

Pool Water Chemistry Guide



balancing water

The water chemistry information in this guide will help you keep your pool water clean and clear, swimmer safe, and plaster friendly.



AquaThORITY
POOLS & SPAS, LLC

the clear choice in pool care



Founders: Tim DeMirjian & Bob Nask

Table of Contents

- Introduction 2
- Water Chemistry Importance..... 3
- Nature of Water 3
- Determining Pool Water Volume..... 4
- Must-have Chemicals 4
- Water Chemistry Basics..... 6

Introduction

The purpose of this Pool Water Chemistry Guide is to provide basic water chemistry information which will help you keep your pool water clean and clear, swimmer safe, and plaster friendly.

Water chemistry includes 2 primary categories: balanced water and sanitized water. Balanced water relates to the chemical and metal elements of the pool water. Sanitized water relates to the cleanliness and sanitary condition of the pool water.



crystal clear

Water Chemistry Importance

The reason balanced and sanitized pool water is so important lies in the destructive effects if it is not. Unbalanced water can corrode, etch, stain and scale pool surfaces and equipment. Unsanitary water will have ill-effects upon swimmers, water quality and pool surface.

The 5 basic chemical elements which affect water quality are pH, alkalinity, calcium hardness, cyanuric acid and sanitizer (e.g. chlorine). Consistently monitoring and adjusting these elements will keep your water balanced and sanitized, and your equipment and pool surface healthy.

Nature of Water

Essentially, pool water has 3 basic chemistry elements: pH, alkalinity and calcium. Additionally, pool water has inherent elements of different origin: foreign, organic, inorganic and environment. All of which need to be managed collectively.

When managed (balanced), the water is swimmer safe and plaster friendly. Conversely, if mismanaged (unbalanced) it will become aggressively destructive, causing swimmer irritation and plaster degradation: stain, scale, etch, etc.

A simpler explanation is that “water has an appetite” derived from its environs and natural occurring chemistry. When “fed what it hungers”, then water is content and passive. However, when “starved” it becomes aggressively destructive.



water chemistry



scaled plaster



mottled plaster



water volume

Determining Pool Water Volume

Knowing volume of water is essential to balancing your pool water. Here are a few simple formulas for determining your pool's number of gallons.

Average depth formula:

- shallow-end depth + deep-end depth divided-by 2 = average depth
- example: $3.5' + 8.5' = 12'$ $12'/2 = 6'$ average depth

Water volume for a rectangular or square pool:

- length x width x average depth x 7.5 = water volume in gallons
- example: $40' \times 20' = 800$ $800 \times 6 = 4,800$
 $4,800 \times 7.5 = 36,000$ gallons

Water volume for a round or oval pool:

- length x width x average depth x 5.9 = water volume in gallons
- example: $40' \times 20' = 800$ $800 \times 6 = 4,800$
 $4,800 \times 5.9 = 28,320$ gallons

Must-Have Chemicals

Having the following products on-hand will make balancing your pool water easy and convenient.

Test kit

A liquid reagent kit which tests for:

- alkalinity
- pH
- calcium hardness (or total hardness)
- sanitizer (chlorine, bromine, salt or sanitizer of choice)
- cyanuric acid

Alkalinity chemicals

- alkalinity increaser (sodium bicarbonate)
- alkalinity decreaser (sodium bisulfate or muriatic acid)

pH chemicals

- pH plus (sodium carbonate)
- pH minus (sodium bisulfate or muriatic acid)



essential chemistry kit



Calcium chemicals

- calcium increase (calcium chloride) or hardness increaser

Sanitizer chemicals

- chlorine (tablets or sticks), if your pool is set-up for chlorine
- bromine (tablets or sticks), if your pool is set-up for bromine
- salt, if your pool has a chlorine/salt generator

Chlorine stabilizer

- cyanuric acid

Shock chemicals

- liquid chlorine or granular chlorine

Diatomaceous earth (D.E.)

- for D.E filters

Algaecides

- prevents and kills algae

Clarifiers

- treats cloudy water

Stain and scale preventer

- keeps minerals/metals in solution



calcium



shock



stain & scale



d.e.



algaecide



clarifier

Water Chemistry Basics

We recommend a regimen of testing and adjusting at least once a week, in the following order.

#1: Alkalinity level

Alkalinity is essentially the water's capacity to neutralize acids. The proper alkalinity level helps stabilize pH, so, get total alkalinity in-range prior to adjusting pH.

Test and adjust total alkalinity

- should be 80 to 120ppm (parts per million) for plaster and concrete pools
- should be 125 to 150ppm (parts per million) for vinyl liner and/or fiberglass pools

Low alkalinity will cause volatility with your pH level

- add alkalinity increaser (sodium bicarbonate) to increase alkalinity

High alkalinity will cause your pH level to be rigidly fixed and may cause scale and cloudiness

- add muriatic acid or sodium bisulfate to decrease alkalinity



#2: pH level

pH is an expression of the basic or acid condition of water: 0 is most acid; 7 is neutral; 14 is most basic.

Test and adjust pH

- ideal level is 7.2 to 7.6

Low pH means that your water is too acidic and can cause damage to plaster and equipment

- add pH plus (sodium carbonate) to increase pH

High pH means that your water needs acid and is prone to stain and scale

- add pH decriaser (sodium bisulfate) or muriatic acid to decrease pH

NOTE: sodium bisulfate can discolor plaster where the granular rests; first, dilute granular in bucket (always follow product label instructions).



#3: Calcium hardness (aka: total hardness) level

Calcium hardness is an expression of calcium content.

Test and adjust calcium hardness

- ideal range is 200 to 400ppm (parts per million)

Low calcium water will pull calcium from the plaster and cause etching and roughness

- add calcium chloride to increase calcium hardness

High calcium water may cause scale formation and cloudy water

- drain and replace some of the pool water to decrease calcium hardness

#4: Chlorine level

The purpose of sanitizers – chlorine (most popular), bromine and salt (chlorine generators) – is to prevent algae and destroy bacteria. Chlorine is most effective at water temperatures of 65 to 90 degrees, whereas bromine is most effective at water temperatures of 85 to 104 degrees.

NOTE: never combine sanitizers and always follow product label instructions.

Test and adjust chlorine:

- add chlorine to achieve an ideal level of 1.5 to 2.0ppm (parts per million)

NOTE: granular chlorine can discolor plaster where the granular rests; first, dilute granular in bucket of water (always follow product label instructions).



#5: Cyanuric acid level

Cyanuric acid (aka: stabilizer) protects against the degradation of chlorine caused by UV exposure.

Test and adjust cyanuric acid:

- should be 30ppm to 50ppm

Low cyanuric acid will cause the chlorine to be consumed by the sun's ultraviolet rays

- add cyanuric acid to increase cyanuric acid level

High cyanuric acid can bind the chlorine and render it ineffective

- drain and replace some of the pool water to decrease cyanuric acid level

#6: Shock (super-chlorination)

Swimmers bring elements – perspiration, deodorant, saliva, urine, mucous, lotions, hair products, etc. – into the water and form chloramines which reduce the effectiveness of the chlorine.

Shocking a pool with liquid chlorine or granular shock will remove the chloramines and also destroy algae and bacteria. Weekly shocking is a proactive means of prevention.

#7: Algaecides

All different types of algae (green, yellow/mustard, pink, and black) are microscopic plants which are introduced to the pool by swimmers, rain, wind, etc. Sunlight and nitrogenous materials stimulate their growth. Algae can overwhelm a pool quickly and, thereafter, be expensive and burdensome to treat.

Algae and bacteria feed each other naturally: algae consumes carbon dioxide and gives-off oxygen, and bacteria consumes oxygen and gives-off carbon dioxide. The key is to prevent it in the first-place by adding algaecides on a regular basis in addition to proper chlorination and weekly shocking.

#8: Clarifiers

Water clarity has an impact on the appearance of the water, prevention of disease, and swimmer welfare. Cloudy water can harbor bacteria and viruses which in-turn can cause human symptoms such as earaches, pinkeye, rashes, etc.

Water clarity is achieved through the filtration system which removes large particulate matter like dirt, skin flakes, algae spores, bacteria, fertilizers and other debris. However, the smaller particulate matter, such as oils and lotions, will pass-through the filter and return to the pool.

Clarifiers essentially coagulate the smaller particulate matter into a larger mass which the filter then effectively removes. Adding a clarifier on regular basis will help ensure clean and clear pool water.

#9: Stain and scale preventer

Surface stains are typically caused by metals in the pool water and other metallic impurities introduced to the pool by groundwater (via garden-hose), rainwater, toys, swimmers and the like. Iron, copper and manganese are the most common metals found in municipal water, well water and rainwater.

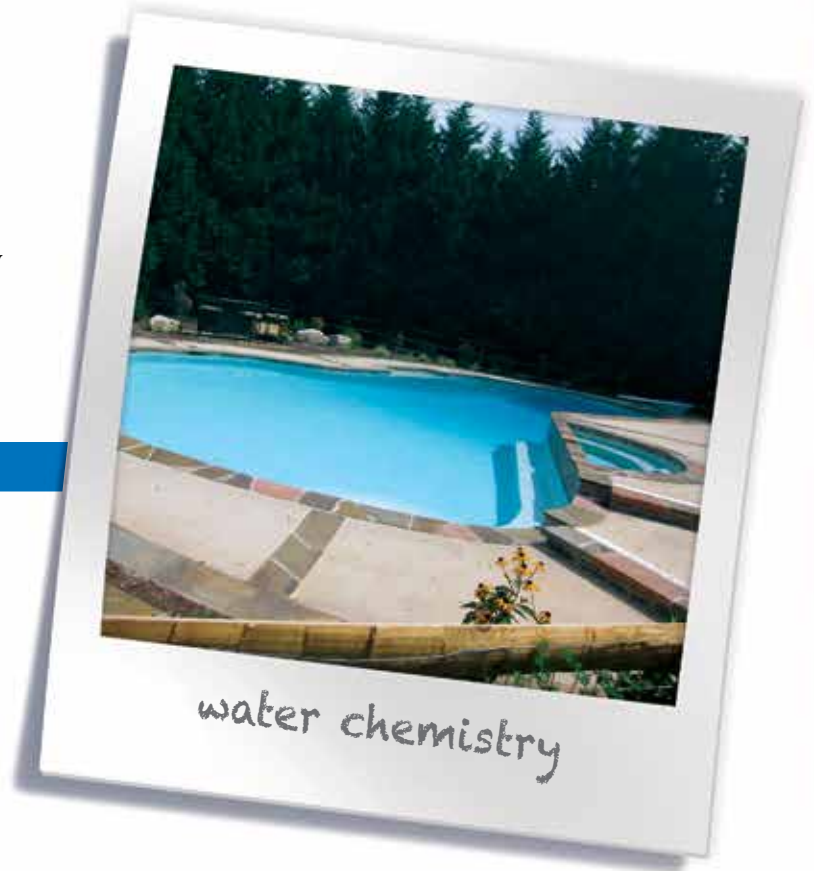
The other source for metallic impurities is corroded pool equipment such as heaters, copper or brass plumbing, metal ladders and pool light housing. Low pH or alkalinity can cause corrosion of these metal-based components and in-turn produce copper and iron metal particulates.

Adding a stain and scale preventer on a regular basis will help prevent metallic stains and scale.

#10: Phosphate remover

Phosphates can be introduced to the pool water via swimmer, dirt, fertilizers, hair products and even pool chemicals (containing tri-sodium phosphate or polyphosphates). Especially a concern for chlorine generator pools (salt), high levels of phosphate can impair the generator's production of chlorine.

Signs of high phosphate include cloudy water and diminished chlorine efficacy. The ideal phosphate range is 200 to 500 ppb (parts per billion). Monitoring the phosphate level on a regular basis is recommended as is adding a phosphate remover as needed.



**Trust AquaThORITY with your pool
and enjoy peace of mind.**

- Better Business Bureau A+ rated
- Angie's List Super Service award
- National Plasterers Council member
- Home Advisor Pro recommended
- PA Registered Contractor: PA083523



AquaThORITY
POOLS & SPAS, LLC

the clear choice in pool care

210 Carter Drive, West Chester, PA 19382

888-400-AQUA (2782)
www.aquathority.com