



FIZZY LEMONADE



Fun Facts:

- The first record of lemonade is from the 12th century in Egypt. Bottles of quatarzimat (lemon juice mixed with sugar) were sold in the markets. You can read more about the history of lemonade here.
- Lemons are a great source of Vitamin C! During the Age of Sail, lemons and other citrus fruit were taken on long sea voyages to prevent scurvy.
- Baking soda is used to make baked goods like cookies and banana bread rise.
- Lemons taste sour because of acetic acid in their juice. Baking soda is a base. When acids and bases are mixed together, they react (cause a change to happen).
- Water is neutral – it is neither an acid nor a base. It does not react in this experiment.

Materials:

- Glass, preferably clear
- Measuring spoons
- Sharp knife*
- Juicer (optional)
- Spoon
- Pitcher or glass
- Two lemons**
- Water, room temperature.
- Baking soda
- Sugar or other sweetener
- Ice (optional)



*Some adult assistance may be needed throughout.

**You will need two lemons for each glass you make. If you don't have fresh lemons, you can substitute 6T of lemon juice per glass.

Procedure:

1. Fill the pitcher with water and let it sit until the water reaches room temperature.
2. Roll the lemon on the table or countertop, applying gentle pressure. This will make it easier to get all the juice out.
3. Cut the lemon in half, width-wise (you should see a circle). Younger scientists should ask an adult for help.
4. Squeeze as much juice as possible into the glass. Use a juicer or the spoon to help you, if you need it. Use the spoon to remove any seeds that may have fallen in.
5. Taste a drop of the lemon juice. How does it taste?
6. Add an equal amount of water to the juice. Taste your mixture (just a tiny sip!). Does it taste different than just the juice? In what way?
7. Add 1/2 teaspoon baking soda to your mixture. Stir it with your spoon. What do you see and hear happening?
8. Stir in 1-2 teaspoons of sugar or other sweetener into the mixture. Taste it now. How does it taste? How does it feel in your mouth? On your nose?
9. Sip and enjoy your fizzy lemonade. Add some ice if you want a cold drink!

Extensions:

- Let your mixture sit for an hour and taste it again. Does it taste the same? How is it different? Why do you think that is?
- Does cold affect the fizz? How about heat? Try again, this time with one glass that is chilled in the freezer, one at room temperature, and one that has warm water in it (until you're ready to use it!).
- What other drinks can you make "fizzy"? Orange juice? Iced tea? Milk? Grape juice? Why do you think some worked? Why do you think some didn't? Did any surprise you?

What's Happening Here?

When the baking soda and lemon juice are combined, they react, releasing bubbles of carbon dioxide into the lemonade. This is the same thing that gives soda pop its fizz. If it is allowed to sit, the bubbles of carbon dioxide will escape the mixture and, just like soda pop, it will go flat.

Like most chemical reactions, the reaction happens faster when heat is added. That's why the warm glass reacted faster than room temperature, and the cold glass reacted more slowly.

We can measure how acidic or basic mixtures are using the pH scale. It ranges from 0 to 14. The lower the number, the more acidic the mixture. The higher the number, the more basic it is. Mixtures with a score of 7 fall right in the middle of the scale and are neutral – neither acidic nor basic. Most drinks we consume are either neutral or acidic. Some may be slightly acidic, but do not have enough acid to react with the baking soda and "fizz".