

# Mystery Powders

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**Date:** December 16, 1999

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**Grade Level:** 5

**Subject(s):**

- Science/Chemistry

**Duration:** Three 60-minute sessions

**Description:** Students will learn about chemical and physical reactions through their investigation of several mystery powders.

**Goals:** Students will learn about scientific procedure as well physical and chemical reactions. This will be completed through their exploration of mystery powders.

**Objectives:** Students will be able to:

1. use touch, smell, sight, and hearing to hypothesize what they think each unknown powder is.
2. work as a team to gather and record information.
3. recognize unique characteristics of each unknown powder.
4. complete each experiment in a safe and responsible manner.
5. explain the concept of change, both physical and chemical.

**Materials:**

- four unknown powders (sugar, salt, baking soda, and corn starch) in a plastic bag labeled A-D (one per group)
- magnifying lenses
- plastic cups

**Procedure:**

*Scientific Explanation:*

How could we find the identity of an unknown powder? We can experiment using different variables. These variables may include water, iodine, vinegar, a heat source, a magnifying glass, and our senses, among others. We use these known resources to identify unique characteristics of an unknown substance in order to come to a conclusion about what each substance may be.

*Focus Phase:*

Instruct the students to fill out prediction sheets about what they think each substance is. The students may explore using the magnifying lens and four of their senses (touch, sight, smelling, and hearing). Be sure to remind the students that they should never taste an unknown substance, even if they think they know what it is. After the directions have been given, hand out the four bags of unknown powders (labeled A-D) to each group.

*Challenge Phase:*

How can we find the identity of an unknown powder? Remind students of the importance of keeping the powders separate. Before the students begin, again stress the importance of safety while conducting their experiments. Model the procedure of the first experiment for the class. They are to put three scoops of the unknown powder into the plastic cup with the corresponding letter. Also tell them that after each experiment they need to clean and dry their materials thoroughly before starting the next experiment. Pass out the first data recording sheet stressing the importance of carefully following the directions. All of the directions for each experiment are carefully laid out on each data recording sheet. After the students have read the directions and made their hypothesis, they need to raise their hand so the teachers can pass out the materials. When a group has finished an experiment, they need to raise their hand so the teacher can inspect their previous experiment and give them the next data recording sheet. Move around the room helping students with any questions that might arise. When the students begin with the heat test, enforce the rule that no student is allowed to leave their seat; the teacher will act as a runner for the groups. Also remind students to wash their hands and equipment after each experiment. Don't be afraid to model any of the experiments for the students.

*Concept Introduction Phase:*

After the students have finished their investigation, call the class together for a discussion of their findings. Create a data table on the board including the powders, their properties, and their unique characteristics. Have the students look at their data and answer questions:

*What happened when vinegar was added to the powders?*

*Did all of them have the same response?*

*What happened when iodine was added, etc.?*

*Why do you think this happened?*

*Were your initial predictions correct? How were they different?*

*What were the true identities of mystery powders A-D?*

*What clues did you use to find the correct answer?*

*What clues from your first guess made you think it was something it wasn't?*

Introduce the concept of change. Acknowledge that all of the powders changed in some way. Explain what indicators, chemical reactions, and solutions are. An indicator is something that produces an observable physical change but still retains its original form. Some of these changes may include the appearance or disappearance of a color. Ask the students if any of the variables were indicators. If so, how do you know? A chemical reaction occurs when the original substance changes form into a new substance. For instance, a solid could turn into a liquid, a gas or vice versa. Some clues to a chemical reaction may include bubbles, smoke, a strong smell, or a sizzling sound. Ask the students if any of the powders went through a chemical reaction. How do

they know? What were the clues? A solution is when one substance mixes with another and dissolves. Ask if anyone noticed any solutions during their experiment. How do they know?

*Concept Application:*

Explain to students that they will be given a mystery mixture of at least two powders. They need to test the mixture using the same procedure as the previous experiments. Model the analysis of one mystery mixture for the students. Pass out mystery mixture Z. Instruct students to use the information they learned in previous experiments to find out the composition of the mixture. They may use any experiment(s) they want. Students also need to note what kind of change took place in their experiments, if any. Students may refer to the powder table on the board to help them in discovering the characteristics of the mystery mixture.

**Assessment:** Evaluation will be based on the following: each group's knowledge of the scientific method, observing how each member of the group performs each step of the experiment, and the data that students recorded. Points will also be given to groups who share the work evenly, stay on task, and follow the safety procedures. The primary assessment focus will be targeted towards the group's analysis of the mystery mixture. This will be a concluding task that will include all aspects of the previous experiments.