Seltzer Science

This activity is slightly adapted from the "Soda Science" activity from our partners at South Sound Green! Images are by Stephanie Bishop.

Background:

Our waterways around the Nisqually River are not only beautiful, but they are very important for the natural environment! Local rivers and streams are habitats for hundreds of species of animals and plants, and all of them rely on clean, healthy water to survive. One species of particular importance is salmon. Salmon are incredible animals that spend their lives in a variety of environments, but when they are living in our local freshwater environments, salmon require certain water quality conditions in order to survive.

The Nisqually River Education Project works with dozens of classrooms each year during our Water Quality Monitoring program, where students go out to local waterways to test the water for a variety of parameters. One parameter is **dissolved oxygen** (DO), which is crucial for salmon and all other animals that live in the water.

Just like how animals on land need oxygen, fish underwater need oxygen as well. The only difference is that they get DO through their gills. We measure DO in milligrams per liter, or mg/L, which is the same as parts per million, or ppm. Salmon like a lot of oxygen, and their ideal amount of DO is 9 mg/L (or 9 ppm) or more. To put that into perspective, imagine you fill your room with 1 million red gummy bears, and you replace 9 of those with green gummy bears. Your room is now 9 parts per million green gummy bears. Now think about that in terms of DO – just 9 ppm of DO doesn't seem like much, but it makes a big impact on salmon!

Materials:

- 1 can of seltzer water
- One cold place (like a refrigerator)
- One warm/room temperature place (like a kitchen counter or table)
- A timer or stopwatch (the one on a phone works great!) (OPTIONAL)

Vocabulary:

Carbon dioxide: A naturally occurring greenhouse gas. In our activity, carbon dioxide is used in soda to give it bubbles, or for carbonation.

Dissolved oxygen: Oxygen molecules that are dissolved in water.

State of matter: A distinct form of matter in which substance can exist. This includes solid, liquid, gas, and plasma.

Water can pick up DO in a number of ways, most notably through bubbles. Places where water is moving fast or falling, such as rapids or waterfalls, have a lot of bubbles, and these bubbles are where air and oxygen become trapped and dissolved in the water. Slower moving water and stagnant water, such as in a lake or pond, generally has less DO.

Temperature also influences the amount of DO in the water. Temperature controls the natural **state of matter** (solid, liquid, gas) of a sub- stance, and for liquids, changing the temperature impacts the solubility of oxygen in water. Did you know that colder liquids can hold more gases than warmer liquids? This means that cold water can hold a lot of DO, and salmon prefer living in cold water. Lower air temperatures and more shade from trees and other native plants help keep the water in our local rivers cool and healthy for salmon! We can test this in our own homes using a different gas, **carbon dioxide**!

Procedure:

1. Remove your can of seltzer water from your kit and place it in the fridge for an hour.

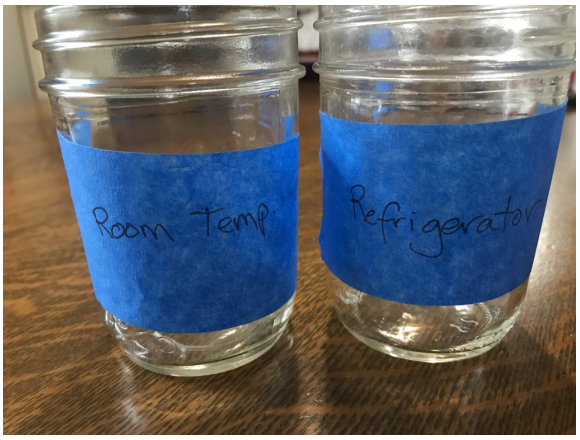
2. After the hour has passed, pour the can into two separate glasses. Make sure each glass is labeled so you can keep track of your results!

3. Put one of the glasses back into the fridge, and leave the other glass out on a counter, or somewhere room temperature or warmer.

4. Start a timer, or if you don't have a timer, record the time that you started. Observe your two drinks. Can you notice any differences?

5. Check your drinks every 15 minutes or so, and keep an eye on when either drink appears to be flat, or out of bubbles. Record the time when that happens. Feel free to taste the drink to confirm!

Want the experiment to go faster? Add hot tap water to one glass and ice water to the other glass of your experiment. You can even set your glasses within other glasses filled with hot and cold water, respectively, so the experimental glasses are surrounded by hot/cold water. Watch the top of the glasses – do you notice a difference in the bubbles at the surface?



Two labeled glasses, ready for the seltzer!

The drink on the right, from the fridge, has more bubbles than the one on the left, which was left on the counter.

To speed up the experiment, place the glass from the counter in a bowl of hot water, and place the glass from the fridge into a bowl of cold water with ice!

Results:

Which drink went flat quicker? Why? Where did all of that carbon dioxide go?

Think about a river or stream in your neighborhood or community. How do trees next to the river affect temperature? How do they affect DO? Do you think salmon, who need a lot of DO, prefer rivers with a lot of trees next to them or not?