



Chemical Mystery

Is it possible to change the color of a liquid without adding food coloring? From reddish to greenish, what does the color change mean about your liquid? Explore the acidity and basicity of common household items in this chemistry of pH experiment.

TEKS:

SCI 5.5 C: The student is expected to identify changes that can occur in the physical properties of the ingredients of solutions such as dissolving salt in water or adding lemon juice to water.

SCI 6.5 C: The student is expected to identify the formation of a new substance by using the evidence of a possible chemical change, such as production of a gas, change in temperature, production of a precipitate, or color change.

SCI 7.6: The student is expected to distinguish between physical and chemical changes in matter.

Materials:

- Blender
- Bowl
- ½ of a red cabbage
- 14 small clear plastic cups (for example, clear 2 ounce portion cups)
- Knife and cutting board (to chop cabbage)
- Paper and pencil
- Permanent marker
- Pipette or eye dropper
- Safety goggles
- Strainer
- Test liquids: Ammonia, baking soda in water, clear soda (7UP), finger nail polish remover, hydrogen peroxide, laundry detergent, lime juice, milk, mouthwash, orange juice, salt water, shampoo, vinegar, and water
- Water (about 4 cups)

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Safety Reminder:

Maintain good lab practices during this experiment. This means wearing your safety goggles at all times and not tasting, smelling, or touching any of the liquids. **Adult supervision is required for this activity.**

How To:

1. Put on your safety goggles.
2. Cut the red cabbage in half and chop into smaller pieces. Add your chopped cabbage to the blender. Pour enough water into the blender to reach the halfway mark (about 4 cups). Blend until liquefied. Then pour the purplish liquid through a strainer into a bowl to filter out chunks. The strained liquid will be your pH indicator. Discard the cabbage chunks. **Safety: An adult should assist when using the knife, cutting board, and blender.**
3. With a permanent marker, label the small clear plastic cups with the names of the different test liquids you are using. Fill each cup $\frac{1}{4}$ full with its designated test liquid. You should have 14 different cups if you plan on investigating all of the test liquids.
4. Use a pipette or eyedropper to add 10 drops of cabbage juice to each test liquid. Watch closely as a chemical reaction occurs and record any color changes you observe in the table below:

Test Liquid	Color Change
1. Ammonia	1.
2. Baking soda in water	2.
3. Clear soda (7UP)	3.
4. Finger nail polish remover	4.
5. Hydrogen peroxide	5.
6. Laundry detergent	6.
7. Lime juice	7.
8. Milk	8.
9. Mouthwash	9.
10. Orange juice	10.
11. Salt water	11.
12. Shampoo	12.
13. Vinegar	13.
14. Water	14.

5. If the liquid turns reddish, this means it is an acid, and if it turns greenish, it is a base. No color change means the substance is neutral. Use the table below to identify and categorize each of the substances you tested as either acidic, neutral, or basic.

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Acid	Neutral	Base

STEM Explanation:

Liquids have many properties, and one of them is pH. The pH scale ranges from 0 to 14 and tells us how acidic or basic a substance is. A 0 on the pH scale is the most acidic, and a 14 is the most basic. A pH of 7 is neutral. An indicator can be used to determine whether a liquid is basic, acidic, or neutral. Indicators change color in the presence of an acid or base. Cabbage juice is a natural indicator. In this case, liquids turn reddish if they are acidic and greenish if they are basic. No color change occurs for neutral substances.

Career Connection:

Analytical chemists use a diverse range of methods to investigate the chemical and physical properties of substances. Their goal is to identify and understand the substance and how it behaves in different conditions. They can work in pharmaceuticals, forensics, quality control, or toxicology fields.

Resources:

<http://teams.lacoe.edu/documentation/classrooms/gary/chemistry/activities/indicators.html>

<http://www.stevespanglerscience.com/experiment/48>

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