**pH- Potential Hydrogen** is the measurement of acids or bases in your water. Acids are composed of free hydrogen ions (H+), while bases are composed of hydroxide ions (OH-).

pH definitely affects fish, and when possible it is best to provide fish with the same pH as their natural habitat, however the most important thing, in my opinion, is to keep the pH stable. Using those pH products (pH up, down or proper) are like playing with fire in a hay barn, you better know what you’re doing, or your going to make everything worse! Those products are “used” up quick and when they are, your pH will rapidly return to its original place, really stressing out your fish. Instead we maintain stability with a healthy KH.

**GH- General Hardness** is a measurement of mineral ions, mainly Calcium and Magnesium. While often overlooked in an aquarium these minerals are very important to a fish’s health. Fish need to have a proper balance of minerals that roughly reflects it’s native habitat. The fish take the minerals in through a process called Osmosis. However when the fish are in an environment that lacks or has too much minerals, the fish will maintain proper (internal) mineral levels through a process called Osmoregulation. Osmoregulation takes energy, so putting a soft water fish into hard water (or vice a versa) can tire and stress your fish, leaving it susceptible to disease and parasites.

**KH- Carbonate Hardness** measure the Carbonates and Bicarbonates present in your water, like Calcium Carbonate or Sodium Bicarbonate (baking soda). Carbonates are amazingly useful in an aquarium. Carbonates bind with free H+ (Hydrogen ions (Acids)), in an aquarium environment where Acids are constantly being produced, KH is essential to keeping pH stable. When KH is getting depleted a water change will replenish these Carbonate buffers. However if the water source is lacking Carbonates, you can add Baking Soda to the water, in small increments, this will need to be done with every water change.

**Now, how do they relate?**

GH measures mineral ions, and KH measures mineral Carbonates/Bicarbonates, some minerals (not all) can show on both tests, for example Calcium Carbonates will raise both your GH and your KH, yet Calcium will only raise GH, and Sodium Bicarbonate will only raise your KH.

KH relates to PH because Carbonates/Bicarbonates bind/buffer acids preventing your pH from dropping. Without, or with low levels of, KH you will notice frequent and sudden drops in pH that will leave life in your tank struggling. Sudden swings in pH harm not only your fish, but also your plants, and even the nitrifying bacteria (your cycle). So unfortunately a rapid pH swing will hurt everything and stall your cycle leaving your fish sitting in their own toxins, often acting as the final blow.