for the analysis of vitamin C.

A tablet of Vitamin C was dissolved into about 100 mL of distilled water in a 250 mL beaker by continuous stirring, using a glass rod. While the tablet was dissolving, the concentrated standard iodate solution was used to make 250 mL of dilute standard solution. About 40 mL of the concentrated solution was poured out into a 100 mL beaker. A 25 mL pipette was first rinsed with the solution and then used to transfer 25.00 mL of the concentrated solution into a clean 250 mL volumetric flask.

The volumetric flask was then filled up to the mark, stoppered and inverted ten times.

After the tablet fully dissolved, it was filtered into a 250 mL volumetric flask through a gravity filtration set-up in order to remove the insoluble residue. A 50 mL burette was filled with the provided sodium thiosulphate solution. 25 mL of the standard dilute KIO_3 was pipetted into a 125 mL Erlenmeyer flask

along with 0.2 g KI (levelled scoop), 1 mL of sulphuric acid (20 drops) and 10 mL of pipetted Vitamin C solution. The contents of the Erlenmeyer flask were titrated slowly until there was a pale yellow colour. 5 drops of starch were added to the flask and titrated until the solution became clear. The titration was repeated until the recorded values agreed within ± 0.2 mL.

Observations:

When all the contents of the Erlenmeyer flask were mixed together, it gave a deep orange colour. As the titration continued, the colour turned to a pale yellow. Upon addition of the starch indicator, the solution turned deep blue and as the titration continued again, the solution became clear.

Data and Calculations:

See the attached Lab G Report Sheets for Data and Calculations.

Discussion:

The lab used titration to determine the mass of Vitamin C in a given tablet. The process involved the titration of iodine, vitamin C and sulphuric acid in the presence of a starch indicator. The starch is added when the solution turns pale yellow which shows that the titration is near completion. At that point of the reaction, iodine concentration is lower so decomposition can be avoided and colour change is more visible. Starch is used as the indicator mainly because of the clear visibility of the colour change. When in the presence of iodine, it will give a deep blue colour but at the endpoint (when neutralization is complete), the solution turns clear because as the titration goes on, the concentration of iodine reduces and the iodide ions increase which leads to the gradual disappearance of the blue colour.

The titration process required approximately 5.05 ± 0.04 mL of $\text{Na}_2\text{S}_2\text{O}_3$ solution to reach its endpoint. The final mass of the Vitamin C in the given tablet was calculated to be 497.9mg which is less than the value stated by the manufacturer. The mass of Vitamin C in the tablet does not mean that the tablet is that mass but instead, the ascorbic acid contained in the tablet weighs that much. The difference between the calculated mass value and the given mass value is 2.1mg. This could be due to decomposition of the Vitamin C content overtime. Decomposition of Vitamin C is very dependent on method of storage. High temperatures or humidity could lead to an irreversible loss in ascorbic acid contents. Tablets that are also exposed to light will lose part of their ascorbic acid content overtime.

The final uncertainty associated with the experimental mass value was calculated to be ± 4 mg. All uncertainties associated with the equipment used for the titration such as 25 mL pipette (0.03 mL), 10mL pipette (0.02 mL), 250 mL volumetric flask (0.1 mL), 50 mL burette (0.02 mL) and analytical balance as well as the uncertainties of the previously calculated values which lead to the final answer were taken into consideration while calculating the final uncertainty. All mass uncertainties were small compared to that of the glassware. The primary source of uncertainty from the used glassware was the burette which had a relative uncertainty of 0.85% for the $\text{Na}_2\text{S}_2\text{O}_3$. The uncertainty is quite low relative to the final mass.

The difference in mass of Vitamin C could also be due to experimental errors. Sources of experimental errors could have arisen from glassware not being properly cleaned and rinsed with the solution to be put in it. The experiment

could have also been carried out in a shorter amount of time to reduce the oxidation of iodide ions. This would not only help reduce the difference in values but also reduce the uncertainty.

Conclusion:

The calculated mass of Vitamin C in the tablet was 497.9 mg as opposed to the 500mg labelled by the manufacturers. The uncertainty associated with this value was calculated to be 4 mg which is less than 1% and this indicates that the experiment is quite precise. The accuracy of this experiment is not certain due to the above stated error sources.