

## Is the secretary guilty?

This resource accompanies the article **Cold case chemistry** in *Education in Chemistry* which can be viewed at: <https://rsc.li/3XpQUNS>.

### Learning objectives

- 1 Use your knowledge of physical and chemical changes to design an experiment to analyse a sugar sample.
- 2 Collect your evidence by making careful observations while carrying out your experiment.
- 3 Write an investigation report including what you did, your results and conclusion.

### Equipment

Suggested equipment for the separation of the soluble and insoluble substances:

- Beaker.
- Conical flask.
- Filter funnel and filter paper.
- Stirring rod.
- Spatula.
- Plastic dropping pipette.
- Distilled water.
- Specimen sample labelled 'Sample from the head's sugar bowl', suggested mass 10.00 g.

Suggested equipment for the evaporation of the sugar solution:

- Evaporating basin.
- Bunsen burner, heat proof mat, tripod, gauze, matches and splints.
- Water bath, heating plate, heated sand tray, drying oven, desiccator with drying agent (eg silica gel).
- Petri dish.
- Crystallising dish.
- Clamps, stand and bosses.
- Tongs.

Students may choose to run their investigation as a microscale experiment and request the following additional equipment:

- Syringe barrel and cotton wool plug for filtration.
- Crucible, kettle, take away container with small holes that fit the base of the crucibles or cavity slide and microscope.

## Preparation

- Prepare a specimen labelled 'Sample from the head's sugar bowl' which consists of a mixture of sugar and anti-bumping granules of equal volume (approximate mass ratio 1:2). Small glass spheres or glass beads can be used as an alternative to anti-bumping granules if they are smooth. Do not use broken glass for safety reasons. Any other suitable alternative to anti-bumping granules can be used if it is safe to do so.
- A microscale approach is ideal if time is limited. Small volumes can evaporate quickly. If a microscope slide is used, do not overheat it as it will break.
- There are different methods to evaporate the sugar solution but keeping the temperature under boiling point is crucial to avoid obtaining caramel. Students should dissolve the sugar in as little water as possible. If left at room temperature, the solution will take several days to evaporate. Faster evaporation can be achieved at 80°C using a heated sand bath if a small amount of sample is used.

## Safety and hazards

[Read our standard health and safety guidance](#) and carry out a risk assessment before running any live practical.

Refer to SSERC/CLEAPSS Hazcards and recipe sheets.

Hazard classification may vary depending on supplier.

- Wear safety glasses.
- The 'Sample from the head's sugar bowl' consisting of sugar and anti-bumping granules is non-hazardous.
- Self-indicating silica gel used is usually classified as non-hazardous if it does not contain cobalt(II) chloride. Check supplier's information and CLEAPSS Hazcards 86A and 25.
- Follow basic fire safety when using Bunsen burners and leave equipment to cool before handling.

### Disposal

- The insoluble substance (anti-bumping granules, glass beads, etc) can be recycled.
- The solid sugar and filter paper or cotton wool plug can be disposed of in the general waste.
- The drying agent can be re-used after drying in an oven.