

## Sampling - Importance and How To

What is a sample?

A sample is part of something that is meant to represent the whole. When items are tested, it is often impossible or not useful to test the entire item. If you need to get a blood test, they can't take all of the blood out of you to test it, so they take a sample. This is true of most things. When scientists test water, they can't test all of the water in a pond, lake, stream, or ocean, so they test some of the water, taking a sample that represents the whole.

When you taste a fresh batch of cookies out of the oven, you don't eat every cookie to taste test them (although you wish you could). Rather, you have one (or a few) cookies. Using the experience of the cookies that you eat (taste, texture, temperature), you make a judgment about the rest of the cookies in that batch. Usually, you decide the whole batch is good. Sometimes, someone forgot to put sugar in the batter and the cookies taste terrible. You are able to make a general and usually correct conclusion about the entire batch of cookies using the few cookies that you eat.

Why does sampling technique matter?

So, why is it important to sample properly? Shouldn't you just be taking a part of a whole and testing it? Why should it matter what part you take or how you take it?

### *Choosing your sample*

Think about the cookies again. If you chose a cookie that looked very different from all of the other cookies (it is smaller, it doesn't have as many chocolate chips), you couldn't make your judgement about the batch of cookies based on the taste and texture of that one cookie. You would have to choose a cookie that looks like it represented all of the cookies in the batch, not the outlier cookie (probably made from the last of the batter so it is smaller and missing chocolate chips).

### *Sampling Technique*

It's also important how you sample. If you drop the cookie on the ground and then eat it, it is likely that your judgment of the cookie will be different than if it went straight from the plate to your mouth. It might taste dirty, have dust on it, or be generally unappetizing. This isn't true of the rest of the cookies (unless you were to drop all of them on the floor and then serve them).

Think about another reason why it is important to sample properly. When a crime scene is investigated, it is critical that the team samples everything in a proper way. They don't want to contaminate the sample. If a crime scene is sampled carelessly, an innocent person may be

convicted, or a murderer could be allowed to walk free. Every crime scene investigation requires that team members wear gloves, use specific sampling containers, and label everything properly.

### *Importance of Labeling Properly*

Why does one label matter? Think about blood tests done by doctors and hospitals. If these blood samples aren't labeled properly with the patient's name, date collected, and other important information, it could lead to severe complications. A patient could be told the wrong information - they might be told they have a disease they don't have, because that information came from a sample from another patient, but due to mislabeling, the information was interpreted incorrectly. Or, they might be told they don't have an illness that they really do have, meaning they won't receive the treatment they need.

### *Why Water?*

But why does all of this matter for water?

Water is just water. There's no crime involved or anyone's health in jeopardy. Or is there?

Beginning in April 2014, water quality caused many problems in Flint, Michigan. Drinking water supply was switched from one source to another nearby source. This caused many problems. The new drinking water had high levels of lead, a heavy metal element that is very bad for humans. It can cause developmental delays and changes in the brain. If levels of lead in the body are too high, it can be deadly. Between 6,000 and 12,000 children were exposed to lead, a harmful and potentially deadly toxin, just by drinking water coming from their sinks and water fountains.

These problems could have been prevented. However, some government officials monitored water improperly. The health of many children was put in danger due to incorrect monitoring of samples.

So, water sampling is very important for both human health and the environment. You are not in charge of reporting your water quality results for public safety. Those in charge of monitoring water quality are professionals with many years of education and training to be trusted to monitor the water we drink. Your water testing experience is an opportunity for you to practice water quality analysis. It is okay to sample incorrectly or perform an analysis wrong, as long as you learn from it. Use the guidelines given to do your best, and ask questions if you aren't sure about something!

How you will sample:

You will be given a 50 milliliter conical tube, a permanent marker, a pen, and a paper to record information about the sample.

When you go to get a sample, you'll want to record everything while you are there. It is not good scientific practice to try to remember information and record it later. You should bring your handout, a pen, a conical tube, and a permanent marker to the sampling site.

Label both the conical tube and the sampling handout with the same name (this means sample information can be matched to the water sample).

It is important to get a representative sample. If you sample tap water, it makes sense to turn the water on, let it run for a short time, and then place your tube under the flow of water until it is full. If you are sampling outside, there is a little more to think about. Ponds and streams have living organisms, plants, trash, and dirt or sediment. You are interested in what is dissolved in the water.

You want to sample the clearest water possible, and try not to get any dirt or other particles in your sample. Don't scrape your tube against the bottom or side of the body of water, try to avoid areas with a lot of algae and floating debris, and try not to stir up dirt into the water. It is okay to have some dirt or swimming organisms in the sample. It is coming from a natural environment, and these things are inevitable.

In general, it is a good idea to try to pick a clear part of the water and sample what looks the most like the area of water you want to test. Remember the cookie example. You want to pick the cookie that looks the most like the rest. For this reason, you want water that is representative of the body of water, not something that doesn't look like the rest of what you are trying to test. Remember personal safety! Do not fall into the water or hurt yourself trying to get the perfect sample. Collect what you can. Always get approval from your instructor when choosing a sampling location.

Now you have the sample and it is labeled with a name that connects it to the sample details handout. Be sure to fill out the handout when you collect your water sample. Include all of the details it asks for.

## Sampling Checklist

What to bring with you when you sample:

- 50 mL conical tube
- Permanent marker
- Sampling handout
- Pen

Here is the sample collection sheet for recording data in the field:

Sample Name (e.g. 5/24/16 A, Team Water Warriors): \_\_\_\_\_

Collector(s):  
\_\_\_\_\_

Date Collected  
(month/day/year): \_\_\_\_\_

Location collected:

Latitude: \_\_\_\_\_

Longitude: \_\_\_\_\_

Your entry could look two different ways.

If recording GPS Coordinates, it will look like this (with different numbers):

39° 17' 25.386" N

76° 36' 43.8804" W

If recording LatLong Coordinates, it will look like this (with different numbers):

39.290385, -76.612189

Remember that because of where you are on the globe, your coordinates should have *North* and *West* or a *positive number* followed by a *negative number*, depending on the form of the recording.