Which Is Which 2?

Topic

Identification of white powders

Introduction

In this experiment, you will be performing further identification tests on mysterious white powders. These powders – you will be working with talcum powder, calcium sulfate, cornstarch, and confectioners sugar – appear similar, but you will demonstrate how they react very differently in certain tests. As in the previous experiment, your teacher will give you samples of the four white powders labeled A, B, C, D, and will give you information relating to their appearance, solubility in water, and the result of adding iodine to the powder. You will perform a number of tests to identify the powders using the data given.

Time required

Part A: 15 minutes
Part B: 20 minutes (but need to leave for about 1½ hours)
Part C: 20 minutes

Materials

Note to teachers: provide each student with 4 small containers each containing about 2 – 3 teaspoonsful of talcum powder, calcium sulfate, cornstarch, 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 pieces of black poster board (about 14 × 9 cm)
magnifying glass
4 test tubes with stoppers
test tube rack
tap water
10 ml graduated cylinder
teaspoon
2 eyedroppers
4 × 80 mm watch glasses (or white plates)
tincture of iodine

Safety note

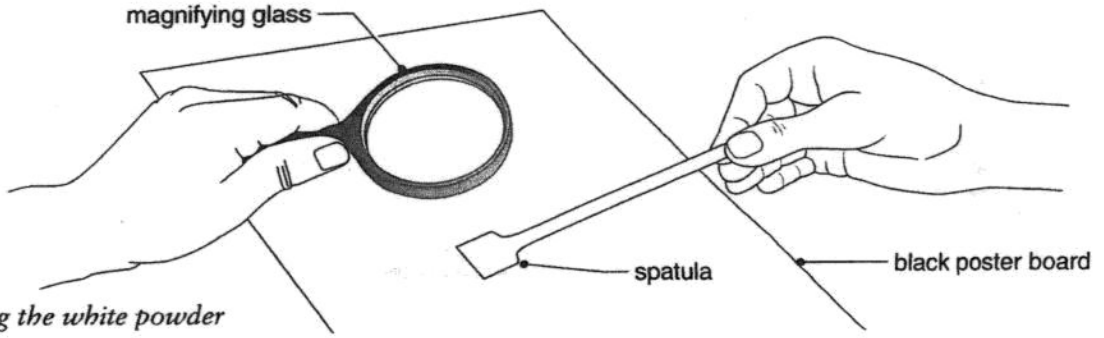
Avoid inhaling any of the powders. Avoid splashing yourself with the iodine.

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 the data table on the next page.
3. Repeat steps 1 to 2 for powders B, C, and D.

1

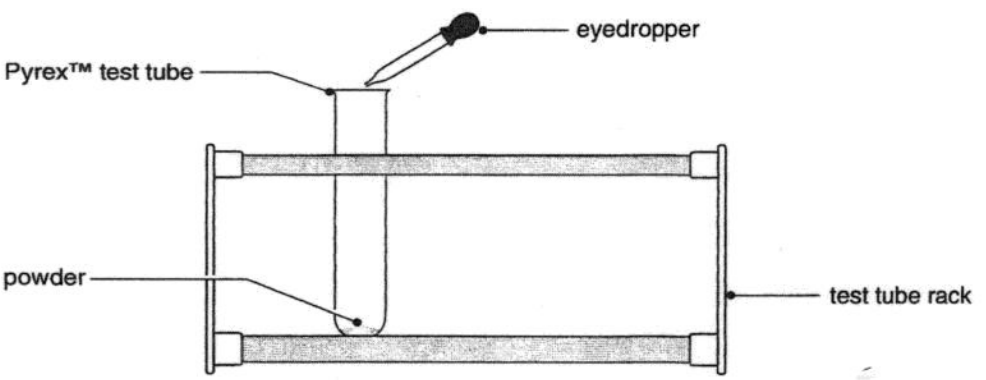


Examining the white powder

Part B: Effect of water

1. Use a clean spatula to place about a quarter of a teaspoon of powder A in a test tube. Put the test tube in a rack and add about 10 ml water to the test tube using an eyedropper (see diagram 2 below). Record any observations in the data table on the next page.
2. Put a stopper in the test tube before shaking it for about 10 seconds. Record your findings in the data table.
3. Repeat steps 1 to 2 for powders B, C, and D.
4. Leave the test tubes for about 1½ hours before pouring off the water. Record your observations in the data table.

2



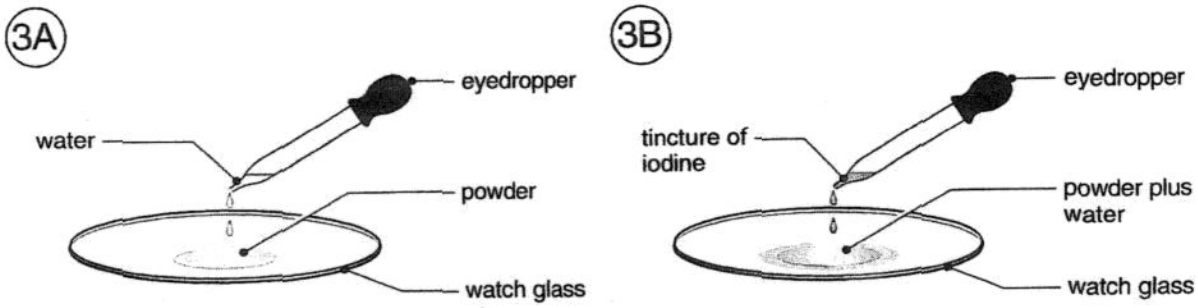
Adding water to the powder in the test tube

Part C: Effect of adding iodine

1. Use a clean spatula to place about a quarter of a teaspoon of powder A on a watch glass or plate.
2. Use an eyedropper to add about 2 ml water to the powder and then use a different eyedropper to add one or two drops of tincture of iodine to the

mixture on the watch glass (see diagram 3 below). Record your observations in the data table below.

3. Repeat steps 1 to 2 for powders B, C, and D.



Adding (A) water and (B) tincture of iodine to the white powder on the watch glass

DATA TABLE

Powder	Appearance	Solubility/reaction with water	Effect of vinegar/lemon juice
A			
B			
C			
D			

Analysis

1. From the results of your tests and the information given in Table 1 on the next page, 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 calcium sulfate?
3. From the results of your tests and the information given in Table 1, can you identify which powder is cornstarch?
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	Solubility/reaction with water	Iodine
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.	On adding water, solid floats to surface and then slowly sinks to the bottom of the test tube. After shaking, white froth forms on the surface of a cloudy liquid, and a white sediment forms at the bottom of the test tube. This sediment does not form a solid.	No reaction.
Calcium sulfate	White solid that is marginally soluble in water (a cause of permanent hardness of water). Occurs naturally as anhydrite and, as $CaSO_4.2H_2O$, as gypsum. Used as a drying agent. When heated at 130°C, gypsum forms plaster of Paris ($2CaSO_4.H_2O$). Anhydrite and gypsum are used in the manufacture of sulfuric acid.	Very fine white powder. Powder packs together when patted with a spatula.	On adding water, a cloudy liquid is formed with a white sediment. After shaking, a thick milky liquid with a white sediment forms. If this solution is left to stand, the sediment forms a solid.	No reaction.
Cornstarch	Fine powder made by grinding grains of corn.	Fine white powder. Packs together when patted with a spatula.	On adding water, a cloudy liquid and a white sediment form. After shaking, a thick milky liquid forms. This sediment does not form a solid.	Rapid color change. Solution turns blue-black.
Confectioners sugar	Finely ground sucrose, $C_{12}H_{22}O_{11}$	Fine white powder. Packs together when patted with a spatula.	On adding water, much of the powder dissolves to leave a slight sediment. After shaking, a clear liquid forms.	No reaction.