The hunt for vitamin C

This resource accompanies the article Vital vitamins in Education in Chemistry which can be viewed at rsc.li/46meZdM.

The resource has been adapted from the book series In search of more solutions. You can find more practical problem-solving activities from this series at: rsc.li/3Q5bsKR.

Introduction

Read our standard health and safety guidance (rsc.li/3IAmFA0) and carry out a risk assessment before running any live practical. See the teacher notes for further instructions and the student sheets for partial instructions to carry out the problem-solving experiment.

Available equipment

- Filter funnel
- Muslin or glass wool
- 25 cm³ pipette and safety filler
- 50 cm³ burette
- 250 cm³ conical flask
- 25 cm³ measuring cylinder
- 100 cm³ measuring cylinder
- 500 cm³ measuring cylinder
- 250 cm³ beaker
- Bunsen burner, tripod and gauze
- Safety glasses
- Liquidiser
- Safety equipment: safety glasses

Preparation and safety

- 100 g of green cabbage
  (With a large class provide students with pre-shredded cabbage and allow them to weigh out 100 g).
- Deionised water to ensure no dissolved oxygen interferes with the vitamin C content.
### Chemicals supplied for the practical

<table>
<thead>
<tr>
<th>Chemicals supplied for the practical</th>
<th>Preparation</th>
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<tr>
<td>Phosphoric acid solution, 5% solution, equivalent to about 0.9 mol dm(^{-3}). (\text{H}_3\text{PO}_4(\text{aq})) Currently not classified as hazardous. CLEAPSS hazcard HC072.</td>
<td>Phosphoric acid concentrated solution. (\text{H}_3\text{PO}_4(\text{l})) The usual concentrated commercial solution is about 85% (w/w) which is equivalent to 14.7 mol dm(^{-3}). Check information from supplier. (\text{MW} = 97.99 \text{ g mol}^{-1}) <strong>DANGER</strong> Causes severe burns and eye damage. Wear splash-proof goggles and chemical-resistant gloves. CLEAPSS recipe book RB065.</td>
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<tr>
<td>2, 6-Dichlorophenolindophenol (DCPIP) solution, 0.4 g dm(^{-3}). (\text{C}_{12}\text{H}_7\text{NCl}_2\text{O}_2(\text{aq})) Not usually considered as hazardous. Check the supplier’s SDS. CLEAPSS hazcard HC032.</td>
<td>2, 6-Dichlorophenolindophenol (DCPIP), solid. (\text{C}_{12}\text{H}_7\text{NCl}_2\text{O}_2(\text{s})) (\text{MW} = 268.1 \text{ g mol}^{-1}) Not usually considered as hazardous. Check the supplier’s SDS. CLEAPSS recipe sheet RB000 recipe 13.</td>
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<tr>
<td>Ascorbic acid (vitamin C) solution, 0.2 g dm(^{-3}) in 5% phosphoric acid. (\text{C}_6\text{H}_8\text{O}_6(\text{l})) Currently not classified as hazardous. CLEAPSS hazcard HC038d.</td>
<td>Ascorbic acid solid. (\text{C}_6\text{H}_8\text{O}_6(\text{s})) (\text{MW} = 176.12 \text{ g mol}^{-1}) Currently not classified as hazardous. Phosphoric acid solution, 5% solution, equivalent to about 0.9 mol dm(^{-3}). (\text{H}_3\text{PO}_4(\text{aq})) Currently not classified as hazardous. See information above.</td>
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### Tips and safety advice
- The concentration of the DCPIP solution will not be accurate hence it is important to carry out Task 3, stage 1 (standardisation) of the experiment.

### Disposal
- Dilute the cabbage solution and the 5% phosphoric acid solution to a concentration of 0.1 mol dm\(^{-3}\) phosphoric acid and the DCPIP solution to 0.1% before pouring down a foul-water drain.