

Purpose

The goal of this laboratory exercise is to determine the amount of vitamin C in samples, such as fruit juice.

Preparing Solutions

1% Starch Indicator Solution

1. Add 0.50 g soluble starch to 50 near-boiling distilled water.
2. Mix well and allow to cool before use. (doesn't have to be 1%; 0.5% is fine)

Iodine Solution

1. Dissolve 5.00 g potassium iodide (KI) and 0.268 g potassium iodate (KIO₃) in 200 ml of distilled water.
2. Add 30 ml of 3 M sulfuric acid.
3. Pour this solution into a 500 ml graduated cylinder and dilute it to a final volume of 500 ml with distilled water.
4. Mix the solution.
5. Transfer the solution to a 600 ml beaker. Label the beaker as your iodine solution.

Vitamin C Standard Solution

1. Dissolve 0.250 g vitamin C (ascorbic acid) in 100 ml distilled water.
2. Dilute to 250 ml with distilled water in a volumetric flask. Label the flask as your vitamin C standard solution.

Standardizing Solutions

1. Add 25.00 ml of vitamin C standard solution to a 125 ml Erlenmeyer flask.
2. Add 10 drops of 1% starch solution.
3. Rinse your burette with a small volume of the iodine solution and then fill it. Record the initial volume.
4. 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.
5. Record the final volume of iodine solution. The volume that was required is the starting volume minus the final volume.
6. Repeat the titration at least twice more. The results should agree within 0.1 ml.

You titrate samples exactly the same as you did your standard. Record the initial and final volume of iodine solution required to produce the color change at the endpoint.

Titration Juice Samples

1. Add 25.00 ml of juice sample to a 125 ml Erlenmeyer flask.
2. Titrate until the endpoint is reached. (Add iodine solution until you get a color that persists longer than 20 seconds.)
3. Repeat the titration until you have at least three measurements that agree to within 0.1 ml.

Titration Real Lemon

Real Lemon is nice to use because the maker lists vitamin C, so you can compare your value with the packaged value.

1. Add 10.00 ml of Real Lemon into a 125 ml Erlenmeyer flask.
2. 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 cheese cloth to remove pulp and seeds, since they could get stuck in the glassware.
- Packaged Fruit Juice - This also may require straining.
- Fruits & 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.

Titration Calculations

1. Calculate the ml of titrant used for each flask. Take the measurements you obtained and average them.

$$\text{average volume} = \text{total volume} / \text{number of trials}$$
2. Determine how much titrant was required for your standard.
 If you needed an average of 10.00 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 6.00 ml to react your juice (a made-up value - don't worry if you get something totally different):

$$10.00 \text{ ml iodine solution} / 0.250 \text{ g Vit C} = 6.00 \text{ ml iodine solution} / X \text{ ml Vit C}$$

$$40.00 X = 6.00$$

$$X = 0.15 \text{ g Vit C in that sample}$$
3. 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:

$$0.15 \text{ g} / 25 \text{ ml} = 0.15 \text{ g} / 0.025 \text{ L} = 6.00 \text{ g/L of vitamin C in that sample}$$

Method courtesy of Deb Smith, Centenary SHS