

The background is a light blue gradient with several white bubbles of various sizes scattered across it. The bubbles are more concentrated at the top and bottom edges of the frame.

POOL & SPA CHEMISTRY THE SCIENCE OF WATER

BRIAN DIGLIO, PRESIDENT

BLUE WAVE POOL SERVICE & SUPPLIES, INC.

CHLORINE

THE MOST COMMON DISINFECTANT IN SWIMMING POOLS IS CHLORINE.

THERE ARE 3 MEASUREMENTS:

- FREE CHLORINE
- TOTAL CHLORINE
- COMBINED CHLORINE



FREE CHLORINE

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FREE CHLORINE IS THE ACTIVE AVAILABLE CHLORINE IN THE WATER.

CT HEALTH DEPARTMENT
REQUIREMENTS:

- MINIMUM OF .8 MG/L (PPM)
- MINIMUM OF 1.2 MG/L (PPM)
IF USING STABILIZER



COMBINED CHLORINE

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**COMBINED CHLORINE
FORMS WHEN FREE
CHLORINE REACTS WITH
CONTAMINANTS.**

ALSO CALLED CHLORAMINES.

COMBINED CHLORINE

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**THERE IS NO SINGLE TEST FOR
COMBINED CHLORINE.**

TOTAL – FREE = COMBINED

***TEST FOR FREE AND TOTAL TO COMPLETE
CALCULATION***

- **SHOULD NOT BE ABOVE .2 PPM IN POOLS**
- **SHOULD NOT BE ABOVE .5 PPM IN SPAS**

COMBINED CHLORINE

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**CREATES SEVERAL CHALLENGES
INCLUDING CHLORINE SMELL.**

HOW TO REDUCE CC:

- WATER
- BREAKPOINT CHLORINATION
- NON-CHLORINE SHOCK
(POTASSIUM MONOPERSULFATE)

Chlorine Type	Physical Appearance	Available Chlorine	pH Effect (pH measure)	Equiv. Amounts	TDS Month
Chlorine Gas	Gas	100%	Lowers (<1.0)	1 Ounce	0.0 ppm
Sodium Hypochlorite	Liquid	10-12%	Raises (13.0)	1 Gallon	300 ppm
Calcium Hypochlorite	Granular Tablet or Briquette	65-78%	Raises (8.5-11.0)	1 Pound	68 ppm
Lithium Hypochlorite	Granular	35%	Raises (10.8)	2 Pounds	125 ppm
Dichlor*	Granular	56-63%	Neutral (6.5-6.8)	4 Ounces	72 ppm
Trichlor*	Granular Stick or Tablet	90%	Lowers (2.8-3.5)	3 Ounces	50 ppm
Bromine	Granular Stick or Tablet	BR=60% CL=28%	Lowers (4.6)**	1.5 Pounds	72 ppm

CHLORINE

Dichlor*	Granular	56-63%	Neutral (6.5-6.8)	4 Ounces	72 ppm
Trichlor*	Granular Stick or Tablet	90%	Lowers (2.8-3.5)	3 Ounces	50 ppm

***STABILIZED**

FOR EACH 10 PPM OF CHLORINE ADDED TO THE WATER FROM TRICHLOR, 6 PPM OF CYANURIC ACID IS ADDED.

CT HEALTH CODE REQUIRES CYANURIC ACID TO STAY BELOW 100 PPM.

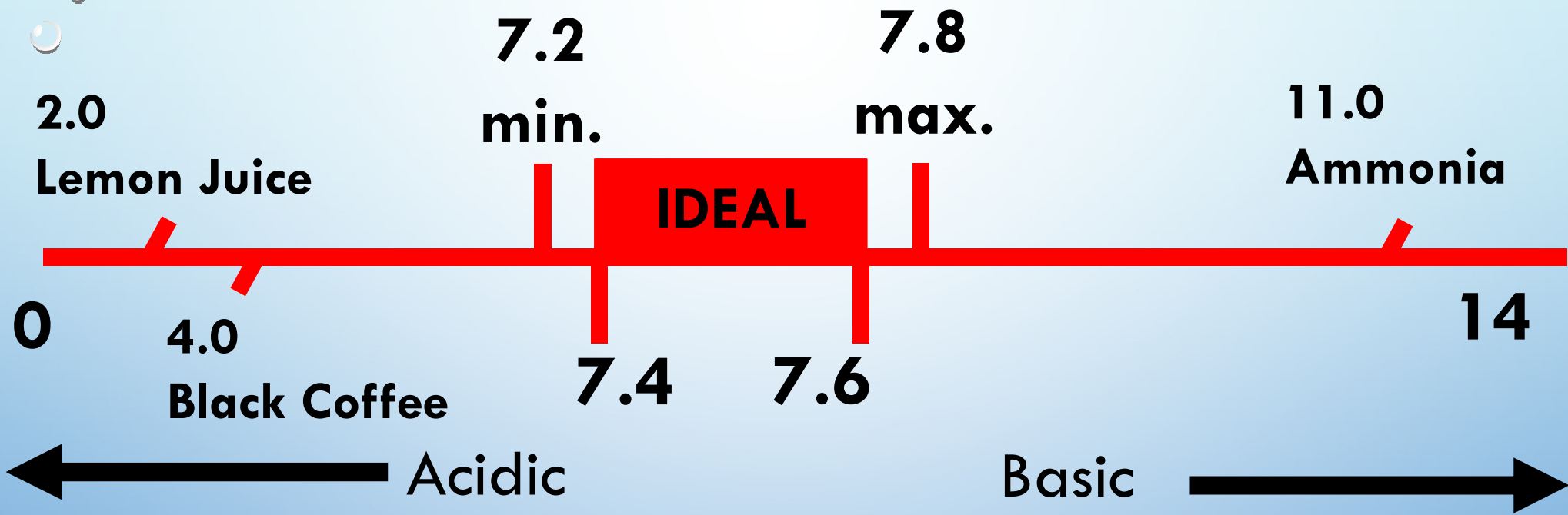
BROMINE

- VERY SIMILAR COMPOUND TO CHLORINE
- COMPARABLE LEVELS ARE A BIT HIGHER
- TEST IS FOR TOTAL BROMINE



pH

**pH IS THE MEASURE OF
ACIDIC OR BASIC WATER IS.**



pH

**THE EFFICIENCY OF THE
DISINFECTANT VARIES BASED
ON pH. AT DIFFERENT pH
READINGS, YOUR PERCENT OF
ACTIVE KILLING FORM OF
DISINFECTANT VARIES.**

% Active HOCL	pH	% Less Active OCL-
97	6.0	3
91	6.5	9
76	7.0	24
66	7.2	34
50	7.5	50
33	7.8	67
24	8.0	76
9	8.5	91

CHLORINE AND pH

% Active HOBr	pH	% Less Active OBr
100	5.0	0
100	6.0	0
98	7.0	2
96	7.2	4
94	7.5	6
87	7.8	13
83	8.0	17

BROMINE AND pH

ALKALINITY

**TOTAL ALKALINITY IS THE
MEASURE OF THE ABILITY OF
WATER TO RESIST CHANGE IN
pH.**

ALKALINITY

- REFERRED TO AS A “BUFFER”.
- WHEN LOW, THE pH CAN EASILY FLUCTUATE AND IS HARD TO CONTROL.
- WHEN HIGH, THE pH WILL LIKELY BE HIGH AND TOUGH TO BRING DOWN.
- RECOMMENDED RANGE IS 80-100 PPM, OR 100-120 FOR POOL USING CYANURIC ACID.

REMEMBER THIS! MORE ON THIS LATER!

CYANURIC ACID

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CYANURIC ACID FUNCTIONS AS A STABILIZER FOR FREE CHLORINE.

- KEPT AT PROPER LEVELS, IT PROTECTS FREE CHLORINE FROM BEING BURNT OUT TOO QUICKLY BY SUNLIGHT.

CYANURIC ACID AND TOTAL ALKALINITY

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- CYANURIC ACID AFFECTS THE ALKALINITY TEST.
- CYANURIC ACID CORRECTION FORMULA:
 - DIVIDE THE CYA READING BY 3, AND SUBTRACT FROM TOTAL ALKALINITY.
- THIS IS THE ACTUAL ALKALINITY THAT SHOULD BE RECORDED AND ADJUSTED ON.

CYANURIC ACID AND TOTAL ALKALINITY

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EXAMPLE

CYA = 60 ALKALINITY = 100

$$60 / 3 = 20$$

$$100 - 20 = 80$$

80 IS THE ACTUAL TOTAL ALKALINITY.

WATER TESTING



WATER TESTING

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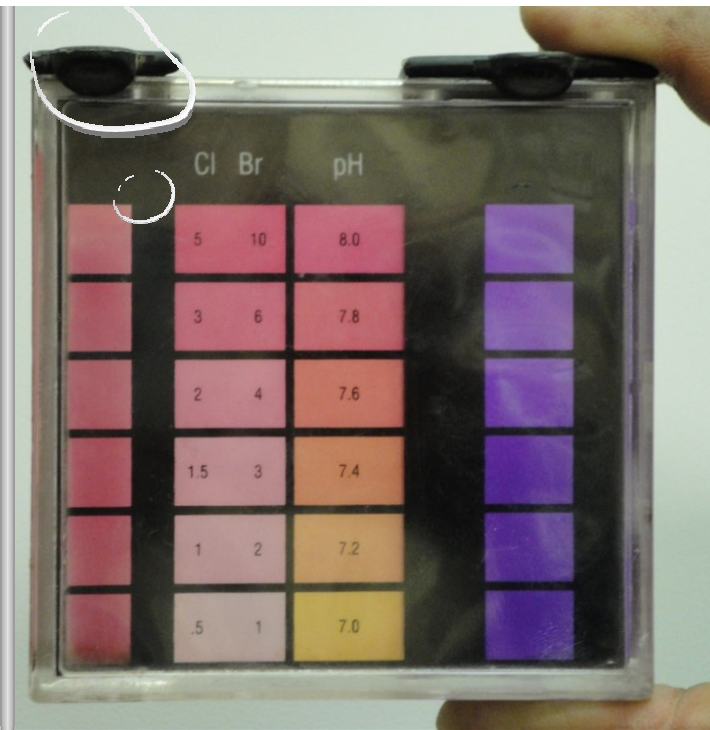
EFFECTS OF HIGH CHLORINE

1. REAGENTS WILL “FLASH” COLOR AND DISAPPEAR. IF NOT WATCHING CLOSELY, YOU WILL THINK FC IS 0.
2. pH TEST CAN REVEAL A PURPLE COLOR.
3. TOTAL ALKALINITY TEST CAN BECOME YELLOW.

WATER TESTING

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**IF CHLORINE IS REALLY HIGH, THIS
PROBLEM SHOULD BE
CORRECTED, BEFORE RECORDING
AND TRUSTING THE OTHER TESTS.
THE HIGH CHLORINE WILL AFFECT
THE OTHER TESTS.**



HIGH CHLORINE



WATER TESTING

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HIGH TOTAL ALKALINITY

WITH A HIGH TOTAL ALKALINITY,
THE ENDPOINT OF THE TEST MAY
NEVER BE REACHED.

CHLORINE VS BROMINE TESTING

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TEST KIT CARE

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PROPER CARE

1. STORE THE TEST KIT IN A TEMPERATURE CONTROLLED AREA.
2. DON'T LEAVE IN DIRECT SUN FOR LONG PERIODS OF TIME.
3. BE SURE NOT TO SWITCH CAPS, AND THAT THEY ARE SCREWED ON TIGHT WHEN STORED.

TEST KIT CARE

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PROPER CARE

4. RINSE THE COMPARATOR AND DISPENSING BOTTLE AFTER EACH USE.
5. REPLACE REAGENTS AT THE BEGINNING OF EACH SEASON.
6. DO NOT USE OTHER BRAND REAGENTS.

TEST KIT CARE

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DOS AND DON'TS

1. DO NOT EMPTY TESTS INTO POOL. IT IS NOT HARMFUL, BUT A COURTESY.
2. CHECK EXPIRATION DATES ON REAGENTS!



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TEST KIT CARE



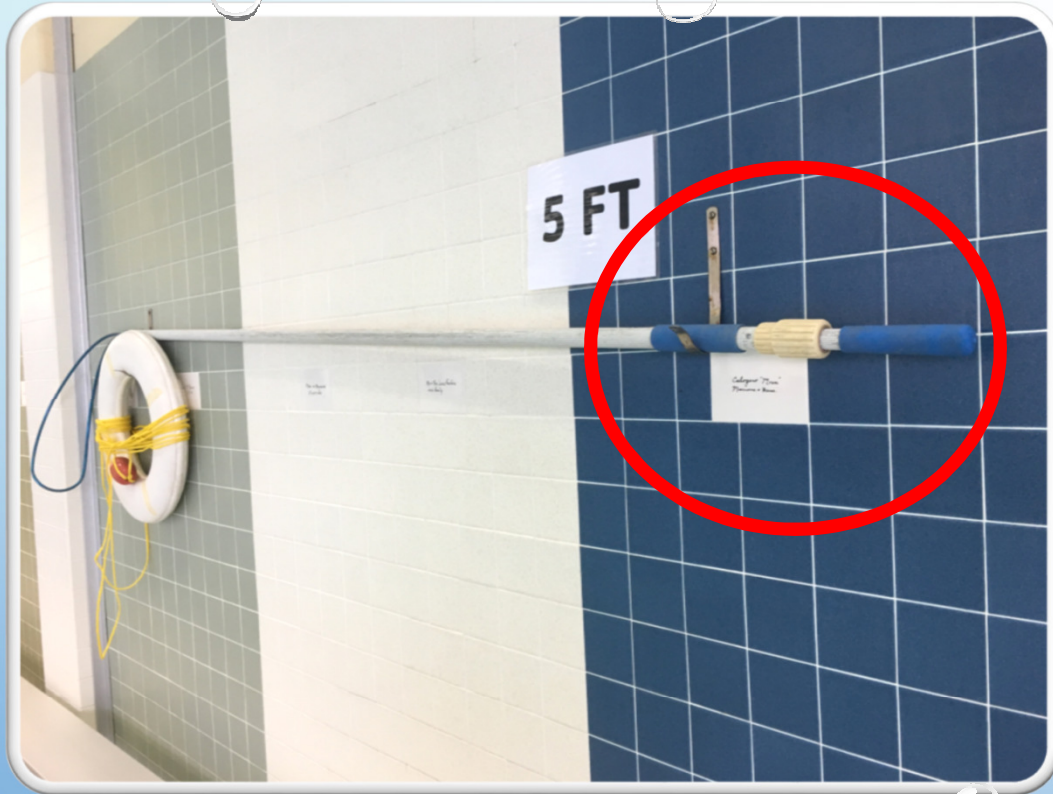
TEST KIT CARE



“QUICK” INSPECTION

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1. FREE CHLORINE
2. pH
3. CAN YOU CLEARLY SEE THE MAIN DRAIN?
4. IS THERE VISIBLE LIFESAVING EQUIPMENT?
5. IS THE GATE FUNCTIONING PROPERLY AND IS THE FENCE UNDAMAGED?



SHEPARD'S CROOK

**HOT TUB
WATER
EXCHANGE**

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**VOLUME ÷ 3
÷ AVG. # OF USERS
DAILY =
NUMBER OF DAYS
TILL DUMPING**

6/19

	Name	W.Temp	Chlorine	PH	Supervisor	
					TA	CA
9am						
1pm	Oscar	off	3-6	8		
4pm		off	3-6	8		
8pm	Kyle	off	7.5-15	8		
		off	10-20	8		

Date: 6-20

	Name	W.Temp	Chlorine	PH	Supervisor	
					TA	CA
9am						
1pm	Bill	80	3-6	8.0		
4pm		80	3-6	8.0		
8pm	Oscar	off	3-6	8.0		
		off	5-10	8.0		

Date: 6/21

	Name	W.Temp	Chlorine	PH	Supervisor	
					TA	CA
am	Kyle	off	5-10	8.0		
om		off	6	8.0		
m	Kyle	84	3-6	8.0		
m		83	7.5-15	8.0		

e: 6-22

	Name	W.Temp	Chlorine	PH	Supervisor	
					TA	CA
	Bill	81	10-20	8		
		82	3-6	8		
	Oscar	82	7.5-15	8		
		81	7.5-15	8		

TEST LOG



Accurate Water Testing

With Blue Wave

Come join us for this educational opportunity. You will be supplied a test kit (that you get to take back with you!).

Master water testing with this one of a kind hands on experience.

Cost: \$105.00

Dates and Times: Monday, April 15 2019 10 AM - 12 PM

Location: Blue Wave, 11 Overlook Drive, Hamden, CT 06514

Register by contacting Justin Ivey at Blue Wave.

P: (203) 248-0429

E: justin@bluewavepoolspa.com

Test kit provided meets CT Health Code requirements.



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ACCURATE WATER TESTING



**CERTIFIED
POOL/SPA
OPERATOR**