

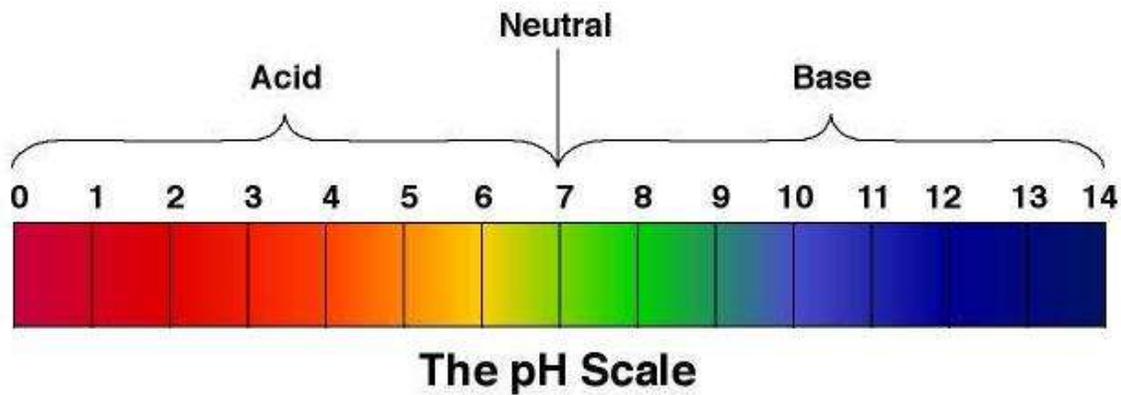
pH Level Explained & Balanced - Roberts Hot Tubs

pH is a scale measuring the acidity or alkalinity of a solution. The scientific definition is 'the negative logarithm of the Hydrogen ion concentration. The pH scale is a measurement of the concentration of acid or base a substance contains and is calculated by determining the concentration of hydrogen ions (H⁺).

High hydrogen ion amounts indicate high acid concentration, low hydrogen ion amounts indicates a basic or alkaline concentration. The pH scale runs from 0 to 14 with 0 being the most acidic, 7 neutral and 14 being the most alkaline or basic.

It is a logarithmic scale based on powers of 10, so that 1 pH unit change equals a 10 fold change in H⁺ ion concentration! A pH of 6 is ten times more acidic than a pH of 7.

pH value	times acidity or alkalinity exceeds that of pure water (7.0)
Acidic 0	10,000,000
1	1,000,000
2	100,000
3	10,000
4	1,000
5	100
6	10
Neutral 7	1
8	10
9	100
10	1,000
11	10,000
12	100,000
13	1,000,000
Alkaline 14	10,000,000



The sanitizing ability of chlorine is achieved by it turning into hypochlorous acid. pH affects the efficiency of chlorine by determining the amount of hypochlorous acid, free available chlorine, that is formed.

- At pH 6.5, 90% of the chlorine will be hypochlorous acid
- At pH 7.5, 50% of the chlorine will be hypochlorous acid
- At pH 8.0, 20% of the chlorine will be hypochlorous acid

Unfortunately, you cannot run your water at pH 6.5 as it would be very acidic and corrode any metals in your system. The number one cause of heater and equipment failure is corrosion due to low pH. As any metals corrode away, the resulting metal oxides can cause surface staining, and under some conditions, can even tint your hair. Lower pH is also far from the human body's pH of 7.4 and can be uncomfortable to soak in.

At a high pH, the water can make your eyes sting and possibly give you a sore throat. A high pH can also cause scale to form. This is because at a pH of around 8.0, the calcium in the water combines with carbonates in the water to form calcium carbonate.

Calcium carbonate can form scale deposits on your spas surface or in the plumbing system. It can also form into tiny particles and float around in the water giving it a cloudy, turbid appearance.

The compromise is **pH of 7.2 to 7.6**, preferably the midpoint of 7.4. Remember, if your pH drifts too high, it will require more chlorine to get adequate disinfection.

pH can be determined in several ways. pH meters electronically measure the ion concentration, giving pH in a digital readout. pH indicators are substances obtained from plant material that change color depending on the degree of acid or base of the substance it is mixed with.

A few drops of indicator is added to a solution of the substance to be measured. The color the indicator changes to is matched to a color chart which matches the color of the indicator to the corresponding pH.

Some indicators have a wide range of color changes from acid to base. Others are specific to a small range within the pH scale, say 2.5 to 5.0 pH. Red cabbage juice is a common indicator you might be familiar with.

Red cabbage juice has a color range from bright pink for a strong acid to yellow for a strong base. Other indicators, such as litmus, indicate if a substance is acid or base, not the degree of acid or base.

Indicators can be soaked into papers, making indicator paper for specific pH ranges. Indicator papers can be dipped into substances, matching the color change of the paper to a pH color chart for the indicator.

Sodium Bicarbonate (sodium bicarb, bicarb or baking soda) has a pH of 8.3 and contributes bicarbonate to total alkalinity. Because the spa water pH is close to the pH of the bicarb, it will have a greater effect on TA than pH. So if you want to raise just the alkalinity with a small rise in pH, use bicarb. 1 lb of bicarb added to 10,000 gallons of water will increase TA by 7.15 ppm and increase pH by about .1 to .2 unit.



Sodium Carbonate (soda ash) has a pH of 13.0 and contributes carbonate to total alkalinity. Because it has a high pH, soda ash will raise both pH and total alkalinity. 1 lb of soda ash added to 10,000 gallons of water will increase TA by 11.33 ppm and will increase the pH by about 1.0 unit.

