

West Side Science Club – Event # 6– “Precipitation Reactions”

Original Presentation

Date: 19 January 2013
Time: 10 am to 12 pm
Site: West Side Science Club

Attendance: Mentors – Ben, Levi, Paul, Anna, Emma, Dylan, Harry S., Kim, Bridgett, Carolyn
Students – Diana, Catherine, Allison, Itzel, Emily, Melissa, Daisy, Adrian, Andres, Sam and Krisofer.

Big Questions

- These questions are meant to frame the day’s event and might be written on the chalkboard
 - (1) What is an element?
 - (2) What is a reaction?

Concepts

- Concepts to cover from the “Work of CCI Solar” Mind Map: Reactions- precipitation, color change, rate, starting materials, products

Lesson Plan

Student Objectives

- Mess around with cool chemistry mixing
- Gain practice and awareness of basic chemistry techniques and equipment
- Introduce reactants and products including that chemical reactions are one way to make new materials
- Introduce the Periodic Table

Schedule/Agenda

- Review: Event # 5– “Making glow sticks (5 min.)
- Activity: Precipitation reactions (1h 45 min.)
- Wrap-up (10 min.)

Materials

Activity: Precipitation Reactions

- "Ca" Calcium nitrate
- "Cl" Potassium chloride
- "Ba" Barium nitrate
- "I" Potassium iodide
- "Cu" Copper(II) nitrate
- "P" Potassium phosphate, dibasic salt
- "Fe" Iron(III) nitrate
- "O" Potassium hydroxide
- "Pb" Lead(II) nitrate
- name tags for elements
- periodic table printouts
- empty vials
- pipettes
- DI water in wash bottles
- Waste container

Safety

- Lab goggles and gloves to be worn the whole activity. All waste and rinses to be collected in a satellite waste container, not to be thrown down the drain!

Review of Previous Event: Making Glow Sticks

- Recall the activity: Making waves and wavelengths/ color/ energy connection, light is energy, making glow sticks

Facilitation Questions

- How did you make the glow sticks?
- What vocabulary can you recall from the reaction of making glow sticks?

Activity: Precipitation reactions

Procedure

0) *Everyone* puts on safety glasses and gloves

1) Each student will select a vial that contains a pure, solid sample of one of the following salts:

"Ca"	Calcium nitrate	"Cl"	Potassium chloride
"Ba"	Barium nitrate	"I"	Potassium iodide
"Cu"	Copper(II) nitrate	"P"	Potassium phosphate, dibasic salt
"Fe"	Iron(III) nitrate	"O"	Potassium hydroxide
"Pb"	Lead(II) nitrate		

- Paul will prepare two samples of each salt. Any extra vials can be taken by mentors.

2) Each student will pick up a corresponding adhesive name tag listing their element.

3) Each student will be issued a clean Pasteur pipette and pipette bulb.

4) Each student will dissolve her sample in ~10 mL of deionized water using her Pasteur pipette. This volume is about half the capacity of the vial.

- Students should record observations in their notebooks. Some samples will change color or heat up.
- Students should be careful not to contaminate their table's stock of deionized water. (Just squirt the water into the sample—don't touch the sample with your pipette!) Contamination will lead to undesired observations when contaminated solutions are mixed.

5) Each student will place his entire vial of stock solution in a cup to protect the vial from getting knocked over accidentally

6) Each student will roam around the room and find a partner. The first student will place a small portion (0.5 to 1 mL) of her solution into a washed vial, then the second student will squirt a small sample of his solution into the same vial. Students will use their notebooks to record their partner's name, element, and the results upon mixing the solutions.

- Prevent contamination: tell the students to squirt their samples into the vial without touching the other solution. If a Pasteur pipette becomes contaminated with two different solutions, collect it into a waste bag and issue the student a new pipette, or wash the pipette into a waste container with the squirt bottle of water.

7) Use a squirt bottle with deionized water to wash out the mixing vial into a waste container for re-use between two new partners.

Wipe up spills immediately! Do not put samples down the drain! Do not taste anything! Do not put gloved fingers in your mouth!

8) Clean up: Collect all glass in a waste bag. Transfer all solutions into waste bottles. Clean tables with Windex and paper towels. Make sure students do not save anything, including vials or gloves.

Facilitation Questions and Concepts

- Here are the expected results

	Ca	Ba	Cu	Fe	Pb	Cl	I	P	O	
Ca	x	x	x	x	x	x	x	●	●	
Ba	x	x	x	x	x	x	x	●	x	
Cu	x	x	x	x	x	x	★	●	●	

Fe	x	x	x	x	x	x	x	●	●	
Pb	x	x	x	x	x	●	●	●	●	
Cl	x	x	x	x	●	x	x	x	x	
I	x	x	★	x	●	x	x	x	x	
P	●	●	●	●	●	x	x	x	x	
O	●	x	●	●	●	x	x	x	x	

- x = no observed change
- = precipitate forms
- ★ = precipitates CuI and releases I₂

- Things to keep in mind:
 - Technique/skills. These students don't have experience pipetting. Review the technique and how not to contaminate your pipette or make a mess.
 - When you mix two things and something observable happens, often a chemical reaction has occurred. Chemical reactions are how scientists can make new materials.
 - Have students locate themselves on the periodic table. Do they notice any trends about elements close together or in the same group/family? Do they notice differences/exceptions?
 - When two partners with identical solutions mixed, did anything ever happen? Why not?
 - What if I wanted to isolate the solid product? When a solid forms, what happens when you let the mixture stand (without agitation)? Can you remove the water on top to leave relatively pure solid?
 - Terms: pipette, bulb, vial, mixing, periodic table, element, salt, solution, reaction, product, precipitate, "no reaction"

Check for Understanding

- What do you think is happening when the chemicals are mixed?
- Which reactions "work" and which don't? What do you think is going on?
- Where do your materials fall on the Periodic Table? What are the similarities between other reactions and materials on it?