Homemade pH Test Strips

# What is Ocean Acidification?

We are the Ocean Acidification Canadian Community of Practice; our main goal is to help deal with the growing problem of ocean acidification, or OA for short. OA is a chemical process that happens when too much carbon dioxide is mixed up in the oceans. This carbon dioxide makes the oceans more acidic, which has changed from a pH of 8.2 to 8.1 since the beginning of the industrial revolution. This creates conditions that are harder for important animals like mussels and crabs to live in and build their shells. OA impacts small areas very differently, and because of this, many communities need to develop their own action plans.

OA impacts everyone. Even if you live nowhere near the ocean! Critters that we eat, like fish and shellfish, need to grow in the ocean and can be greatly affected by OA. All water eventually flows to the ocean, this means any pollution that is put into rivers and lakes near you may reach the ocean and make the effects of OA worse. Also, the rivers and lakes of the world can also become more acidic, creating problems for the plants and animals that live in them. OA is still new to many people, and because of this, it is not understood by everyone. Important ways that you could help in your community are raising awareness by educating people and making sure your communities are not adding to the problem of pollution leading to OA.

We at the OA Canadian Community of Practice want to encourage as many communities as possible to start thinking about OA and pH. To learn more about these issues, try the following experiment focusing on the pH scale.

# What is pH?

pH (or potential of hydrogen) is a number that represents a measurement of the acidity or basicity of a solution by measuring the concentration of Hydrogen ions in a solution. Acids and bases lie on opposite ends of a logarithmic scale (a scale that changes by a factor of 10 each time, so each increment is 10x greater than the one before it). This measurement ranges from 0 (most acidic and with the most hydrogen ions) up to 14 (most basic, containing the least amount of hydrogen ions), with 7 being "neutral pH. To measure the pH of solutions, pH indicators can be used. The most common of these indicators change colour when exposed to a non-neutral pH. An everyday example of a pH indicator is test kits that are used to maintain proper pH in pool water and can be bought from most outdoor/pool stores. Another common example is pH indicators used in fish tanks.

# Why Is pH Important?

pH is a very informative measurement which provides information about the chemical conditions in both natural and man-made solutions. It can be used to assess the danger of substances to humans, plants, and animals. For example, most plants grow best when the water they are receiving is between 6 and 7 on the pH scale, drinking water should be between 6.5-8.5, and the pH of the oceans is 8.1. Knowing these values allows decision makers to make more educated decisions about the resources that they are managing. This means pH is important to something as small as your pet fish, to restaurant owners trying to avoid ruining their food, to decision makers for entire coastlines and managing the species that reside there.

# What is the Science Behind This Experiment?

Red cabbage gains its red colour from a water-soluble pigment called anthocyanin. This pigment gives many other plants their colour, such as blackberries, pomegranates, red onions, and tomatoes. When exposed to different pH conditions, anthocyanin’s chemical structure slightly changes, creating a visible difference. When exposed to acidic consciousness, anthocyanin is a pink, and when it is exposed to basic conditions, the pigment expresses a blue/green.

# What You Will Need

* 1 Red Cabbage
* 1 sheet of cardstock, or 2-3 cue cards
* Water and a method to boil
* 2 large bowls
* 1 strainer
* pH-varying solutions to be tested

# How to Run the Experiment

1. Dice about a quarter of the red cabbage, or until you have 1-2 cups and place in a bowl
2. Boil water
3. Pour boiling water into a bowl with diced cabbage and let sit for 10 minutes (or until the water has become a dark purple colour).
4. When cabbage is sitting, cut cardstock into pieces about the length and width of a thumb
5. Remove the cabbage from the solution by pouring the solution through a strainer into another large bowl
6. Let the solution cool until it is a safe temperature to touch
7. Place the strips of cardstock into the indicator solution and let them sit for 10 minutes
8. Remove the strips and let them dry
9. Once the strips are dry, begin testing the pH of the solutions by placing the strips in the solution for ∼ 10 seconds. If the strip becomes pink, the solution is acidic. If the strip becomes darker blue, the solution is basic. If the strip does not change colour the solution is approximately neutral.
10. As an alternative to using the pH strips, you can also add acids and bases to the solution itself and watch it change colour.

# Lesson Takeaways

1. Understanding of pH and the distinction between an acid and a base
2. What is pH used for and how it is measured
3. Why pH is important
4. How pH is affecting the oceans

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# Fun Activities to do with the pH strips

1. Have your student use their pH strips/fluid to test mystery solutions and tell you if they are acidic, basic, etc.
2. Create your own pH scale: provide safe solutions from all over the pH scale, and then have your student attach the strips to a piece of paper and assign a number to each colour/solution. and developing a pH scale based on their own testing strips (which can then be combined with the mystery solution).
3. pH Art: Treat a full cardstock sheet with the indicator solution. Once dry, give students safe solutions of various pH’s (i.e. lemon juice) and allow them to paint with various solutions on the indicator paper.