

# Pool water chemistry made easy

By Annette M. Stockley

When you mention pool water chemistry, memories of a high school chemistry class might come to mind! Well, our chemistry teachers were right — we will use this information again — especially if we own a swimming pool.

I'll explain pool water chemistry in an easy-to-understand way. For water to be clear, clean and healthy, certain water chemistry factors need to be kept in the proper ranges as shown in the box below.

Let's take chlorine. Chlorine kills germs and bacteria, and keeps your pool water healthy. Just because your pool water is clear does not necessarily mean that your pool water is healthy. For instance, the water in our toilet bowl is clear, but not healthy. For water to remain clear and healthy, chlorine needs to be added to the pool water on a consistent basis to maintain a 1-3 part per million (ppm) level of chlorine (for every 1,000,000 "parts" of water in your pool, 1-3 "parts" should be chlorine).

Now, as chlorine is introduced into your pool water, it kills germs and bacteria. Visualize the chlorine attacking and killing germs and bacteria. The "used up" chlorine (called chloramines) that has a chokehold on these dead germs and bacteria rapidly accumulates in your pool water day after day. As this "used up" chlorine accumulates, an awful chlorine smell develops around your pool. At this point, most people assume there is way too much chlorine in their

pool water and they stop adding chlorine. Big mistake! What your pool water really needs at this point is a shock treatment. By adding an overabundance of chlorine to the pool water (and raising the chlorine level to at least 10 ppm), all this "used up" chlorine will oxidize and burn away and that awful chlorine odor will disappear. As a general rule of thumb, use at least 1 pound or 1 gallon of shock for every 10,000 gallons of pool water whenever a shock treatment is needed. After shocking, remember not to swim until the chlorine level returns to below 3 ppm.

When should you use a shock treatment? For general guidelines, shock your pool every one to two weeks, after a pool party or after a heavy rainstorm. Treating your pool water chemistry proactively is much less expensive than treating it reactively!

Chlorine performs two very important jobs. In small doses (1-3 ppm), chlorine kills germs and bacteria. In large doses (10 ppm), it rids your pool water of "used up" chlorine.

Next is pH. The pH tells us if our pool water is acidic or basic. Also, pH has a very close and direct relationship with chlorine. For instance, when the pH factor of your pool water is between 7.2 and 7.6, chlorine works well. When the pH factor of your pool water is below 7.2, chlorine does not stay in the water very long. In contrast, as pH rises above 7.6, chlorine becomes less effective. For example, at a pH factor of 7.8, only 33% of the chlorine in your swimming pool is working and the

other 67% is "inactive." Therefore, to maintain clear, clean, healthy water in an economical manner, keep your pH between 7.2 and 7.6

## Know your levels

Now let's talk about those confusing words, acidic or basic. When the pH factor of your swimming pool is between 7.2 and 7.6, your pool water feels comfortable, remains clear and is not damaging to your pool equipment (liner, filter, plump, lights, etc.). When the pH factor of your pool water is below 7.2, your pool water is corrosive and acidic (like vinegar). Acidic pool water will "eat away" at everything it touches and corrode your pool equipment rather quickly. Swimming in pool water that has the same pH factor as vinegar will make us feel itchy and burn our eyes.

When the pH factor of your pool water is higher than 7.6, your pool water is basic and forms scale (think of barnacles on the bottom of a boat) on everything it comes in contact with. High pH will cloud the pool water as dissolved solids come out of the solution and leave grayish, white deposits on your pool equipment. Swimming in basic water burns our eyes, dries our skin and decreases filter efficiency as scale forms.

Lots of people have a hard time keeping their pH in range because they neglect to maintain their total alkalinity within its proper range (80-120 ppm). Think of total alkalinity as a "buffer" for your pH — it helps keep the pH where it

should be. Low, total alkalinity contributes to acidic water (like vinegar) and contributes to pH "bounce" (when the pH of your pool water "bounces" from high to low). High total alkalinity contributes to scaling (think barnacles), high pH, cloudy water, dry skin and inactive chlorine.

Next is calcium hardness. Calcium hardness is a dissolved mineral in your pool water. When calcium hardness is in its proper range, your pool water has a sparkling-in-the-sunlight appearance. More importantly, when your calcium hardness is in range, your vinyl liner or plaster pool surface is protected. Although low calcium hardness levels will never cause cloudy water, it leads to a "dull" appearance. High calcium hardness levels will make the water "milky" looking. Also, just as with pH and total alkalinity, low calcium hardness contributes to corrosive and acidic water, and high calcium hardness contributes to scaling water.

Therefore, low pH, low total alkalinity and low calcium hardness will produce acidic and corrosive pool water and high pH, high total alkalinity and high calcium hardness will produce cloudy, scaling pool water.

Chlorine stabilizer (cyanuric acid) helps keep chlorine from burning off or dissipating in the sunlight and keeps chlorine in your pool longer. As an example, on a bright sunny day, 3 ppm of chlorine will last approximately two hours in your pool water if no chlorine stabilizer is present. Maintaining your chlorine stabilizer reading within its proper

range (40-80 ppm) and maintaining your chlorine reading between 1-3 ppm will ensure that your pool water stays healthy for longer periods of time. Think of chlorine stabilizer as a "sunshield" or "insurance policy."

## All about metals

As for iron, copper or any other metals, we strive to maintain a 0 ppm reading. When metals are present, your pool water may appear colored (green, red, brown) and the potential for staining surfaces is greater.

TDS stands for total dissolved solids. Every product you add to your pool water contributes to the TDS level. At a high TDS level, your pool water requires more chlorine and water chemistry products to stay in balance, your filter operates poorly and your pool water becomes cloudy. Fortunately for us in New England, this is a rare problem since we lower our water level every autumn. When we lower our water level and refill in the spring, we are diluting our TDS levels.

So, let us think of chlorine, pH and total alkalinity as dominos — each one affects the other. Proper total alkalinity helps keep our pH in range, proper pH enables the chlorine to work well and chlorine keeps our pool water clear, clean and healthy. If one is out of balance, the "dominos" start to fall!

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## WATER CHEMISTRY FACTOR

Chlorine  
PH  
Total Alkalinity  
Calcium Hardness  
  
Chlorine Stabilizer (cyanuric acid)  
Iron  
Copper  
Metals  
Total Dissolved Solids

## IDEAL RANGE

1-3 ppm  
7.2-7.6  
80-120 ppm  
200-275 ppm, plaster pools  
175-225 ppm, vinyl liner pools  
40-80 ppm  
0 ppm  
0 ppm  
0 ppm  
Les than 1500 PPM

