SCIENCE MUSEUM OKLAHOMA

CHEMISTRY DAY

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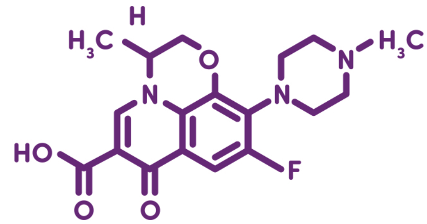

Science Museum Oklahoma and The Oklahoman present

Chemistry Day Teacher's Resource Guide

Thank you for your participation in Chemistry Day. Science Museum Oklahoma and The Oklahoman want to ensure your students' experiences continue beyond the museum. Included in this resource guide are three classroom-appropriate experiments and eight thought-provoking talking points that draw upon your students' experiences during Chemistry Day.

Eight Talking Points:

1. One experiment involved students creating and setting off rockets as a result of a chemical reaction between sodium bicarbonate, citric acid, and water. Discuss with your students:
What else might use chemical reactions to create propulsion? Which factors affected their rocket's speed and distance? How would those factors affect other propulsion devices, if at all?

2. We rely on chemical reactions to make our lives easier, especially the way we cook food, how we travel, and the products we use. Talk students through their daily activities to determine other ways in which they depend on chemical reactions.

3. During Chemistry Day, students conducted a number of experiments that created or extinguished flames. As a class, invent a hypothetical machine that uses similar types of chemical reactions to operate. What is the purpose of your machine? What kind of reactants would be needed to produce enough combustion for your machine to work?

4. During Chemistry Day, students discovered compounds that become hot or cold based on exothermic or endothermic reactions. Ask your students to envision themselves as a superhero or villain whose power utilizes these types of chemical reactions. What would their chemistry power be and why would it be beneficial?

5. Students also conducted tests for oxygen and carbon dioxide gases. Being able to identify the presence of different gases can provide valuable information for scientists. For example, volcanoes are monitored to check the gases released within magma. Knowing what gases are being released may help indicate if an eruption is eminent. Ask your students other reasons why it would be of interest to know what gases are present? What could be some implications of those findings?

6. Exothermic reactions can produce heat and may even produce explosions. Endothermic reactions are also powerful. These reactions can absorb a great deal of heat energy. Ask your students whether exothermic reactions or endothermic reactions are more powerful and why.

7. Students at the museum experimented with slime, a polymer. Synthetic polymers include rubber, polyester, nylon, and plastic. Plastics have a variety of properties, from being hard and brittle to soft and malleable. Ask your students to discuss which physical properties are more useful in a polymer and why.

8. At the reaction rocket station, the rocket launched because of trapped gas that formed during a chemical reaction. Discuss other ways to identify gas production in a chemical reaction.

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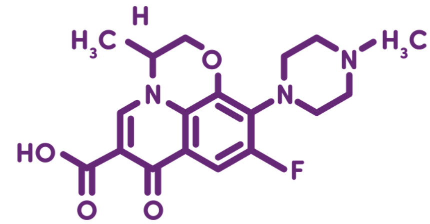


Reaction Rockets

Materials:

• White film canisters and lids
(The black ones with grey lids will not work.)
• Water
• Goggles
• Solid, level launch surface (Lunch trays work well)
• Fizzy antacid tablets like Alka-Seltzer
• Water pitchers
• Bin for wet waste
• Towels

What to do:

1. Provide and fit safety goggles.
• Ensure that students have safety goggles and that they fit property. No student should be near the launch zones until wearing safety goggles. Reaction rockets are projectiles. Water spray may contain parts of the tablet which should not come into contact with eyes.

2. Prepare level area for launch.
• The area will be wet after launch, so ensure that carpeting can be protected and that there are no breakables overhead. (Rockets can launch more than twenty feet under the right conditions.)
• Open packets of Alka-Seltzer.

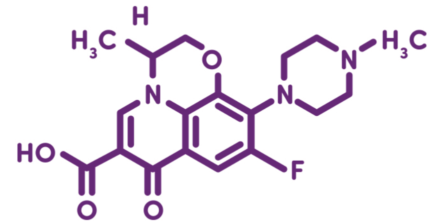
3. Provide students a launch tutorial.
• Demonstrate how to secure cap on film canister. Flip the canister lid side down, and place on launch site quickly.
• Have students practice securing cap and flipping the canister lid side down.
• Students will need to designate a safe zone about 10 feet from the launch site. After securing the lid and flipping the canister lid side down, students should quickly move into the safe zone.

4. Add water.
• Instruct students to fill their film canister with their desired amount of water.
• Students may experiment with using varying amounts of water in each canister to see which travels the highest.
• Students may document the levels of water and chart results.

5. Dispense fuel (fizzy tablets).
• Instruct each student not to add fuel until it is time to launch.
• Give each student approximately half of a tablet.
• If the students are documenting water levels and launch heights, have them design a table that will help them share their results.

6. Assist students with launch.
• Review the cap and flip procedure once more. Remind students to step into the safe zone.
• Have students add the tablet to the water, quickly secure cap, and flip the canister lid side down.
• Launches are more effective if more than one can be launched at a time for comparison.

What's happening?
Water allows the sodium bicarbonate and citric acid in the fizzy tablet to combine, creating a chemical reaction. A number of things can indicate that a chemical reaction is taking place. There may be a temperature change, a color change, or something entirely new might form. In this case a gas, carbon dioxide, forms when the substances combine. Like bubbles in soda, this gas travels as bubbles to the top of the water. If left uncapped, this gas expels harmlessly into the air. However, when the cap is secured, the gas has no way to escape and pressure builds up inside the container. Eventually the pressure exceeds the force that holds the cap to the film canister. This pressure propels the film canister upward.



Ooblek

Materials:

- Corn starch
- Bowl
- A rinse tub with water
- Water
- Towels

What to do:

1. While stirring, slowly add water to the cornstarch in a bowl.
- Add water a little at a time, making sure to stir in corn starch completely.
- Keep adding water until the consistency is about that of honey when dripping off of spoon or hand.

2. Allow students to experiment with the "ooblek."
- Assure students that ooblek is merely cornstarch and water, it will not stain or damage most clothing.
- Demonstrate that under pressure the substance resists movement like a solid object would. When not under pressure the substance flows freely and retains the shape of its container like a liquid. This is the primary property of a non-Newtonian fluid.
- Ooblek dries quickly. You may need to add small amounts of water throughout the duration of the experiment to keep the correct consistency.

3. After students have finished experimenting with the ooblek, help them remove the greater part of it from their hands and use the rinse tubs to wash the rest of the corn starch off.

4. Encourage students to wash hands.

5. Dispose of cornstarch in the trash. Do not attempt to pour down sink.

What's happening?
Ooblek is a suspension. The cornstarch does not dissolve in the water but instead the molecules are suspended in water. Due to the shape of the starch molecule, when you apply pressure the molecules hook together like Legos and the goo reacts like a solid. When you stop applying pressure, the molecules are able to drift apart in the water, allowing the substance to behave like a liquid again. These are the properties of a non-Newtonian fluids.

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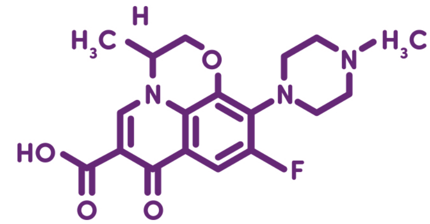

Homemade “Lava” Lamp

Materials:

- Clean and dry soda or water bottle
- Vegetable oil
- Fizzy antacid tablets like Alka-Seltzer
- Water
- Food coloring

What to do:

1. Remove label from clean and dry clear bottle. Remove lid from bottle.

2. Fill bottle ¼ full of water.

3. Add three drops of food coloring to water.

4. Fill the remainder of the bottle with vegetable oil (leaving only a little bit of space at the top).

5. Break one fizzy tablet into six to eight pieces.

6. Simultaneously drop all pieces of the fizzy tablet into the bottle. An immediate chemical reaction will occur. Return lid to bottle.

What’s happening?
Oil and water do not mix or dissolve in one another. This is called immiscibility. Immiscible means incapable of being mixed or blended. The more dense colored water stays in a layer underneath the less dense oil. Since food coloring is water-based, it mixes well with the water but not the oil.

The main ingredients in fizzing antacid tablets are sodium bicarbonate and citric acid. The water breaks down the tablet creating a chemical reaction, releasing carbon dioxide bubbles through the water and into the oil. This is what causes the “lava lamp” effect. The released bubbles carry small amounts of water with them as they are formed. When the bubbles reach the top of the water, they continue up through the oil to escape. The bubbles bring water with them through the oil. When the bubbles reach the top, they burst and the water sinks back to the bottom creating the effect of a lava lamp.