Acid Base Indicators

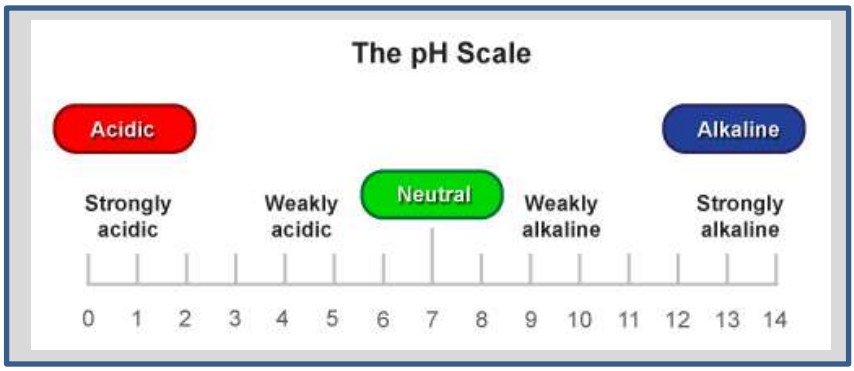
PURPOSE

Using two different acid/base indicators, identify each substance as either an acid, base, or neutral. Using the colors obtained from the anthocyanins and the color chart, determine the approximate pH of the substance.

The substances that will be tested are: *baking soda, citric acid, vinegar, sodium hydroxide, saliva, and liquid soap.*

INTRODUCTION

The pH scale measures how acidic or basic a substance is. It ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is basic (or alkaline).



The pigment that gives red cabbage its deep color is a natural pH indicator. By boiling red cabbage leaves, we extract a class of pigment molecules called anthocyanins into solution. Anthocyanin molecules will change their color depending upon the pH of their environment and can indicate the pH of a solution.

Blue and red litmus paper is also an acid/base indicator. Blue litmus paper is an acid indicator. These test strips turn a light red at 4.3 pH and lower. Red litmus paper is a base indicator. It turns blue at 8.1 pH and higher, indicating basic (alkaline) solutions.

Hypothesis

Will be an acid: _____

Will be neutral: _____

Will be bases: _____

The order of the substances from most acidic to most basic:

_____ Most ACIDIC

_____

_____

_____

_____

_____ Most BASIC

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Materials

- Blender
- Red cabbage
- Cutting board
- Sharp knife
- Wire strainer
- 2-cup liquid measuring cup
- Two 1-cup liquid measuring cups
- 1/8 Teaspoon
- 6 Large test tubes (labeled #1-6)
- Test tube rack
- 5 Test tube rubber stoppers
- Red and blue litmus paper
- Tweezers
- White vinegar
- Citric acid
- Liquid soap
- Baking soda
- Sodium hydroxide (NaOH)
- Distilled water
- Safety goggles
- Rubber safety gloves

*We will be working with sodium hydroxide (NaOH) which is a caustic chemical. You **MUST** wear your safety glasses at **ALL TIMES** during this lab.*

Procedure

TEST #1: Anthocyanins as Acid/Base Indicator

1. Rinse all test tubes with water and then also distilled water. Set in the test tube rack.
2. Cut a small chunk of red cabbage and chop into smaller pieces.
3. Put cabbage into blender. Pour in some distilled water.
4. Close lid of blender and blend for 30 seconds.
5. Pour the cabbage liquid through a strainer and into the 2-cup measuring cup. Clean out strainer of solid cabbage.
6. Label test tubes 1-6.
7. ***Put on your safety gloves and wear them for the remainder of the lab.***
8. In test tube #1 put in 1 pellet of NaOH. Fill test tube 1/2 way with distilled water. Put on rubber stopper and shake gently to help dissolve the NaOH pellet. Place back in test tube rack.
9. In test tube #2 fill 1/2 way with white vinegar.
10. In test tube #3 squirt a little bit of liquid soap. Fill test tube to just under 1/2 way with distilled water. Put on rubber stopper and shake gently to mix. Place back in test tube rack.
11. In test tube #4 put in 1/8 tsp baking soda. Fill test tube to just under 1/2 way with distilled water. Put on rubber stopper and shake gently to help dissolve the baking soda. Place back in test tube rack.
12. In test tube #5 put in 1/8 tsp citric acid. Fill up test tube with distilled water to just under the 1/2 way mark. Put on rubber stopper and shake gently to mix. Place back in test tube rack.
13. In test tube #6 spit into the test tube several times to that you have a good sample of saliva. Fill test tube to just under 1/2 way with distilled water. Put on rubber stopper and shake gently to mix. Place back in test tube rack.
14. Carefully take off all test tube rubber stoppers and place them in front of their respective test tubes.
15. Take the cabbage juice from the measuring cup and pour into each test tube one at a time. Be careful not to overfill the test tubes. Leave about an 1/2 - 1” of space at the top of the test tube.
16. Place the rubber stoppers on each test tube (except vinegar) and shake gently to mix thoroughly.
17. Record the color change for each test tube.

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TEST #2: Litmus Tests

18. Test each solution with the red litmus paper and then the blue litmus paper. Use a tweezers to dip each test strip. Record the color changes you see on the litmus paper in the data table.
19. Using your Red Cabbage pH Scale at the end of the worksheet, rearrange the test tubes so that the pH goes from most ACIDIC substance to most BASIC substance (from left to right).
20. Use your Red Cabbage pH Scale to record the approximate pH numbers of each substance.
21. Identify each substance as either an acid, base, or neutral. Record your results.
22. Clean up your mess:
    a. follow your teacher's directions to dispose of the sodium hydroxide. DO NOT PUT IT DOWN THE SINK WITHOUT YOUR TEACHER'S PERMISSION.

Data/Observations

TEST TUBE #	SUBSTANCE	COLOR	ACID OR BASE	APPROX. PH	BLUE LITMUS	RED LITMUS
1	NaOH					
2	vinegar					
3	soap					
4	baking soda					
5	citric acid					
6	saliva					

Conclusion: Do your results support your hypothesis? Explain.

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Red Cabbage pH scale