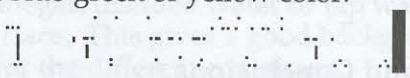
Bridging the Gap I
Acidity, pH, Indicator Paper and Red Cabbage

Acids and bases are part of us and our surroundings. The body uses hydrochloric acid, HCl(aq) in the stomach during digestion. Calcium carbonate, $CaCO_3(s)$, is the active ingredient in Tums™ an antacid used to treat excess stomach acid. These substances all yield solutions with characteristic pH values. Several pH sensitive dyes can be used to estimate pH values for solutions. You will use these as your pH indicator.

Red cabbage contains natural dyes that change color with acidity changes. The color displayed by these dyes is a good indicator of the pH. The color of these dyes is shown in the text on page ~~168~~. 290

This plot is a graphical summary of the relationship between color and pH. Acid solutions will have a red or pink color. Neutral solutions will have a pretty lavender color and basic solutions will have a blue-green or yellow color.



Red cabbage indicator solution

You will need a few leaves of red cabbage, a blender or food processor, a coffee filter or food strainer, and a clean container to collect the cabbage juice. Tear one or two cabbage leaves into pieces and place these in the blender with about 2 cups of water; blend for one or two minutes, then filter the mixture through the coffee filter. Collect and save the red cabbage juice.

1. Test at least three different household chemicals such as baking soda, vinegar, household ammonia, soap, milk, 7-Up™ or club soda; each must be dissolved in water. Place each solution in a clear, colorless container such as a glass or jelly jar.
2. Place a piece of white paper on your work surface. This gives a good background for seeing the solution colors. Label the different containers.
3. Add about 10 mL, 2 teaspoons, of cabbage extract to each solution and stir; note the color of your liquid. Record the results of the different tests in the table on the report sheet.

Indicator paper

1. Take a 2-inch-wide strip of white facial tissue and tape the upper end to a pencil so the tissue hangs down and can be lowered into the cabbage indicator solution. Put about 1/3 cup of cabbage dye into a quart jar or other tall container. Lower the strip of paper into the jar until its lower end is in the cabbage dye. Rest the pencil across the top of the container so the paper hangs inside. Let the solution wick up the paper until the liquid has climbed to about 6 inches. This will take about 40 minutes.
2. Remove the wet paper from the liquid and hang it up to dry.
3. When the strip of facial tissue is thoroughly dry, cut it into pieces about 1 inch x 1 inch. Store them in a brown jar or dark place.
4. This paper will act as an acid base indicator. It will turn pink when touched with a drop of acid and turn blue-green when touched with a drop of base; try it. Save the indicator paper for your own tests.

Bridging the Gap I Name _____
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Data and Observations

Household substance	Cabbage juice indicator color	Estimated pH	pH using page 266

Analysis and Conclusions

Do you believe the estimated experimental pH values and the table values agree? Remember these are only estimates and are not exact. Justify your answer.