Ocean Acidification Experiment

Have fun doing this simple, fast and fascinating experiment in your own kitchen!

EXPERIMENT MATERIALS

2–3 large beakers or glasses
6–8 test tubes or small cups
Red cabbage juice pH indicator*
Lemon juice
White vinegar
Tap water
Salt water (optional: Coral Reef salt from an aquarium store mixed into water)
Baking soda
Liquid soap
Straws
Eyedropper/teaspoon

INDICATOR MATERIALS

Red cabbage
Knife
Boiling water
2 large glass containers or bowls
Fine mesh strainer or coffee filter

BACKGROUND

This experiment is a neat way to see the different levels of acidity in common household liquids. Acids tend to dissolve things and taste sour, like lemon juice. The opposite of an acid is a base, which feels slippery and tastes bitter, like soap. With a homemade pH indicator you can test many liquids to see which are acids, and which are bases. The cabbage juice indicator will cause acids to turn pink and bases to turn blue.

MAKING YOUR INDICATOR

01. Finely chop half of a red cabbage. (The finer you chop it the better)
02. Put the chopped cabbage in a large bowl/glass container and add enough boiling water to cover all the cabbage.
03. Allow the cabbage to sit for about 10–15 minutes. The longer it sits in the water, the more color will be extracted.
04. Pour the mixture through a fine strainer or coffee filter and into another container to separate the juice from the cabbage pieces. Allow the liquid to cool. Now you are ready to test some liquids!

MAKING YOUR SCALE

01. Fill each test tube or small cup half full with a different test liquid (one liquid per tube): lemon juice, vinegar, tap water, salt water, baking soda dissolved in water, soapy water. For the baking soda and soap, add a couple pinches of baking soda or a few drops of soap to the tube first, then add enough water to fill ½ the test tube and shake gently to mix.
02. Label all of your test tubes/cups!
03. Take your eyedropper (or teaspoon) and add about 4–5 droppers full or 1 teaspoon of your red cabbage juice indicator to each tube. Add the same amount of cabbage juice to each test liquid.
04. What do you observe? What does the color of each liquid mean?

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MAKING YOUR “OCEAN”

01. Pour water into a beaker or glass to fill it about ¼ full.
02. Add a few droppers full of indicator to the water (you will probably need more than in the test tubes to get a dark enough color). What color is it? Compare to the other liquids you just tested.
03. Take your straw and gently blow air (CO_2) into the water. Make sure to only blow out and not suck water up the straw.
04. Watch what happens to the water. What color is it now? Why did it change?

HOW IT WORKS

When you blow bubbles, you are transferring the carbon dioxide (CO_2) from your breath into the water. When water and CO_2 react, they form carbonic acid (the same acid in soda). This acid causes the indicator in your beaker of water to turn from blue to purple as your CO_2 makes the water more acidic.

WHAT THAT MEANS FOR YOU

We are not the only source of CO_2. Much of the CO_2 in the air comes from fossil fuels burned in cars and power plants. Just like the CO_2 you are blowing into your beaker, the CO_2 that’s in the air gets absorbed by the ocean like a big sponge. The same reaction you just observed happens in the ocean, which is steadily making the ocean more acidic. As this continues, shelled animals such as crabs, mussels, and coral may not be able to build their shells as well. Impacts of this could mean shelled animals are eaten by predators more easily and that there may not be as much shellfish for humans to eat or beautiful coral reefs to visit. So, if we want to have a healthy ocean in the future, then we need to start taking actions to help our ocean today.

HERE IS HOW YOU CAN HELP

Cold water wash
Washing clothes in cold water instead of warm water saves tons of energy. If everyone in the US washed their laundry in cold water, we would prevent 30 million tons of CO_2 from going into the atmosphere. This would be like taking over 5 million cars off the road! (International Green Energy Council)

Become a Coastal Steward
http://www.coastal.ca.gov/publiced/steward/pledge_form.html

Also, learn more about how Academy Researchers study marine animals that may be affected by ocean acidification:
http://research.calacademy.org/izg/research

FURTHER EXPLORATIONS

You can repeat these steps using other things too—grab some other liquids from your kitchen or around your house and try it again! (Bleach, soda water, milk, etc.) Be careful and ask an adult for help. Is anything a different acidity than you expected?

Make your own pH paper-Instead of adding the indicator directly to the liquid, pour it over a white coffee filter and let it dry. Then cut up the coffee filter into strips and dip them in different liquids.

Why cabbage juice works as an indicator:
http://science.howstuffworks.com/life/botany/question439.htm