

Red Cabbage Acid-Base Indicator Lab

Introduction:

There are numerous types of pH indicators. Many of these indicators are simply weak acids or bases extracted from plants. Red cabbage is an indicator that gives various colors in response to different pH conditions. In this lab, you will determine the pH by magnitude (number) and color. This will be done by the use of pH test paper and a solution of red cabbage.

Materials:

- 16 small test tubes
- a piece of paper so that you can make a “map” of each test tube’s identity
- Six different solutions with different pH values:
 - tap water, distilled water, vinegar, ammonia, HCl, and NaOH
- 10 solutions of known pH: these are called the **standards**.
- red cabbage indicator solution

Procedure/Results :

1. Obtain 16 small test tubes.
2. Label the test tubes in your test tube rack with a map.
3. Obtain one squirt of each solution (16 total solutions). Label each solution. There are 10 “known” standard solutions. There are 6 substances of unknown pH (HCl, NaOH, tap water, etc.) Try to use the same size of squirt for each of the test tubes.
4. Add one squirt of red cabbage indicator solution to each test tube.
5. Observe the color of each solution, and record these colors in the chart below.
6. If time allows, check the accuracy of our red cabbage indicator by using different indicators: litmus paper and wide-range pH paper.

Substance Tested	Color of Red Cabbage Indicator		Substance Tested	Color of Red Cabbage Indicator
pH=2 standard solution			Tap water	
pH=3 standard solution			Distilled water	
pH=4 standard solution			HCl	
pH=5 standard solution			NaOH	
pH=6 standard solution			Vinegar	
pH=7 standard solution			Ammonia	
pH=8 standard solution				
pH=9 standard solution				
pH=10 standard solution				
pH=11 standard solution				

Questions:

1. Make a chart or scale that relates the pH number to the corresponding color. Title the scale: "Color Scale for Red Cabbage Indicator." (This scale will be similar to the scale on the vial that holds the pH paper. Of course, the colors will be different on the "red cabbage scale.")
2. Fill in the chart below by computing the pOH, $[H_3O^+]$, and $[OH^-]$ for each solution.

Substance Tested	pH	pOH	$[H_3O^+]$	$[OH^-]$
Tap water				
Distilled water				
HCl				
NaOH				
Vinegar				
Ammonia				

3. What is "acid rain"? What causes it? How would you determine how acidic rain water is?
4. When a strong acid is spilled – on the highway during a traffic collision, or in the laboratory – the acid is diluted with water and then neutralized with a weak base such as baking soda ($NaHCO_3$, also known as sodium bicarbonate). Even though a strong base such as NaOH would neutralize the spill faster, a weak base is used. Why do you think this is?