Prompting Questions
Actions to be Performed
"Suggested phrasing"
Curriculum Connections to be emphasized
Hands-On activity for students
- Extra Information

Chemistry Lab At Home Outline

Supplies:

- 1 Empty plastic water or soda bottle for each student.
  - Corresponding bottle cap with a hole punched or drilled through.
- Baking Soda
- Vinegar
- ½ cup measuring cup
- Funnel (optional but recommended).
- Tablespoon
- Toilet paper

Flash in a Pitcher:

- Has anyone ever seen baking soda and vinegar react? If students have, give them a chance to describe it.
- *Ask for 3 volunteers.* Have one pour a ½ cup of water, another a ½ cup of vinegar, and the last a tablespoon of baking soda into a pitcher. *Pause before the last one to invite students to guess what will happen.*
- How might firefighters use this reaction? *Leave time for a few guesses.*
  - The reaction can be used pressurize water in a confined space.
- "Firefighters used this chemical reaction, of mixing an acid and base, in fire extinguishers like this one." *Show soda and acid extinguisher diagram.*

Atom Swap:

- What's happening on the atomic level during this reaction?
- *Show students the atoms that comprise the chemicals using the Reaction Diagram as a template. Identify the elements that are involved.*
- "This is what is happening to the atoms when you mix these 2 chemicals, also known as an acid and a base." *Draw arrows/lines showing Na and H swap. Use Reaction Diagram as a template.*
- *Circle CO2 and H2O byproducts.* Who knows what these are?
  - Carbon Dioxide and Water.
- *If you have enough people (14), act out reaction holding up signs to represent atoms.*
  - Students representing CO2 and H2O can "act" like water or carbon dioxide (aka act silly).

Fire Extinguisher Construction:

- Have students use funnel and measuring cup to pour ½ cup of water into their bottles.
- Have students use funnel and measuring cup to pour ½ cup of vinegar into their bottles.

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  - How are we going to introduce the baking soda in a way that delays the reaction long enough for us to get the cap on?
  - *Reveal your secret weapon, toilet paper.*
  - Have students use a toilet paper square and 1 tablespoon of baking soda to make a pouch. "The toilet paper buys a few second while it is dissolving to get the cap on the bottle."
  - *Have students stop here. Distribute safety glasses.*

Making a Mess:

- *Outside; set up a target.* Have students introduce baking soda pouch to bottle and quickly put the cap on. ***REPEATEDLY EMPHASIZE THAT BOTTLE IS ONLY POINTED AT TARGET.***
- Students can cover whole in cap while pressure builds. They can also shake the bottle to agitate it. One at a time, they can take aim and spray the target.
- If the group is small enough, they can try the experiment again, changing something. What did you change? Did it work better or worse?
- *Have students clean up their "laboratory."*

The Real Deal:

- * Show your students the Holloway Close Up, Holloway Patent Drawing, Holloway Patent Specification, and Holloway Extinguisher pictures.*
- Charles Holloway, the first Chief Engineer of the Baltimore City Fire Department and the organizer of the Baltimore County Fire Department, went on to invent this type of fire extinguisher (note acid is separate from soda and water mixture, opposite of Lab experiment).
- "This kind of acid and base mixture was used in chemical tanks for over 50 years."
- *Show Chemical Engine and Chemical Tank pictures.*

Aftermath:

- If your time and supplies allow, conduct the experiment again and slightly alter the amount of baking soda, water, or vinegar used to see what happens.
- *Tag the Fire Museum of Maryland if you post videos or images of your homemade fire extinguishers.*
- *Send news or images of your success to education@firemuseummd.org to receive a certificate celebrating your success.*