thLAB: pH PAPER

QUESTION

What are the pH values of common substances around the house?

SAFETY

Do not dip the papers into the substances you are testing to avoid contaminating them. Instead, use a toothpick or similar object to put some of the substance on the paper. Wear goggles if you use any chemicals that are not kitchen ingredients in foods.

MATERIALS

- Red cabbage - one small head
- Large glass measuring cup
- Blender - *optional*
- Chopping knife
- Microwave - *optional*
- Strainer
- Coffee filters
- Filter paper
- 2 large glass bowls
- Glass or plastic jar with lid
- Pipet or turkey baster
- Toothpicks
- Household products to test (feel free to choose your own. Refer to step 8 for some examples.)
  Note: To test solids or powders with your pH paper, you will first need to dissolve them in a small amount of water.

PROCEDURE

Some of the most important kinds of chemical s in science are acids and bases. Although you may not realize it, you use acids and bases in your home every day. You can recognize an acid because it makes food and drinks taste sour. If you have ever tasted something chalky or ever felt a liquid that feels slippery like soap, those substances are probably bases.

In this lab, you will use pH paper made from the juice of a red (purple) cabbage to test different substances to determine if they are acids or bases. Because of a chemical called anthocyanin, red cabbage juice acts as a good indicator of acid and base over a wide range of pH values. Following the procedure is a chart and photograph of “cabbage juice indicator colors”. Generally, starting from low pH to high, they go red, pink, purple (neutral), green, and yellow.

To Make the pH Paper

1. Cut a red cabbage (or purple) into pieces such that it will fit into a blender.
2. Chop the cabbage in the blender, adding the minimum amount of water needed to blend it, about 1 – 1 ½ cups, because you want the juice as concentrated as possible. *If you don't have a blender, then use a vegetable grater or chop your cabbage using a knife.*
3. Microwave the cabbage until it's at the boiling point. You'll see the liquid boil or else steam rising from the cabbage. *If you don't have a microwave, soak the cabbage in a small volume of boiling water until all the color has boiled out of the cabbage.*
4. Allow the cabbage to cool (about 10 minutes).
5. Strain the liquid from the cabbage through a strainer or coffee filter. The liquid should be deeply colored.
6. Soak a filter paper or coffee filter in this liquid, then lay it on something to allow it to dry. If the color is not dark enough, dip them again after drying, and let them dry again

   Tip: If you don't want colored fingers, soak only 3/4 of the filter paper with the cabbage juice, leaving the other 1/4 or at least a corner uncolored. You'll get less usable paper, but you will have a place to grab it.

7. Cut the dry colored paper into at least ten test strips, 2 cm x 6 cm wide, to test 8 different liquids (at least two extra in case you have an oops!)

To Test for pH

8. Choose 8 chemicals around the house. You may test liquids or solids dissolved in water. You cannot test anything that will bleach the color of the paper (peroxide,bleach, some cleaning products) or something so thick and dark that the paper cannot be seen (ketchup, barbecue sauce, etc.). Do not use any hazardous substances, such as pesticides, pharmaceuticals, poisons, or strong cleaning chemicals. Feel free to choose your own – below are some examples to get you started)
    - Orange juice
    - Vinegar
    - Soap - *dissolved in a very small amount of water*
    - Milk
    - Baking Soda - *dissolved in a very small amount of water*
    - Tums, Rolaids or other stomach antacids - *dissolved in a very small amount of water*
    - Lemon/Lime juice
    - Window Cleaner such as Windex
    - Powdered laundry detergent
    - Aspirin tablet - *crushed and dissolved in a very small amount of water*
9. Use a toothpick or pipet to apply a small amount of each of the household liquids to a different test strip and immediately record the color. The colors will change with time; record the color immediately after the test.
10. You must find at least one of each – acid, neutral, base. The pH scale ranges from acid (0-6), through neutral (7) to base (8-14).
11. Allow the test strips to dry, and then use the table and/or photograph below to arrange the dried test strips in the order from most acidic to most basic and tape them to a sheet of copy paper to include with your lab report. Label each of the strips on the paper with the identity of the substance tested and the pH of the substance. If you have questions about colors, search the Internet for other examples of colors of red cabbage juice indicators.

pH scale for Red Cabbage Juice

pH	1-2	3-4	5-6	7-8	9-10	11-12
Color	Pink	Dark Red	Violet	Blue	Blue-Green	Greenish-Yellow
Acid/Base	Acid	Acid	Acid	Neutral-Base	Base	Base

Data

In addition to the test strips that you will turn in, make an organized data table to record your observations. For each test, you should record the following data:

- Substance tested
- Color that the substance turned the pH paper
- Whether the substance is a strong acid, a weak acid, neutral, a weak base, or a strong base

Extension – OPTIONAL BONUS

If it rains any time soon, test the rain water to find out if it is an acid or a base. Include your test strip samples with your lab report and also include the data in your data table.