WOW at Home Lesson Plan

When Life Gives You Lemons, Make Lemon Volcanoes and Lemonade

Program Duration:
30-45 minutes

Recommended Grade Levels:
Grades K-5

Materials Needed:

- Lemons
- Drinking Glass
- Water
- Baking Soda
- Sugar
- Knife and cutting board
- Popsicle/craft sticks
- Food coloring
- Dish soap
- Large dish/plate

Learning Objectives

Students will be able to identify and apply the acidic properties of lemons and citrus fruits.

Preparation

- Discuss with your child the taste of lemon juice and why they think it has a sour taste
- Ask them what they think soap will do in a chemical reaction
- Ask them what they think is inside of soap bubbles
- Ask them what they think baking soda will do with acid
- Discuss with them what carbon dioxide (CO_2) is and what it does in a liquid

Background

Chemical reactions occur between substances that have compatible chemical properties. A common type of reaction is an acid-base reaction, in which an acid reacts with a base with an exchange of hydrogen ions, or protons. A well-known acid-base reaction is the combination of baking soda (base) and vinegar (acid), which results in a 'volcanic' eruption! Citrus fruits contain an acid called citric acid, which give them their sour taste. Citric acid can react with bases to make a chemical reaction. Therefore, a combination of baking soda (base) and lemons (acid) will produce a similar reaction to that of baking soda and vinegar. In these experiment, we will combine citric acid and baking soda to make a fun, bubbly chemical reaction and a yummy drink!

Activity

Lemon Volcano

1. Roll and squeeze the lemons with your hands to release some juice inside
2. Have an adult cut the lemons in half and place them in the large dish/plate
3. Use a popsicle/craft stick to poke the lemons more to release more juice
4. Add a few drops of food coloring to the surface of each lemon, then add a few drops of dish soap
5. Add a generous layer of baking soda to the top of each lemon; you will start to see the reaction start in the form of bubbles
6. Use a popsicle/craft stick to poke the lemons more to release more juice to react with the baking soda
7. Watch as the lemon volcanos produce colored bubbly reactions!

Make Lemonade Fizzy

1. Squeeze all the juice you can from a lemon into a glass.
2. Pour water until there is an equal amount of water to lemon juice.
3. Add a teaspoon of baking soda and stir.
4. Add some sugar to make the mixture sweet and taste!

Additional Questions

1. What other fruit could you use for a similar experiment?
2. How can you make different colors by mixing the food coloring?
3. Can you change how bubbly the lemonade will get? If so, how?

Summary

In these reactions, the citric acid from lemons and baking soda (sodium bicarbonate) reacted to release carbon dioxide gas and sodium citrate as byproducts. As a result of the released carbon dioxide, we were able to visualize bubbles in both the volcano and fizzy lemonade. These are the same bubbles you find in most sodas! To visualize the release of gas while making the lemon volcanos, we added dish soap to trap the gas in bubbles and make a foam. The dish soap made fun bubbles in our experiment, but scientists sometimes use a similar idea in their experiments. Since it can be hard to see a chemical reaction happen with our eyes, scientists will use a method of detection, just like our soap bubbles! These fun experiments can also be done with different fruits; since the citric acid is the acidic part of the reaction, any fruit with citric acid could be used in place of lemons. Other citrus fruits include limes, oranges, and grapefruit.

Acid-base reactions occur all around us in cooking, industry, and pharmaceutical production. For example, antacids are medicines that are bases and react with stomach acid to reduce pain, reflux, and ulcer pain. Further, venom from bee stings is acidic, and a base like milk of magnesia can react with the venom to reduce pain and swelling! Try to think about different types of chemical reactions in your everyday life and if any of them could be similar to an acid-base reaction.