Determination of Vitamin C in Processed Fruit Drinks

Student Handout

Purpose

To determine the vitamin C content of a sample of processed fruit drink.

Introduction

Vitamin C (ascorbic acid) is often added to canned or packaged fruit drinks to enhance their nutritional value. In this experiment, you are required to propose a titrimetric method to determine the vitamin C content of a sample of fruit drink purchased from a supermarket.

Tasks

1. Search for information on methods of determining vitamin C contents in fruit drinks. You may use search engines (e.g. Yahoo or Google), textbooks or reference books.
   - What are the chemical principles underlying the various methods of vitamin C determination?
   - Select one method which involves reaction with iodine.

2. With the possible methods in mind, choose the one which you think is the best and design step-by-step procedures to investigate quantitatively the sample of fruit drink with regard to its vitamin C content. You may consider the following when designing your experiments.
   - What chemicals and apparatus would you use?
   - What is the chemical structure of vitamin C?
   - Explain whether vitamin C is stable.
   - What is the chemical reaction(s) involved in the titration?
   - Outline calculation steps based on chemical stoichiometry.
   - Compare experimental result with the vitamin C content indicated on the label of the package.

3. For the second part of the investigation, design an experiment to investigate the effect of temperature on the content of vitamin C in fruit juice.

4. Before carrying out your investigation, seek advice from your teacher on the details of your proposed experiment.

5. Carry out your investigation and record all observations.

6. Write up a report for the investigation. Your report should include:
   - the underlying chemical principle of your method,
   - procedures,
   - tables summarizing titration results,
   - treatment of data involving calculations,
   - a conclusion of the investigation,
   - comments on the results obtained and
   - references.

7. Does your result agree with the figures indicated on the label of the drink? What may be the reasons for discrepany? Try to design further experiments to find out.

Safety

Avoid direct contact with chemicals. Dispose of chemical wastes and excess materials according to your teacher's instruction. Safety information about the chemicals used or produced in your investigation is available from relevant Material Safety Data Sheets (MSDSs).

Materials and Apparatus

1 M sulphuric acid 

0.004 M I_2(aq), 0.05 M potassium iodate(V)(aq), 1 M KI(aq), starch solution, 0.1 M sodium thiosulphate solution, apparatus for titration, beakers and measuring cylinder.

Other chemicals or apparatus may be provided upon request.