



# Crazy Cabbage Chemistry

## Testing the pH of Household Liquids

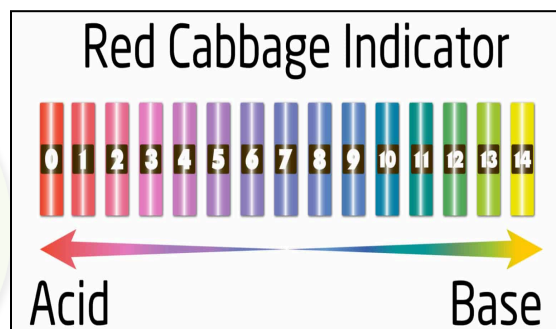
NAME:

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### INTRODUCTION:

In this lab, you will explore the pH of various household solutions using red cabbage juice as a natural pH indicator. pH indicators are substances that react with solutions and change color based on the solution's acidity or basicity. Red cabbage juice contains anthocyanin, a pigment that displays a spectrum of colors when it interacts with different pH levels. For example, if the juice turns yellow, it indicates a pH of 14.



The pH scale ranges from 0 to 14. A pH of 7 is neutral, meaning the solution contains equal concentrations of hydrogen ions ( $H^+$  or  $H_3O^+$ ) and hydroxide ions ( $OH^-$ ). Solutions with pH values below 7 are acidic, having more hydrogen ions than hydroxide ions. Conversely, solutions with pH values above 7 are basic, containing more hydroxide ions than hydrogen ions.

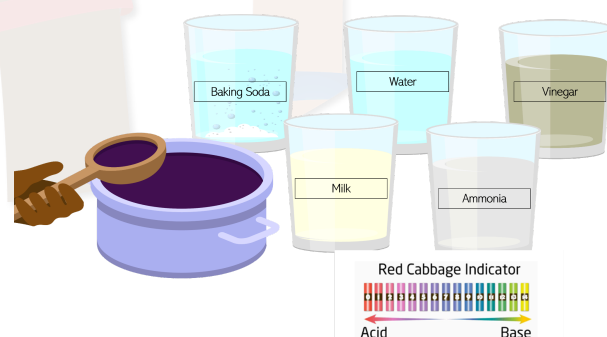
### PRE-LAB QUESTIONS:

1. What is the role of anthocyanin in this lab, and how does it help determine the pH of a solution?
2. Describe the differences between acidic, neutral, and basic solutions in terms of their ion concentrations.
3. If a solution turns purple when cabbage juice is added, is the solution acidic, neutral, or basic? Explain.

### MATERIALS RECEIPT:

Red Cabbage Juice	\$3.00
White Vinegar	\$1.00 (32oz)
Clear Ammonia	\$2.00 (64oz)
Sprite	\$2.00 (1.25L)
Baking Soda	\$1.00 (1lb)
Water	---
Cups (6/group)	---
Spoon or Pipette (1/group)	---
<b>TOTAL</b>	<b>\$9.00</b>

### EXPERIMENTAL SET-UP:





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## Testing the pH of Household Liquids

### PROCEDURE:

1. Prepare the Indicator: Chop, boil, and strain red cabbage to extract the juice. Let it cool.
2. Set Up Solutions: Pour equal amounts of water, vinegar, ammonia, Sprite, and a baking soda solution (made by dissolving baking soda in warm water) into labeled cups.
3. Test the Solutions: Add 1 spoon or pipette of cabbage juice to each cup, avoiding direct contact with the solutions.
4. Observe and Record: Use the cabbage indicator scale to record the color change for each solution. Record the pH value and identify if each solution is acidic or basic in the data table.

### DATA:

SOLUTION	COLOR CHANGE	pH VALUE	ACID, BASE, OR NEUTRAL?
Water			
Vinegar			
Ammonia			
Sprite			
Baking Soda			

### CONCLUSION:

1. Arrange the solutions from most acidic to most basic based on their pH values.
2. Which solution had the highest concentration of  $H^+/H_3O^+$  ions? Explain how pH relates to hydrogen ion concentration.
3. Which solution had the highest concentration of  $OH^-$  ions? Explain how pH relates to hydroxide ion concentration.
4. Based on its sour taste, texture, and your experiment, what do you think the pH of lemon juice might be? Justify your prediction.