

Unknown Powders

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Subject: Chemistry

Grade Level: Grades 3-6

Standards: Next Generation Science Standards (www.nextgenscience.org)

5-PS1-3 Make observations and measurements to identify materials based on their properties.

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Schedule: 2-3 45 minute lessons

CCMR Lending Library Connected Activities:



<p><u>Objectives:</u></p> <p>Observe various reactions of white powders and use the observations to identify the powders in an unknown mixture</p>	<p><u>Vocabulary:</u></p> <p>Chemical Reaction Chemical Change Solution Mixture</p>
<p><u>Students Will:</u></p> <p>Understand the signs of a chemical change.</p> <p>Perform drop-by-drop reactions of various white powders with universal pH solution, vinegar, baking soda solution, and iodine.</p> <p>Make observations of the powders reaction with different solutions.</p> <p>Use their observations to determine the composition of a mixture of 2 unknown white powders.</p>	<p><u>Materials:</u></p> <p>For Each Group (3-4 students)</p> <p>___ Paint well ___ Toothpicks ___ Magnifying lens</p> <p>For 2-3 Groups</p> <p>___ Cups for pH indicator, vinegar, and baking soda solution ___ Eyedroppers</p> <p>For Class</p> <p>___ Baking powder ___ Sugar ___ Baking soda ___ Borax ___ Cream of tartar ___ Flour ___ Alum ___ Vinegar ___ Iodine ___ Universal pH solution</p> <p>For Teacher</p> <p>___ MSDS sheet for Iodine ___ MSDS sheet for Universal pH indicator</p>
<p style="text-align: center;">Safety</p>	<p>Iodine and Universal pH solution can be an irritant if gotten in eyes or on skin. Please see MSDS sheets for each.</p>



Science Content for the Teacher:

Your students will be trying to identify chemical reactions. A chemical reaction is when two or more substances interact. By breaking and reforming bonds, they form new substances. With the baking powder and water demo, you are combining baking soda(base), cream of tartar(acid) and water. The water dissolves the acid and base and allows them to react. The reaction causes a new substance to form, carbon dioxide.

You can tell if there was a reaction by looking for signs of a chemical change. The 4 signs the students will encounter are: bubbles, energy/light, odor, and color. In the baking powder reaction, there are bubbles being given off that tell you that a chemical change is occurring.

A physical change causes the substance to change appearance (ice to water), but the substance has not changed (it is still water).

A mixture is a combination of two or more different substances, but they do not combine chemically. A solution is when two or more substances are evenly mixed. In this one substance dissolves in another. The baking soda solution the students will use is a good example. The water dissolves the baking soda so that it evenly mixes with the water.

Classroom Procedure:

Before the Class:

Prepare a solution of water and baking soda. Pour vinegar, pH indicator, and baking soda solution into cups. Photocopy lab sheets.

Prepare unknown powder mixtures before the second part of the experiment.

Engage:

As a class or in groups, add some water to a small amount of baking powder. Observe and discuss.

Explore:

In groups, have students experiment to observe how each powder reacts with the 4 solutions. They will record their observations.

Explain:

Have each group explain their results:

What are two powders that look very similar?

How can you tell those two powders apart?

Which powders do you think would be the hardest to tell apart? Why?



Experiment:

Give each student group a mixture of two unknown powders. Have them test with the reactants and use their prior observations to try to figure out what the powders are. Some good combinations to use are:

Mixture	Observations
Sugar/Cream of Tartar	pH will be orange/red because sugar will not change acidity
Cream of Tartar/Baking Soda	pH will turn green because they neutralize each other. Will bubble for both baking soda solution and vinegar.

Resources:

"Using Chemical Change to Identify an Unknown - Middle ..." 2011. 5 Feb. 2016
<<http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson6>>



Assessment:

The following rubric can be used to assess students during each part of the activity. The term “expectations” here refers to the content, process and attitudinal goals for this activity. Evidence for understanding may be in the form of oral as well as written communication, both with the teacher as well as observed communication with other students. Specifics are listed in the table below.

- 1= exceeds expectations
- 2= meets expectations consistently
- 3= meets expectations occasionally
- 4= not meeting expectations

	Engage	Explore	Explain
1	Shows leadership in the discussion and lab. Makes excellent observations and inferences.	Completes work accurately while providing an explanation for what is observed. Works very well with group.	Provides an in depth explanation of findings. Fills out worksheet clearly.
2	Participates in the discussion and lab. Makes good observations and inferences.	Completes work accurately and works cooperatively with group.	Provides clear explanation of findings. Fills out worksheet clearly.
3	Contributes to the discussion and lab, but does not make very good observations and inferences.	Works cooperatively with partner, but makes some mistakes with the procedure.	Provides a limited explanation of findings. Fills out some of the worksheet.
4	Does not participate in discussion or lab. Makes no observations and inferences.	Has trouble working with partner. Does little to complete the procedure.	Is not clear in explanation of findings. Does not fill out worksheet.

