

OH WOW! Moment

Activity by Colleen Ruby, Education Coordinator

Grade Level: suitable for grades 4-8

Red Cabbage Lab

AT A GLANCE :

Students have the opportunity to test a variety of home substances in an indicator solution of cabbage juice. From this testing and observation students will begin to grasp the concept of acids and bases.

STUDENTS WILL BE ABLE TO:

Demonstrate the process of science inquiry by posing questions and investigating phenomena through language, methods and instruments of science.

BACKGROUND INFORMATION:

Very acidic solutions will turn anthocyanin a red color. Neutral solutions result in a purplish color. Basic solutions appear in greenish-yellow. Therefore, it is possible to determine the pH of a solution based on the color it turns the anthocyanin pigments in red cabbage juice.

PRINCIPALS:

Students are introduced to the concept of acids and bases.

MATERIALS :

- Red cabbage
- Distilled Water
- Blender
- Strainer
- Clear graduated cylinders or glasses
- White paper
- Apron or lab coat (avoid nasty stains!)
- Test chemicals: Vinegar, Baking soda, Lemon juice, Washing soda, Laundry detergent, Soda pop, Alka-Seltzer
- safety goggles or glasses

PROCEDURE :

1. Peel off six big cabbage leaves and put them in a blender with 12 cups of water. Liquify!
Depending on how much Red Cabbage Indicator you want to make use the optimum ratio of one cabbage leaf to two cups of water.
2. Pour the purplish cabbage liquid through a strainer to filter out all of the big chunks of cabbage. Doesn't cabbage juice smell great? Save the liquid for the experiments to follow.
3. Set out three graduated cylinders or glasses, side by side. Fill each container half full with cabbage juice.
4. Since you know that vinegar is an example of an acid, add a little vinegar to the first glass of cabbage juice. Stir with a spoon and notice the color change to red, which indicates that vinegar is classified as an acid.
5. In the second glass add a teaspoon of washing soda or laundry detergent. Notice how the liquid turns green, indicating that this chemical is a base. Keep these two glasses of red and green liquid for future reference.
6. Try adding other "test chemicals" to a small amount of cabbage juice and note the color change to determine if the chemical is an acid or a base.

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What's Happening?

Some substances are classified as either an acid or a base. Think of acids and bases as opposites - acids have a low pH and bases have a high pH. For reference, water (a neutral) has a pH of 7 on a scale of 0-14. Scientists can tell if a substance is an acid or a base by means of an *indicator*. An indicator is typically a chemical that changes color if it comes in contact with an acid or a base.

As you can see, the purple cabbage juice turns red when it is mixed with something acidic and turns green when it mixes with something basic. Red cabbage juice is considered to be an indicator because it shows us something about the chemical composition of other substances.

What is it about cabbage that causes this to happen? Red cabbage contains a water-soluble pigment called *anthocyanin* that changes color when it is mixed with an acid or a base. The pigment turns red in acidic environments with a pH less than 7 and the pigment turns bluish-green in alkaline (basic) environments with a pH greater than 7.

Red cabbage is just one of many indicators that are available to scientists. Some indicators start out colorless and turn blue or pink, for example, when they mix with a base. If there is no color change at all, the substance that you are testing is probably neutral, just like water.

Try this:

Use your cabbage juice indicator to test the acid or base properties of other common substances. You might want to try orange juice, lemonade, milk, salt, ammonia, or soap.

Try soaking some filter paper in concentrated cabbage juice. Remove the paper from the cabbage juice and hang it up by a clothespin to dry. Cut the dried paper into thin strips. Dip the strips into various liquids to test their pH. The redder the strip turns, the more acidic the liquid is. The greener the strip turns, the more basic the liquid is.

What do you notice or observe?

What conclusions can you make?

What can you do differently next time?