



Blue Ridge Reef & Pet
102 WNC Shopping Ctr Dr.
Black Mountain, NC 28711
(828) 669 – 0032
www.blueridgereef.com

Water Chemistry Made Easy

This article is going to be overly simplistic. In order to do this, it will necessarily be incomplete and full of generalizations. To the advanced aquarist or student of chemistry, my apologies; the idea of this article is to provide beginners a general understanding of the subject.

pH

pH is a term that describes how alkaline or acidic a solution is. The scale goes from 0 to 14, 0 being as acidic as a solution can get, 14 as alkaline (or basic) as a solution can get. Bleach is very alkaline (12.6), and vinegar is very acid (2.9). Pure water is neutral, or has a pH of 7.0. The pH scale is logarithmic, meaning that water with a pH of 6 is ten times as acidic as water with a neutral pH of 7.

In freshwater aquariums, most community tanks will be fine at a pH of 7.0. Saltwater generally has a pH of slightly over 8. One thing to keep in mind in your freshwater aquarium is that the trend is usually downward; your aquarium will tend to drop in pH over time. This is just one reason to keep up with partial water changes. If the pH is going up, something inside the tank is almost certainly making that happen. Usually the culprit is a seashell or calcium carbonate rock or gravel. Avoid these in freshwater tanks unless you keep fishes that do best in very alkaline conditions, such as African rift lake cichlids.

pH test kits are inexpensive and fairly accurate. I'd recommend any aquarium keeper have one. The liquid tests are much more accurate than the simple paper strips. Most fishes can acclimate to a pH drastically different than what they do best in, as long as the change occurs gradually. Their health is much better when the water is closest to what they are adapted to, though. Changing the pH to where they do best also needs to be done gradually. This is best achieved through a series of small partial water changes. Chemical products that raise and lower pH should be avoided in most cases.

Hardness

Water's other characteristic, hardness, can get really confusing. Dissolved salts of calcium and magnesium determine how "hard" water is. Essentially, hardness is of two types, temporary and permanent. Temporary hardness can be removed by boiling, when the chalky scale leaves the solution. Permanent hardness can only be removed by distillation or chemical means, such as an RO/DI filter or ion-exchange resin.

Hardness is also termed "alkalinity," which is the same term used to describe pH. Then there are different scales used. The German scale uses GH to describe general (total) hardness and DH to describe carbonate hardness. English aquarists use a scale that measures parts per million of calcium carbonate or degrees/Clarke. Still others concern themselves with primarily total dissolved solids (TDS).

The important thing to understand about hardness is hard water has a high mineral content; soft water has a low mineral content. Hard water tends to "buffer" water and pH is generally more stable in an aquarium with harder water than softer water. Hard water also tends to have a higher pH when drawn from a tap.

Nitrogen Cycle

This is usually the most important aspect of water quality in the aquarium. To explain it in the simplest of terms, fish and uneaten fish food produce ammonia (NH_3/NH_4). Ammonia is highly toxic to fish. Luckily, there are "good" bacteria that consume ammonia. These bacteria colonize in the aquarium and "eat" the ammonia, causing the levels to drop. This is great, right? Yes, but their waste is in the form of nitrite (NO_2),

which is also deadly. Fortunately, other bacteria will colonize that “eat” nitrite, which will make those levels drop. Their waste product is nitrate (NO₃), which is much less toxic. When ammonia and nitrite levels have risen and dropped to zero, the tank is called “mature.” A mature aquarium is a much more stable place for fish to live. This process takes on average from one to three months. In a properly maintained mature tank, ammonia and nitrite will read zero, and the lower nitrate reads, the better.

Until a tank is mature, it is risky to add any expensive or delicate fish. In freshwater, most people cycle their tanks with Zebra Danios or other cheap, hardy fish. In marine tanks, damsels are the normal choice. There are products on the market that claim to have beneficial bacteria in a bottle, such as “Cycle.” While I am skeptical of these products, many people swear by them. It seems unlikely that bacteria that need oxygen to survive could live long in a sealed bottle. I have tried these products in similar new aquariums and tested how long the cycle took a number of times. In some cases it seemed to really speed things up, but in most cases the difference was negligible. I wish I had a clear answer on this, but the verdict is still out for me.

Different Fishes for Different Types of Water

Most municipal tap water in the Asheville area is soft and neutral. This water is ideal for most aquariums, and it is much easier to raise hardness or pH than lower either. Some examples of fishes that generally do best in softer water are tetras (such as neons, etc.), South and Central American cichlids (Angelfish, Oscars, Rams, etc.), Cory Cats, Gouramis, and Loaches. Fishes that can thrive in harder water include African Cichlids, Guppies, Mollies, Platys, Swordtails, and Rainbows. It is generally easier to see how your water tests from the tap and get fish that do well in the type of water you already have than to alter your water, but it is always easier to raise pH and hardness than lower it.

With liquid test kits for pH, ammonia, nitrite and nitrate, you can diagnose most problems that might be occurring in your aquarium. Avoid the cheap paper strips, they are quite unreliable. Regardless of what is out of whack, frequent small partial water changes will usually get parameters back in line. It is good to know how different your aquarium is from your tap, though, so you can estimate how much is safe to change!

Remember that fish can adapt to downright awful conditions over time and a large water change of much better water often will kill them! Nothing good happens fast in an ecosystem. Make any changes gradually, and your fish will thank you!

- Chip Bridges