

Overview: Students will use the scientific method to determine the physical and chemical properties of seven commonly used white powders. Students will collect data from a series of tests and put together their findings to describe each of the powders.

Duration of study: Approximately 50-minute sessions not including time needed to teach students how to use measurement tools, perform the chemical tests etc.

Key concepts

- A physical property of a substance can be observed or described; e.g., color, state of matter, texture, solubility, melting point.

A chemical property is the substance's ability to react chemically with other substances to create new physical and chemical properties.

A physical change occurs when the appearance of matter changes, but composition of the matter does not change. Changes in size, shape, color, odor, hardness, or in state such as gas, liquid, or solid are all considered physical changes.

A chemical change occurs when new kinds of matter are formed. The composition of the matter changes and the new kind of matter has different properties from the old matter. Evidence of a chemical change may include a change in temperature, a change in color, or production of a gas or solid.

The mystery powders

1. Detergent
2. Baking soda
3. Salt
6. Sugar
7. Cornstarch

(Other powders that could be used: plaster of Paris, powdered milk, baking powder)

Outcomes: The mystery powders in this activity have different physical properties, even though they are all white. Also, they will have different chemical reactions. Some will not react at all with the substance, only creating a physical change (wetting). Others will produce obvious chemical reactions.

The following changes and reactions can be expected in this activity:

1. Baking soda fizzes with vinegar (chemical reaction).
2. Cornstarch turns black with iodine (chemical reaction).
3. Plaster of Paris turns hard and warm with water (warm: chemical reaction; hard: physical change).
4. Sugar turns brown, then black with heat (chemical reaction).
5. Iodine changes powders to its own color, but does not create a new powder (physical change).

Students should demonstrate a greater comfort level with the microscope, both in their ability to operate it correctly and to explain its function.

You must identify the following white powders from the list below:

Materials you may use:

Candle (Heat Source)

Parafilm

Iodine

Vinegar

Water

pH indicator

Aluminum Foil

Cyclohexane

Forceps

Tweezer

Dissecting Scope

Unknown Materials:

Sodium Chloride (Table Salt)

Sucrose (Sugar)

Detergent

Sodium Bicarbonate (Baking Soda)

Starch

Your write-up must include all of the following parts:

(Rubric points are given in parenthesis):

1. Statement of Problem (2)
2. Hypothesis (4)
3. Materials (3)
4. Procedure: Including diagrams (6) (Flowchart!)
5. Qualitative: results and observations (4)
6. Quantitative: data table using significant figures (6)
7. Conclusion/analysis of results (4)
8. Recommendations for further experimentation (2)

Clean-up:

1. Discard any of the following: papers folded or torn, any tape, any broken supply pieces experimented with but not used in the final design
2. Do not hit other participants with paper airplanes. First infraction is a warning, second is a point deduction, third is disqualification from the event.
3. Place your write-up in the middle of your station, in the appropriate order, when you are finished (up to 50 minutes allotted). Make sure each page is marked with your name and school information. Please this sheet on top of your final report.

YOU MUST BE FINISHED WITH YOUR EXPERIMENT, WRITE UP AND HAVE YOUR STATION CLEANED IN 50 MINUTES, NO EXCEPTIONS.