Mystery Powders

Summary

Five powders and five tests are provided for students to explore chemical and physical properties, changes, and reactions.

Time Frame

1 class periods of 45 minutes each

Group Size

Small Groups

Materials

For the Student: (Groups of 5)

- Hand lens
- small microscope or other viewer
- 5 mystery powders, about 1 tablespoon of each, in paper cups or zip- lock baggies labeled A, B, C, D, and E.
- Baking soda
- Cornstarch
- Plaster of Paris
- Sugar
- Salt
- 3 substances in jars with lids (One or two drops of each liquid will be mixed with each powder)
- Iodine
- Water
- Vinegar
- Heat source (votive candle is good)
- 1 metal lid without a plastic liner (such as the lid from a soup can)
- 1 clothespin
- 3 eye droppers
- 5 sheets of aluminum foil
- 'Mystery Powders' directions and recording sheet for each student.

NOTE: Cafeteria trays or ice cream buckets provide an excellent way of passing out complete lab setups to each group.

Background for Teachers

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 kinds of matter have different properties from the old matter. Evidence of a chemical change may include production or use of energy such as heat or light, the new production of a gas or solid, or a change in color.

The five 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:

Baking soda fizzes with vinegar (chemical reaction).
Cornstarch turns black with iodine (chemical reaction).
Plaster of Paris turns hard and warm with water (warm: chemical reaction; hard: physical change).
Sugar turns brown, then black with heat (chemical reaction).
Salt tastes salty; sugar, sweet (physical change).
Sugar and salt dissolve in water (physical change).
Iodine changes powders to its own color, but not a new one (physical change).

Intended Learning Outcomes

1. Make observations.
2. Collect, record analyze data.
3. Seek and weigh evidence.
4. Solve problems using scientific principles.
5. Draw inferences.

Instructional Procedures

Step 1. Divide the students into groups of 5. Explain that two observations will be made in these experiments.
a. Physical properties
b. Physical changes and chemical reactions.
Step 2. Each group should have a copy of the directions and the recording sheet. [See Mystery Powders Lab Directions and Recording Sheet attached below.]Before giving students directions, remind them about care in experimenting. Never taste unknown substances .
Step 3. After the investigation, discuss with the class their observations in the two areas:
a. Physical properties
b. Physical changes and chemical reactions.
Step 4. After group comparison of results, provide each group with a mystery sample and see if they can identify it.

Assessment Plan

Step four may be used as an assessment.
Show the children sugar and Kool-Aid. Instruct them to describe the physical properties they observe. Mix the two. Ask them to identify it as a physical or chemical change. Instruct them to justify their answer. Show students vinegar and baking soda. Instruct them to describe the physical properties. Mix the two. Tell them to identify the result as a physical or chemical change. Instruct them to justify their answer.

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