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### **Science Projects**

#### **Acids & Bases (Making pH Paper)**

**Difficulty:** Easy

**Safety Equipment Needed:** None. Hot pads for stove and cooking pot.

**Principal:** Use boiled red cabbage to make your own pH test paper and then check the pH of various common household liquids. Red cabbage gets its color from a chemical called “Anthocyanin.” It is also the pigment that turns leaves red or purple in autumn. Anthocyanin is a good indicator of acids and bases. When added to a base, the purplish pigment turns green or yellow. When added to an acid, it changes to pink or red. In something that is neutral (neither an acid nor a base), the paper will remain the same color (or maybe turn a little blue).

#### ***STEP ONE: Make the pH Test Strips***

##### ***Supplies:***

- Half a red cabbage
- Saucepan
- Colander or strainer
- Mixing bowl
- Wire cooking rack
- Baking sheet or aluminum foil
- Paper towels (for clean up)
- White paper coffee filters

1. Chop the cabbage into small pieces. Put the pieces in the saucepan and cover with water.
2. Heat the pan on the stove until the water begins to boil then turn the heat down to let the cabbage simmer for 20 or 30 minutes. Stir occasionally.
3. While the cabbage is cooking, cut the coffee filter paper into strips about ½” wide and 2” long.
4. Let the cooked cabbage cool slightly then pour the contents of the pot through the strainer and collect the purplish cabbage liquid in a bowl.
5. Discard the cooked cabbage. Clean up any drips because the cabbage liquid can stain.
6. Once the liquid has cooled place the paper strips into the bowl. Stir them around and then allow the strips to soak for about 5-10 minutes and until they have turned blue or purple.
7. Remove each paper strip and place on a cooling rack to dry. (You can put a baking sheet lined with paper towels under the rack to catch drips). Let the papers dry completely.

## **STEP TWO: Test pH of Common Household Liquids**

Here is the real science part of the project. Discover how different liquids change the color of the test strips depending on how acidic or alkaline (basic) they might be.

### **Supplies:**

- Test tubes and stand (or small jars) to hold liquid samples
- Liquids from around your house to test (Suggestions below)
- Red cabbage pH test strips we just made
- A worksheet to record your results

### **Experimental Procedure:**

8. Pour a small amount of each liquid into a separate test tube.
9. Dip one test strip into each test tube and place it on a paper towel next to that tube.
10. Observe any color change in the test strip after being wetted by the test liquid.
11. Keep track of your results with a worksheet. Once the used test strips are dry, you can tape the test strips onto your worksheet and record the liquid that was used for testing. Note that the colors will lighten as they dry, so make sure to write down your results before the strips dry!

Suggested liquids to test (choose 6 or more):

- ✓ Milk
- ✓ Lemon juice
- ✓ Apple juice
- ✓ Ketchup (Add 1 tablespoon to 2 oz warm water)
- ✓ Coke or some other soda pop
- ✓ Bottled water
- ✓ Soda water
- ✓ Coffee or tea
- ✓ Vinegar
- ✓ Baking soda (mix 1 teaspoon with 1 tablespoon of water)
- ✓ Dish soap or laundry detergent (mix 1 teaspoon with 1 tablespoon of water)
- ✓ Aspirin tablet (dissolve two in 2 oz of warm water)
- ✓ Eggs (whisk the yolks and whites together)
- ✓ Antacid, such as Tums (crush 2 tablets dissolve in 2 oz of warm water)

### **Discussion:**

Were you surprised by which liquids were acidic and which were an alkaline base? Many foods contain naturally occurring acids like Ascorbic Acid (Vitamin C). Aspirin is made from Salicylic acid. Soda pops contain phosphoric acid. Baking soda is made from Sodium bicarbonate.

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