

## Testing the pH of different liquids

Many household liquids fall into the category of either acids or bases. Compare the color change you see with the chart and determine the pH for each liquid.

1. You can make a simple pH indicator from red cabbage.
  - a. Place a piece of red cabbage into a pot of water. Boil for 5 minutes and turn off the heat. Leave the cabbage in the water for up to 30 minutes. Drain the water (which is now purple) into a separate container. This is your pH indicator.
2. You can use this indicator to test the pH of household liquids. The best results will come from light colored or clear liquids. You can test the pH of solids (such as baking soda) by dissolving them in water.
3. The red cabbage indicator is a solution that changes color depending on the pH of the liquid.
4. Collect several liquids that you want to test and several small cups. Label each cup and pour a small amount of liquid into each cup.
5. Use pipettes to add one to two drops of red cabbage indicator to each cup and swirl. If you don't have pipettes, you can just pour the indicator into each cup.
6. Use the chart below to determine the pH of the liquid. Record your results.

Liquid 1 \_\_\_\_\_ color \_\_\_\_\_ pH \_\_\_\_\_ Acid or Base \_\_\_\_\_

Liquid 2 \_\_\_\_\_ color \_\_\_\_\_ pH \_\_\_\_\_ Acid or Base \_\_\_\_\_

Liquid 3 \_\_\_\_\_ color \_\_\_\_\_ pH \_\_\_\_\_ Acid or Base \_\_\_\_\_

Liquid 4 \_\_\_\_\_ color \_\_\_\_\_ pH \_\_\_\_\_ Acid or Base \_\_\_\_\_

### Red Cabbage Indicator pH Color Change Scale



0

2

4

6

8

10

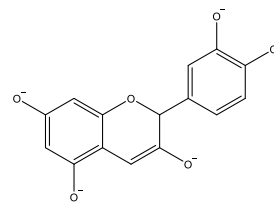
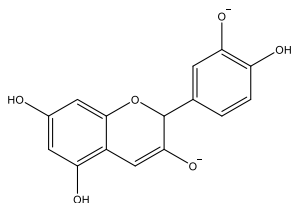
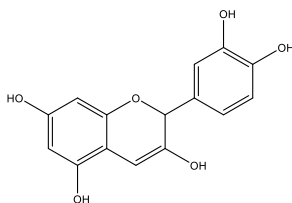
12

14

Acidic

Neutral

Basic



Red cabbage extract can be used to test the pH of liquids because of the structure of one of its molecules. A set of compounds called anthocyanins are present in many plants (red cabbage, beets, blueberries, etc.) and produce the purple color seen in these fruits and vegetables.

The pH of a solution is a measurement of the number of protons or 'free' hydrogens in solution. It is a helpful scale (from 0-14) that chemists use to describe how acidic or basic a solution is. Acidic solutions, such as lemon juice or vinegar, have a low pH (< 7). Pure water has a neutral pH (7). Basic solutions, such as baking soda in water or soap, have a high pH (> 7).

Acidic solutions have a large number of 'free' hydrogens in solution. When you put the anthocyanin molecule (red cabbage indicator) into these solutions, the 'free' hydrogens attached to the molecule and produce a red color. Basic solutions have a low number of 'free' hydrogens. When the same molecule is put into this solution, the hydrogens attached to the molecule get pulled off and produce a yellow/green color.