Is the secretary guilty?

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.

Introduction

It's the start of your science lesson and having just completed the register, your teacher suddenly stops mid-sentence and looks rather serious. 'Please listen very carefully, I am going to read out an email from the headteacher that has just dropped into my inbox'.

Subject: Please help me class Sc10B
From: Headteacher@RSCAcademy.org
To: PRoberts@RSCAcademy.org

I suspect that the school secretary is trying to do me in by putting glass shavings in my sugar bowl. Your teacher tells me that you are expert scientists, so would you please analyse the sample that I am sending down to your lab right now. Please report back to me by the end of the week. This matter needs to be resolved urgently.

Kind regards,
Headteacher

PS: The school budget is really tight this year, so I would like my sugar back.

Your task

Working in small groups (2–3 students), analyse the sample from the headteacher's sugar bowl to determine if there are any glass shavings present. Then, write up your findings and be ready to present your report to the headteacher, along with the remaining sugar from the bowl. You will need to be prepared to state your verdict: is the secretary guilty or not?

Equipment and materials

Safety glasses.

General

Equipment for the separation of soluble and insoluble substances:

- Beaker.
- Conical flask.
- Filter funnel and filter paper.
- Stirring rod.
- Spatula.
- Plastic dropping pipette.
- Distilled water.

Equipment for evaporation:

- 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.

Per group

- Specimen labelled ‘Sample from the head’s sugar bowl’.

Group report

Problem

Method

Results

Conclusion

Exam-style question

Having received the recrystallised sugar, the secretary makes the headteacher a cup of tea. Just as they are leaving the room, the head takes the first sip.

'Come back!' the head yells, 'This tea tastes salty'.

'Oh no! The sugar and table salt must have been mixed up!' cries the secretary.

Describe a series of chemical tests you could carry out to identify whether table salt has been mistaken for the sugar.

Structure strip Chemical tests to identify ions	
Write down the chemical formula for table salt.	
Identify the positive and negative ions present in table salt.	
Describe a chemical test that could be used to identify the positive ion. Write down the expected result.	
Describe a chemical test that could be used to identify the negative ion. Write down the expected result.	
State your overall conclusion.	