

## *Red Cabbage Experiment*

### Goal

Teach students about observation making and hypothesis building.

### Introduction

Red cabbage contains an indicator molecule called flavin, which is one type of a molecule called an anthocyanin. There are several other fruits and vegetables that also include this anthocyanin. This molecule can be used to indicate whether a solution is basic or acidic through a color change.

### Next Generation Science Standards

#### Practices

- Planning and carrying out investigations
- Analyzing and Interpreting Data

#### Core Ideas

- ESS3.C Human impacts on earth systems

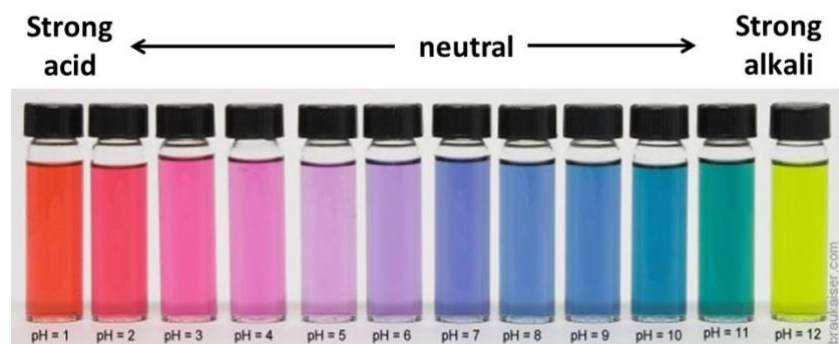
#### Crosscutting Concepts

- Systems and system models
- Influence of Science, Engineering, and Technology on Society and the Natural World

### Materials

- A small red cabbage
- Boiling pot of water
- Strainer
- Small beaker (one for each household item you want to test the pH of)
- Medicine dropper
- Large bowls or pots (2)
- Lab notebook
- A series of household items to test the pH of:
  - Fruit juice: lemon, lime, orange, apple
  - Soda pop (dark sodas might be tricky to see)
  - Vinegar
  - Baking soda solution
  - Cleaning products

## Red Cabbage pH scale



## Procedure

1. Grate a small red cabbage and place the pieces into a large bowl or pot.
2. Pour boiling water into the bowl to just cover the cabbage.
3. Leave the cabbage mixture steeping, stirring occasionally, until the liquid is room temperature. This may take at least half an hour. The liquid should be reddish purple in color.
4. Place a strainer over a second large bowl or pot and pour the mixture through the strainer to remove the cabbage pulp. Press down on the pulp in the strainer, such as by using a large spoon, to squeeze more liquid out of the pulp.
5. In the bowl, you should now have a clear liquid that will either be purple or blue in color. (It should look darker after the pulp is removed.) This will be your indicator solution.
6. The color of the liquid will change depending upon the pH. Use the gradient picture to figure out the pH of the liquid by observing the color.
7. Set aside your indicator solution. You will use it as your "stock" solution for your experiments.
8. Next you will test various household solutions with your indicator. Use a separate beaker for each solution you want to test because you do not want to mix chemicals that do not go well together or contaminate your results.
9. Tell the students that the color of the indicator solution will change when the liquid of interest is added (will turn red with lower pH and will turn blue/green with higher pH).
10. Have students guess what colors the liquid of interest will turn based on their perception of their acidity/alkalinity and form a question (ie I wonder if lemonade will turn pink? Since they may know lemons are acidic.)
  - The hypotheses should look as follows:
    - H1: Lemonade will turn pink
    - H2: Lemonade will turn blue
    - H3: Lemonade won't have a color form
11. Fill about a quarter of the beaker with your cabbage indicator solution. You can use less indicator solution for each cup if you do not have a lot of indicator solution.
12. Add drops of a liquid you want to test until you see the solution change in color. Gently swirl the beakers as you add the drops, being careful not to spill the solution.
13. Record the pH and a description of each solution in a data table in your lab notebook.
14. Test the solutions with the litmus paper to see how close your guess was the actual pH.
15. Discuss the results with the students and the steps taken any why they were necessary, as well as how they came to their hypotheses.