



WATER CHEMISTRY - pH

Water Recreation Program

What is Water?

H₂O

H⁺ + OH⁻

What is pH?

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

Acid or Base?

pH Scale



pH

The pH scale was invented in in 1909 by APL Sorenson

pH is:

the **negative logarithm** of the **hydrogen ion concentration** in an **aqueous solution**

The “p” in pH is never capitalized

pH roughly stands for the “power of hydrogen”

What is pH?

Aqueous Solution

Hydrogen Ion Concentration

NEGATIVE Logarithm

Negative Logarithm

- Logarithms are mathematical shorthand for writing very big or very small numbers

$$10^2 = 100$$

$$10^{-2} = .01$$

Negative Logarithm of the Hydrogen Ion Concentration



$$10^{-7} = .00000001$$

$$10^{-7.5} = .00000000316227$$



Why is this important?

1. Small changes in pH are actually big changes
2. Damage to the pool – Corrosion or Scaling
3. Swimmer discomfort / possible harm
4. Big changes in the disinfecting power of Chlorine –
 1. **Disease** / cloudy water / **algae** / \$\$\$

The pH Range

Ideal pH
7.4 – 7.6

Allowed Range
7.2 – 8.0

Controlling pH

Test with your test kit

pH testing uses phenol red reagent. This reagent can change color within the normal pH operating range of pools and spas. **But it will not test beyond the range that the test kit manufacture specifies.**

Phenol red is sensitive to Chlorine and Bromine. If these levels are very high, your pH test may show a purple color. This is not a very high pH reading it is a chemical reaction the changes the reagent to chlorophenol red or bromophenol red.

To Raise pH

Test and adjust total alkalinity – retest pH then, if needed:

Perform a base demand test – follow the instructions in your kit and add:

Soda Ash – Na_2CO_3

Using the dosing chart that should come with your test kit

To Lower pH

Test and adjust total alkalinity – retest pH then, if needed:

Perform an Acid demand test – follow the instructions in your kit and add:

Muriatic acid (HCL)

Or

Sodium bisulfate (NaHSO₄)

Use the dosing chart that should come with your test kit

Chemical Safety

Pool chemicals can be very dangerous. pH adjusting chemicals can be very harsh and pool operators should take care to understand the hazards of these chemicals:

Read the SDS

Read the label

Follow all instructions

Use PPE

Store according to label instruction

Always add chemical to water never the other way around

Be careful with other chemicals – serious and fatal reactions are possible if accidentally mixed.

Questions?

Contact

David DeLong

360-236-3817

david.delong@doh.wa.gov



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