

# THE POWER OF HYDROGEN

Written by Russell McAndrews

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What is pH? Why should I be concerned with it? Technically, pH equals the negative log of the hydrogen ion concentration.

$$\text{pH} = -\log [\text{H}^+]$$

Functionally, pH is a relative measure of the alkalinity or acidity of a solution. An acid is anything which produces an acidic solution. A base is anything which produces a basic or alkaline solution.

More literally, pH is the power of hydrogen ions. It is an exponential or logarithmic number scale indicating the relative concentrations of hydrogen (+) and hydroxyl (-) ions.

Exponents are simple numerals which progress in sequence by a factor of ten. Not ten at a time, but ten times the previous digit. Instead of 1, 2, 3... they run 1, 10, 100... Each higher number is ten times its predecessor.

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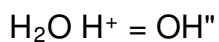
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Ions have a very slight electrical charge of their own because they are either missing an electron or have an extra. Since electrons are negatively charged, when one is missing the resultant ion is positive.

Water molecules consist of two atoms of hydrogen and one atom of oxygen (H<sub>2</sub>O). Because of the properties of water, it actually partially comes apart. It disassociates into the following ions:



(water) (hydrogen) (hydroxyl)

Equilibrium reactions such as this one take place in both directions simultaneously but never completely in either direction. Pure water contains an equal amount of each of these ions. The pH scale ranges from 0 - 14. In a straight forward manner, the middle of the scale where the ions balance is neutral pH (7.0). The fact that the scale is exponential tells us how the numbers relate to one another. A pH of 8.0 is ten times more alkaline than 7.0. Oppositely, a pH of 5.0 is 100 times more acidic than 7.

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As aquarists, we need to keep the perspective of the fish in mind. Even minor changes in pH represent drastic changes in the ionic concentrations. Massive ionic fluctuations can result in abnormal blood chemistry and or gill damage.