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Iodine titration helps determine the amount of vitamin C in foods like fruits and vegetables. The titration shows a color change when all vitamin C is oxidized, indicating it is complete. The method works for various samples, including juices, tablets, and both fresh and packaged foods. Vitamin C (ascorbic acid) is an antioxidant that is essential for human nutrition. Vitamin C deficiency can lead to a disease called scurvy, which is characterized by abnormalities in the bones and teeth. Many fruits and vegetables contain vitamin C, but cooking destroys the vitamin, so raw citrus fruits and their juices are the main source of ascorbic acid for most people. Peter Dazeley/Getty Images One way to determine the amount of vitamin C in food is to use a redox titration. The redox reaction is better than an acid-base titration since there are additional acids in a juice, but few of them interfere with the oxidation of ascorbic acid by iodine. Iodine is relatively insoluble, but this can be improved by complexing the iodine with iodide to form triiodide:  $I_2 + I^- \rightarrow I_3^-$ . Triiodide oxidizes vitamin C to form dehydroascorbic acid:  $C_6H_8O_6 + I_3^- + H_2O \rightarrow C_6H_6O_6 + 3I^- + 2H^+$ . As long as vitamin C is present in the solution, the triiodide is converted to the iodide ion very quickly. However, when all the vitamin C is oxidized, iodine and triiodide will be present, which react with starch to form a blue-black complex. The blue-black color is the endpoint of the titration. The vitamin C titration procedure is appropriate for testing the amount of vitamin C in tablets, juices, and fresh or frozen fruits and vegetables. The titration can be performed using just iodine solution and not iodate, but the iodate solution is more stable and gives a more accurate result. Laguna Design/Getty Images The goal of this laboratory exercise is to determine the amount of vitamin C in samples, such as fruit juice. The first step is to prepare the solutions. We've listed examples of quantities, but they aren't important. What matters is that you know the concentration of the solutions and the volumes that you use. 1% Starch Indicator Solution (doesn't have to be 1%; 0.5% is fine) Add 0.50 g soluble starch to 50 ml near-boiling distilled water. Mix well and allow to cool before use. Iodine Solution Dissolve 5 g potassium iodide (KI) and 0.268 g potassium iodate (KIO<sub>3</sub>) in 200 ml of distilled water. Add 30 ml of 3 M sulfuric acid. Pour this solution into a 500 ml graduated cylinder and dilute it to a final volume of 500 ml with distilled water. Mix the solution. Transfer the solution to a 600 ml beaker. Label the beaker as your iodine solution. Vitamin C Standard Solution Dissolve 0.250 g vitamin C (ascorbic acid) in 100 ml distilled water. Dilute to 250 ml with distilled water in a volumetric flask. Label the flask as your vitamin C standard solution. Standardizing Solutions Add 25 ml of vitamin C standard solution to a 125 ml Erlenmeyer flask. Add 10 drops of 1% starch solution. Rinse your buret with a small volume of the iodine solution and then fill it. Record the initial volume. Titrate the solution until the endpoint is reached. This will be when you see the first sign of blue color that persists after 20 seconds of swirling the solution. Record the final volume of iodine solution. The volume that was required is the starting volume minus the final volume. Repeat the titration at least twice more. The results should agree within 0.1 ml. Hill Street Studios/Getty Images Titrate the samples exactly as you did your standard. Record the initial and final volume of iodine solution required to produce the color change at the endpoint. Add 25 ml of juice sample to a 125 ml Erlenmeyer flask. Titrate until the endpoint is reached. (Add iodine solution until you get a color that persists longer than 20 seconds.) Repeat the titration until you have at least three measurements that agree to within 0.1 ml. Titrating RealLemon RealLemon brand is nice to use because the maker lists vitamin C, so you can compare your value with the packaged value. You can use another packaged lemon or lime juice, provided the amount of vitamin C is listed on the packaging. Keep in mind, the amount can change (diminish) once the container has been opened or after it has been stored for a long time. Add 10 ml of RealLemon into a 125 ml Erlenmeyer flask. Titrate until you have at least three measurements that agree within 0.1 ml of iodine solution. Other Samples Vitamin C tablet - Dissolve the tablet in ~100 ml distilled water. Add distilled water to make 200 ml of solution in a volumetric flask. Fresh fruit juice - Strain the juice through a coffee filter or cheesecloth to remove pulp and seeds, since they could get stuck in the glassware. Packaged fruit juice - This also may require straining. Fruits and vegetables - Blend a 100 g sample with ~50 ml of distilled water. Strain the mixture. Wash the filter with a few milliliters of distilled water. Add distilled water to make a final solution of 100 ml in a volumetric flask. Titrate these samples in the same way as the juice sample described above. Andrew Unangst/Getty Images Calculate the ml of titrant used for each flask. Take the measurements you obtained and average them. Average volume = total volume / number of trials. Determine how much titrant was required for your standard. If you needed an average of 10 ml of iodine solution to react 0.250 grams of vitamin C, then you can determine how much vitamin C was in a sample. For example, if you needed 6 ml to react your juice (this is a made-up sample value - don't worry if you get something totally different!), then: 10 ml iodine solution / 0.250 g Vit C = 6 ml iodine solution / X ml Vit C  $40 X = 6X = 0.15$  g Vit C in that sample. Keep in mind the volume of your sample, so you can make other calculations, such as grams per liter. For a 25 ml juice sample, for example:  $0.15 \text{ g} / 25 \text{ ml} = 0.15 \text{ g} / 0.025 \text{ L} = 6.00 \text{ g/L}$  of vitamin C in that sample. 0 ratings 0% found this document useful (0 votes) 2K views This document summarizes an experiment conducted to determine the amount of vitamin C in a solution. The experiment involved using an iodine solution and starch indicator to titrate a vitamin C sample. Al-enhanced title and description Save Save DETERMINATION OF VITAMIN C LAB REPORT For Later 0% found this document useful, undefined Deadline pressure? Get your assignment done in just 3 hours. 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