

Which Is Which 1?



Topic

Identification of white powders

Introduction

To identify particular substances, forensic scientists use tests that require knowledge of the detailed appearance of the substance, its solubility or otherwise in water, the effect of heat, the effect of acids, etc. This knowledge is important because many substances found at a crime scene can look quite similar. In this experiment, your teacher will give you four samples of white powders labeled A, B, C, and D. They will be samples of talcum powder, sodium bicarbonate, sodium chloride, and confectioners sugar, but only she will know which is which. Using information provided in Table 1 on page 4.03-4, you will then perform a number of tests to identify the powders.

Time required

Part A: 15 minutes

Part B: 20 minutes

Part C: 20 minutes

Materials

Note to teachers: provide each student with 4 small containers each containing about 2 – 3 teaspoonsful of talcum powder, sodium bicarbonate, sodium chloride, and confectioners sugar. Label the containers A, B, C, and D, and keep a note of their identity.

4 samples (A, B, C, and D)

spatula

4 sheets of black poster board (about 14 × 9 cm)

magnifying glass

4 Pyrex™ test tubes

test tube holder (or clamp and support stand)

Bunsen burner

4 × 80 mm watch glasses (or white plates)

4 ml vinegar or lemon juice

eyedropper

teaspoon

safety glasses

Safety note



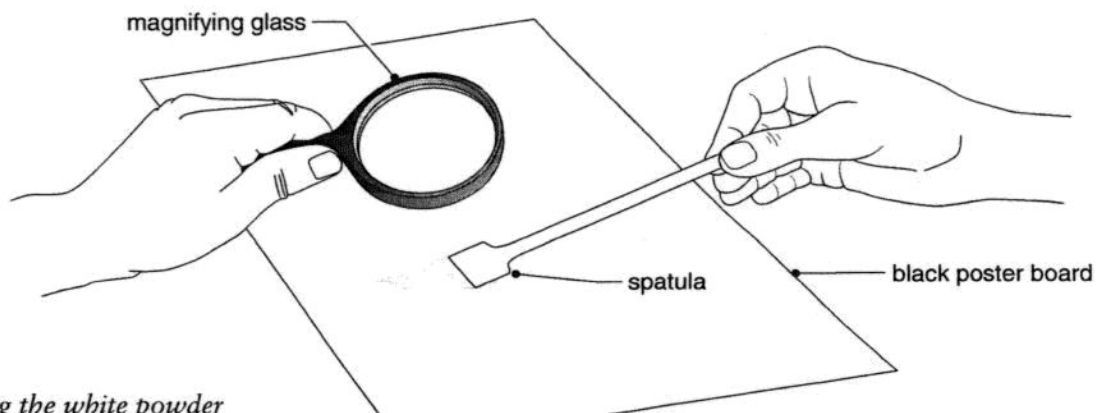
Avoid inhaling any of the powders. Be careful not to get vinegar or lemon juice in your eyes. Wear safety glasses, especially when pouring these liquids. Be careful when using the Bunsen burner. Pull back long hair.

Procedure

Part A: Appearance

1. Use a clean spatula to place about half a teaspoon of powder A on a sheet of black poster board.
2. Look at the powder carefully with the magnifying glass, using the spatula or spoon to move the powder around (see diagram 1 below). Record your observations in data table A below.
3. Repeat steps 1 to 3 for powders B, C, and D.

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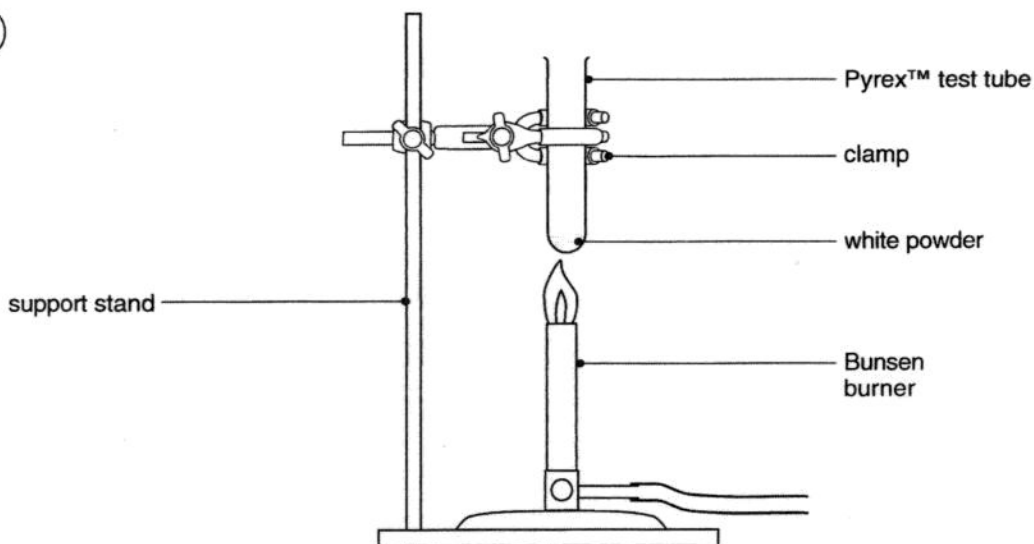


Examining the white powder

DATA TABLE A

| Powder | Appearance | Effect of heat | Effect of vinegar/lemon juice |
|--------|------------|----------------|-------------------------------|
| A | | | |
| B | | | |
| C | | | |
| D | | | |

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Heating the white powder

Part B: Effect of heat

1. Use a clean spatula to place about a quarter of a teaspoon of powder A in a Pyrex™ test tube.
2. Place the test tube in a holder and heat the base of the test tube with a gentle flame for no more than 2 minutes (see diagram 2 above).
3. Record your observations in data table A on the previous page.
4. Repeat steps 1 to 3 for powders B, C, and D.

Part C: Effect of acid

1. Use a clean spatula to place about a quarter of a teaspoon of powder A in the middle of a watch glass or plate.
2. Use the eyedropper to add about 1 ml of vinegar or lemon juice to powder A.
3. Observe any reaction carefully. Record your observations in data table A on the previous page.
4. Repeat steps 1 to 3 for powders B, C, and D.

Analysis

1. From the results of your tests and the information given in Table 1, can you identify which powder is talcum powder?
2. From the results of your tests and the information given in Table 1, can you identify which powder is sodium bicarbonate?
3. From the results of your tests and the information given in Table 1, can you identify which powder is sodium chloride?
4. From the results of your tests and the information given in Table 1, can you identify which powder is confectioners sugar?

Want to know more?

See Section 10: Our Findings

Table 1. Information for students about the substances being tested.

| Substance | Properties | Appearance | Effect of heat | Effect of vinegar/ lemon juice |
|---|---|--|---|---|
| Talc $Mg_3Si_4O_{10}(OH)_2$ (use talcum powder) | White or pale green mineral. It is soft and greasy, and has a hardness of 1 on the Mohs scale. It is often powdered for use in toiletry products. | Very fine white powder. Moves when patted with a spatula. | Powder becomes gray. There may be a slight smell of perfume if talcum powder is used. | No reaction. Powder floats to surface of the liquid. |
| Sodium bicarbonate $NaHCO_3$ | White crystalline solid that decomposes at $270^\circ C$ to form sodium carbonate, carbon dioxide, and water. It is used in cooking as baking soda. | Fine sparkling white crystals. The crystals move when patted with a spatula. | Powder clumps together slightly, and vapor condenses on the sides of the test tube. Powder stays white. | Instant reaction. Powder fizzes vigorously. |
| Sodium chloride $NaCl$ | Ionic compound ($Na^+ Cl^-$) Not volatile. Soluble in water; aqueous solution is an electrolyte. Melting point is $803^\circ C$. | White straight-sided crystals. The crystals move apart when patted with a spatula. | No reaction with a gentle flame. Powder stays white. If heated with a more vigorous flame, it produces a crackling noise. | No reaction (if using table salt rather than pure sodium chloride, there may be a slight reaction caused by the additives used to keep the salt running freely in use). |
| Confectioners sugar | Finely ground sucrose with the chemical formula $C_{12}H_{22}O_{11}$. | Fine white powder. Packs together when patted with a spatula. | Powder quickly melts to form a liquid, which turns dark brown. | Powder dissolves slightly. |