TEACHING GUIDE: EXPLORING ACIDITY

Level: Easy!
Duration: 15-20 minutes
Unusual Materials: None – all standard kitchen materials
Remember to record your experiment in a lab notebook! Download yours at www.FoodScienceSecrets.com

Purpose: Familiarize your student with the terms "acid" and "acidity," and demonstrate fun acid/base reactions!

Objectives: By the end of this lesson, your student will understand:

- Why acidity is a key principle in food science
- The pH scale, and where acids and bases fall on the scale
- How the acidity of different ingredients compares
- Additional objectives: use the scientific method to practice STEM skills such as: critical thinking, problem solving, data collecting and interpretation

EXPERIMENT

Start with these questions:

What is an acid? Can you name any acidic foods?

Background:

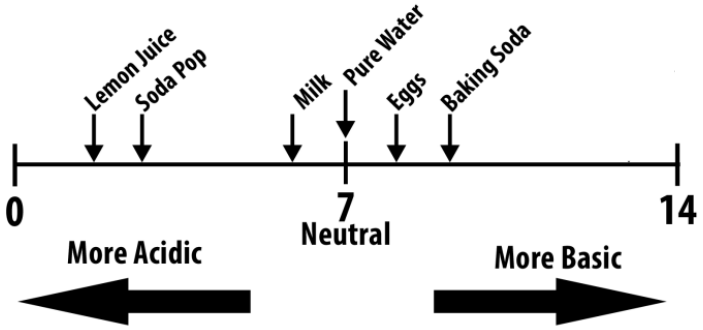
Most people recognize "acidic" ingredients by their sour taste. Vinegar and lemon juice are two common kitchen ingredients that are considered acidic, but the acidity of some ingredients may surprise you! Why is it important to understand acidity?

Acids and bases are at the foundation of food science. When a food scientist makes a new food product, the acidity of that product is important for many reasons. Two major reasons food scientists care about acidity are:

1. Acidity affects the flavor of a product. A more acidic product usually tastes more sour than a product with less acidity. Sometimes it's good if a product tastes sour, and sometimes not!
2. Acidity affects the shelf life of a product. (Shelf life is how long a product will last before it "goes bad.") A product with higher acidity can maintain a longer shelf life (last longer) than a product with less acidity because most harmful bacteria prefer to grow at neutral (or slightly acidic) pH.

A food scientist is expected to develop a product that tastes good, and is safe and stable over time.

The pH scale (shown below) is a tool that food scientists use to determine the acidity of a food. The pH scale ranges from 1-14, where a pH of 7 is considered "neutral." A higher pH indicates the item is more basic. Foods with a higher pH have less acidity. A lower pH indicates the item is more acidic. Foods with a lower pH have more acidity.



Materials needed:

- White Vinegar
- Baking Soda
- Different liquid ingredients to test: water, lemon juice, milk, soda, fruit juice, buttermilk, honey, etc.
- Pipettes
- A large, clear container for mixing the baking soda with the various kitchen ingredients. Clean, clear, empty soda bottles or jars work great.
- Smaller containers for the "test" samples of liquid kitchen ingredients
- Baking sheet, or dish (to catch the mess!)
- Food Coloring (not required, but makes the experiment more colorful)

Procedure:

1. Set up your station!

a. Put the baking sheet on a table or work surface. Place the large, empty container (for mixing) and the smaller containers (for the vinegar and other test ingredients) on the baking sheet.
b. Add a few tablespoons of baking soda to the large container.
c. Add white vinegar to another container (and if using, mix food coloring into the vinegar). In separate containers, add the other "test" ingredients (lemon juice, milk, soda, fruit juice, buttermilk, honey, etc). Note: If you don't have enough containers for all tests, that's okay. You can wash a container then repeat with a different test.

2. Use the pipettes to add a little vinegar to the baking soda. *Explain to your scientist that baking soda is a basic ingredient, and vinegar is an acidic ingredient. Show them where each ingredient falls on the pH scale. Note the reaction that occurs: when mixed, the vinegar and baking soda should bubble and foam. Larger amounts of vinegar and baking soda will create a more intense reaction.*
3. When finished with the vinegar, clean out the baking soda/vinegar mixture in the large container and begin again. Add more baking soda to the container get ready for the next "test" ingredient.
4. Begin experimenting! Use the pipettes to add each liquid to the large container with baking soda. *Encourage your scientist to experiment with different amounts. Show your scientist where each ingredient falls on the pH scale. Note how each ingredient reacts differently with the baking soda. Discuss which kitchen ingredients are more acidic or less acidic.*

Observations: *(Record all observations in a lab notebook!)*

- What happened when vinegar was added to the container with baking soda?
- What other ingredients did you experiment with? What happened when these ingredients were added to baking soda?
- Which liquids created the strongest reactions with the baking soda?

Discuss with your scientist what they see, hear, smell, etc. All observations are important! Encourage your scientist to record their observations in a way that makes sense for them. Draw pictures, make notes, graph, and/or describe their observations to a scribe (you)!

Conclusions:

Why did different ingredients react differently?

Review what was learned during the experiment. Discuss with your scientist how the baking soda (a basic ingredient), reacted with the vinegar (an acidic ingredient). Discuss

how the ingredients with a lower pH (and stronger acidity) create stronger reactions with the baking soda than the ingredients with a more neutral pH.

Explore more!
For more ideas on STEM in the kitchen with kids,
visit www.FoodScienceSecrets.com