

Baggie Science

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Grade Level(s): 3, 4, 5

Subject(s):

- Science/Chemistry

OVERVIEW: This activity introduces students to the idea of chemical reactions. As student teams work together the excitement mounts as they watch changes occur when the chemicals inside their zip-lock bag are mixed. The bag gets hot, inflates with gas, the bubbling contents change color and the liquid turns cold, all within a matter of minutes. The task then becomes one of designing and conducting a series of experiments to determine which variables produce the different reactions.

PURPOSE: This activity teaches students to observe, experiment, and make inferences.

OBJECTIVES: Students will be able to: Observe changes and design experiments to explain observations.

ACTIVITIES: Tell students they will be doing an activity involving a chemical reaction and then designing some experiments of their own. For the first part of the activity they will need to observe very carefully. Give teams of students 5-10 minutes to use all their senses EXCEPT TASTING to write down observations such as "looks like small styrofoam moth balls" or "has a strong odor". Write down observations on the right side of the worksheet. Demonstrate procedure outlined on Chemical Reactions sheet, but don't spill the bromothymol blue. Discuss leveling off teaspoon to get consistent measurement. Tell students the reactions will happen quickly so they will have to concentrate and watch closely. Write down reactions on the bottom of the worksheet. WARNING!! Excitement is high! Students are amazed at the reaction. They will want to repeat the experiment 3-4 times to validate the sequence of reactions. At the end of class period gather students back together and list reactions on the board. Reactions should include:

turns blue
turns green
turns yellow
gets cold
gets hot
forms gas

During this session students will design and test experiments to determine which variables caused the different reactions. Summarize the results from the last session. Ask students what they think caused the fizz and bubbles? What caused it to get hot? What caused the gas to form? Note that three things went into the baggie, two dry chemicals and one fluid. Ask them how they could design experiments to test the variables. List ideas and discuss. Select one of the students'

ideas and show them how to write it down. For example, "If you mix everything but the baking soda, it will get hot." $\text{CaCl}_2 + \text{bromo blue} \rightarrow \text{hot}$. Challenge students to design experiments by combining 2 variables and recording results. Which reactions are dependent on the combinations of all 3 variables? Gather the class together at the end of the session to go over the results.

RESOURCES: The following quantities are enough to conduct each activity 2-3 times with a group of 30 students.

1. 1.5 lbs. sodium bicarbonate (baking soda).
2. 3 lbs. calcium chloride - purchase at chemical supply house, at some hardware stores (ask for "road salt"), or borrow from local high school.
3. Bromothymol blue - concentrate to make 1 gallon.
4. 5-6 plastic zip-lock bags per student team.
5. 5-6 plastic vials per team - go to the photo store and ask for the clear plastic 35 mm film containers.

For each team set up a tray with:

1. Calcium chloride - CaCl_2
2. Sodium Bicarbonate - NaHCO_3
3. Bromothymol Blue
4. 10 ml graduated cylinder

TYING IT ALL TOGETHER: Adapted from [Chemical Reactions, GEMS](#), ; Lawrence Hall of Science, U of Calif., Berkeley, CA and article "The Baggie Problems", Scott Bowler, Catlin Gabel School, Portland, OR.