IDENTIFYING ACIDS AND BASES LAB

INTRODUCTION:

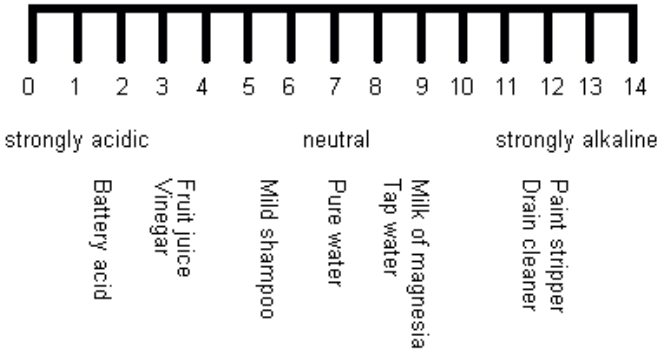
Water molecules can react to form ions. This reaction can be summarized by a chemical equation in which double arrows are used to show that the reaction can occur in either direction.

$H_2O \leftrightarrow H^+ + OH^-$

(water ←→ hydrogen ion + hydroxide ion)

Because the number of positive hydrogen ions produced is equal to the number of negative hydroxide ions produced, water is neutral.

Chemists devised a measurement system called the **pH scale** to indicate the concentration of hydrogen ions in solution. As the figure below shows, the pH scale ranges from 0 to 14. At a pH of 7, the H+ concentration is equal to the OH- concentration. Pure water has a pH of 7. Solutions with a pH below 7 are called **acidic** because they have more H+ ions than OH- ions. The lower the pH number, the more acidic the solution. Solutions with a pH above 7 are called **basic**, or **alkaline**, because they have more OH- ions than H+ ions. The higher the pH number, the more basic the solution.



Acids tend to have a sour taste, produce a tingling or burning sensation when they touch the skin, and can be highly corrosive when concentrated. Examples of acids include citric acid found in oranges and lemons, hydrochloric acid produced by glands in your stomach, and vinegar. Bases tend to have a bitter taste and a slippery feel. Bases may also burn the skin if they are concentrated. Examples of bases include ammonium hydroxide (waste product of many living organisms), soap, and bleach. The acidity or alkalinity of a solution determines some of the physical and chemical properties of the solution. The pH of most body fluids must be maintained between 6.5 and 7.5 in order for chemical reactions necessary for life to take place.

pH can be measured electronically, or it can be determined using test papers or indicators. In this lab activity, we will determine how litmus paper and red cabbage juice can be used to determine the acidity or alkalinity of a solution.

MATERIALS:

- test solutions
- red litmus paper
- blue litmus paper
- red cabbage juice

Procedure

Setup

Put on goggles and an apron.
For Parts A and B the test tube contents should be as follows:

Tube #	Substance
1	Ammonia
2	Vinegar
3	Lemon Juice
4	Antacid Tablet
5	Cola
6	Baking Soda
7	Table Salt
8	Water

PART A (Litmus Paper):

1. Obtain one strip of red litmus and one strip of blue litmus for each test solution.
2. Label eight test tubes 1-8. Place them in a test-tube rack
3. Using a separate dropper for each solution, add 10 drops of each substance to the specified test tube. **Record the color of each test tube's contents in the data table.**
4. Dip one end of the red litmus paper into a test solution, remove, and **record any color change**. Repeat for the same test solution with the blue litmus paper. Discard your litmus papers after each test. **Do NOT try to re-use litmus paper.**
5. Repeat step #4 for all of your test solutions, recording your observations in the data table.
6. Keep the solutions for Part B.

PART B (Red Cabbage Juice):

1. Using a separate dropper for each solution, add 10 drops of red cabbage juice to a test solution. **Record the color change of each test tube's contents in the data table.**
2. Repeat step #1 for all of your test solutions, **recording your observations in the data table**.
3. Discard the contents of the test tubes according to your teacher's directions. Gently use a test-tube brush and soapy water to clean the test tubes and rinse with clean water.

Cabbage Juice pH Scale

pH	Color	pH	Color
0 - 1.9	red	7 – 7.9	light purple
2 - 3.9	reddish-pink	8 – 9.9	blue to blue-green
4 – 4.9	pale pink	10 – 10.9	green
5 – 5.9	pinkish-lavender	11 – 11.9	light green
6 – 6.9	purple	12 – 13.9	greenish-yellow
		14	yellow

Names: _____ Date:_____

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RESULTS

Substance	**Original Color**	**Litmus**		**Cabbage Juice**		**Acid or Base?**
		Blue Litmus Color	Red Litmus Color	Color after adding	Estimated pH	

ANALYSIS QUESTIONS:

1. What is pH?
2. What are the pH values of acids?
3. What are the pH values of bases?
4. What type of ions do acids (mostly) contain?
5. What type of ions do bases (mostly) contain?
6. If we mixed an acid and a base together, what products would form?
7. How would you neutralize an acid?
8. How would you neutralize a base?
9. What color changes did you observe in the blue litmus paper in testing the lemon juice? In the red litmus paper?
10. What color changes did you observe in the red litmus paper in testing the ammonia? In the blue litmus paper?
11. Which of the solutions you tested were acids?
12. Which of the solutions you tested were bases?
13. Were any substances you tested neither acids nor bases? List them. What word could you use to describe such substances?
14. How can litmus paper be used to identify the acid-base properties of a solution? Be as detailed as possible.
15. How can red cabbage juice be used to identify the acid-base properties of a solution? Be as detailed as possible.