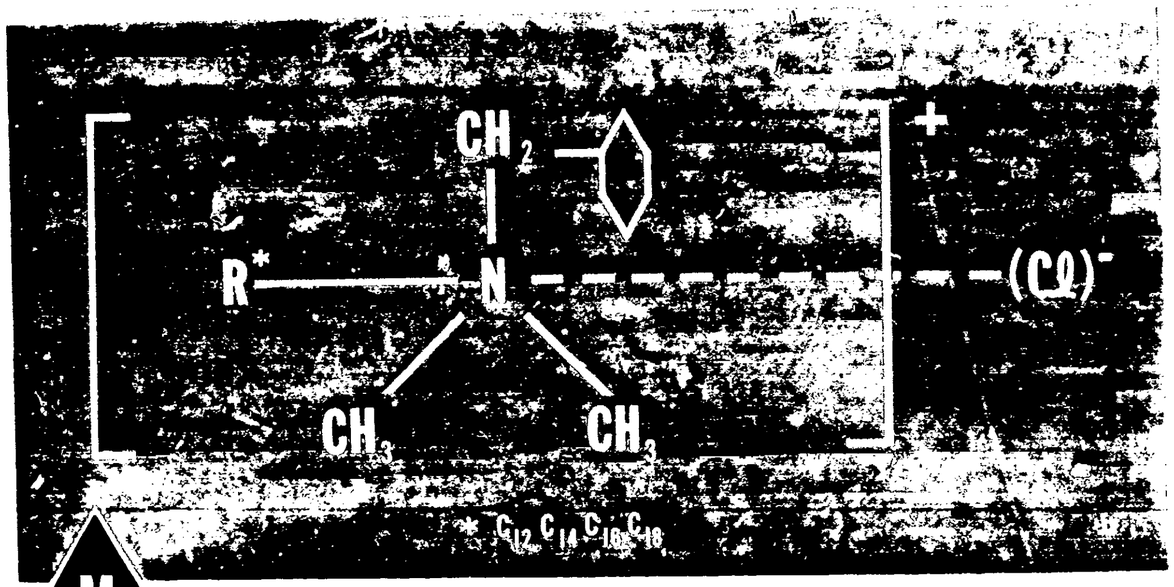
MAQUATS

Quaternary ammonium compounds



The Maquats are a selected group of quaternary ammonium compounds covering a wide range of products and properties. They have proven themselves exceptional microbicidal agents when used as disinfectants, sanitizers, deodorants, germicides and algaecides.

The dodecyl (C_{12}), tetradecyl (C_{14}), and the hexadecyl (C_{16}) have been the most effective germicidal components of the alkyl radical. The Maquats are manufactured from these select alkyl groups to give the highest microbicidal activity along with the finest physical properties.

We at Mason Chemical Company believe our progress and growth depend upon our finding ways to do that "something extra" for our customers. You will find us pleased to discuss any problems or projects which will help you make your product line more successful.

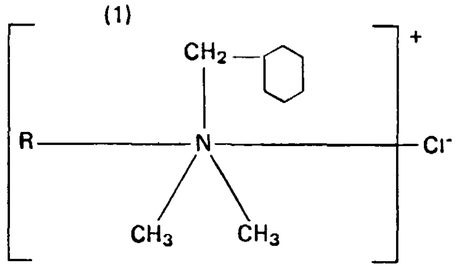
INTRODUCTION:

The Maquats are quaternary ammonium compounds manufactured by Mason Chemical Company of Chicago, Illinois. These products are characterized by a halide ion and a cationic nitrogen atom with four covalent carbon-nitrogen bonds. The nitrogen atom is attached to at least one long chain hydrocarbon radical. The straight chain radical ranges from C_8H_{17} to $C_{18}H_{37}$ and is derived from coconut fatty acid. To illustrate:

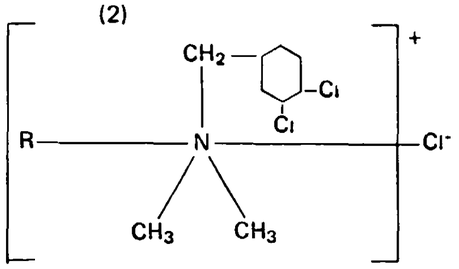
Fatty acid ——→ Nitril ——————→ Tertiary amine + (1) (Benzyl chloride) (2) (Dichlorobenzyl chloride) ——→ Q.A.C.

(1) Alkyl dimethyl benzyl ammonium chloride.
(2) Alkyl dimethyl dichlorobenzyl ammonium chloride.

(1)



(2)



This chemical structure gives these compounds high germicidal activity because of the well balanced cation (lipophilic) and anion (hydrophilic) group. The quaternary molecule is such that it gives excellent wetting and penetration action which enables it to kill microorganisms in areas inaccessible to other germicides.

PHYSICAL AND CHEMICAL PROPERTIES

The Maquats are all liquids and are extremely stable: They will maintain their stability over a wide range of temperatures and storage conditions. Maquats are readily soluble in water and most polar solvents and insoluble in non-polar solvents.

They are compatible with many organic compounds, acids, alkalis and organic salts. Complete solubility and compatibility data is available from Mason Chemical Co. on a wide range of products. Maquats are incompatible with soap and anionic surface active agents.

The biological properties of these products are increased as you raise the temperature and pH of the product. All quaternaries will lose some of their effectiveness if the pH falls below 5. The Maquats maintain their bacteriological properties in waters up to and including 1100 ppm of hardness depending on the product selected. Maquats have been tested according to the latest bacteriological test methods and the results are reported on the specification page. The A.O.A.C. Use Dilution Test is basic in determining the efficacy of the product as an environmental disinfectant. The applications for use of these Maquats are varied and include the following industries: Food, beverage, dairy, swimming pool, secondary oil recovery, paper, textile, aerosol, and many others. Mason Chemical Company will be pleased to suggest specific formulations on any applications where a quaternary ammonium compound may be contemplated.

MAQUAT SPECIFICATIONS

PRODUCT Active Ingredient(s)	LC 12S (1) Alkyl dimethyl benzyl ammonium chloride-Isopropanol	MC 1416 (E) (1) Alkyl dimethyl benzyl ammonium chloride-Isopropanol (Ethanol)	MC 1412 (E) (1) Alkyl dimethyl benzyl ammonium chloride-Isopropanol (Ethanol)	DLC 1214 (7) (2) Alkyl dimethyl dichlorobenzyl ammonium chloride	MQ-2525 Alkyl dimethyl benzyl ammonium chloride (A) Alkyl dimethyl ethylbenzyl ammonium chloride (B) (Isopropanol)	SC-18 Stearyl dimethyl benzyl ammonium chloride
Inert Ingredient(s) Active	Water 50% - 80% (20%) (3)	Water 50% - 80% (20%) (3)	Water 50% - 80% (20%) (3)	Water 50% - 80%	Water 25%A - 40%A - (20%) (3) 25%B - 40%B - ——	Water - Alcohol 25%
% Inert	50% - ——	50% - ——	50% - ——	50% - 20%	50% ——	75%
Alkyl Group Distribution (4) C_{12}, C_{14}, C_{16} & C_{18}	61, 23, 11 & 5	5, 60, 30 & 5	40, 50, 10 & –	61, 23, 11 & 5	A) 5, 60, 30 & 5 B) 50, 30, 17 & 3	—— 5 & 95
Average Molecular Weight	360	380	358	425	384	424
Color A.P.H.A. (Max)	100	100	100	100	100	100
Physical Form	Liquid	Liquid	Liquid	Liquid	Liquid	Paste
pH (10% Sol.)	7 - 8	7 - 8	7 - 8	7 - 8	7 - 8	3 - 4
Weight/Gal.	8.2 - 7.8	8.2 - 7.8	8.4 - 8.0	8.4 - 8.0	8.2	7.9
Standard Container	55 gal. Liquipak	55 gal. Liquipak	55 gal. Liquipak	55 gal. Liquipak	55 gal. Liquipak	55 gal. Liquipak
Gross - Net - Tare 50%	464-440-24	464-440-24	464-440	464-440-24	464-440-24	464-440-24
80%	449-425-24	449-425-24	449-42[illegible]	449-425-24	449-425-24	

BIOLOGICAL PROPERTIES (100% ACTIVE QUATERNARY BASIS)

USE DILUTIONS A.O.A.C.						
Staphlococcus aureus	ATCC - 6538	400 ppm (5)	400 ppm	400 ppm	400 ppm	400 ppm
Salmonella choleraesuis	ATCC - 10708	400 ppm (5)	400 ppm	400 ppm	400 ppm	400 ppm
Pseudomonas aeruginosa	ATCC - 15422	1400 ppm	1400 ppm	1200 ppm	——	800 ppm
PHENOL COEFFICIENTS A.O.A.C. (6) Killing Dilutions Average Values						
Staphlococcus auereus		1:39905 P.C. 614	1:42850 P.C. 659	1:47600 P.C. 666	1:53500 P.C. 764	1:41600 P.C. 538
Salmonella typhosa	ATCC - 6539	1:39905 P.C. 443	1:42850 P.C. 476	1:59500 P.C. 661	1:74400 P.C. 783	1:41600 P.C. 594
Escherichia coli	ATCC - 11229	1:47600 P.C. 680	1:27450 P.C. 392	1:42850 P.C. 612	1:44340 P.C. 633	1:31300 P.C. 447
HARD WATER TOLERANCE ($CaCO_3$) at 200 ppm of compound Chambers Test A.O.A.C. 99.999% Kill in 30 sec.						
Staphlococcus aureus		300 ppm 18 grain	550 ppm 32 grain	550 ppm 32 grain	1100 ppm 64 grain	850 ppm 50 grain
Escherichia coli		300 ppm 18 grain	550 ppm 32 grain	550 ppm 32 grain	1100 ppm 64 grain	850 ppm 50 grain
ACTIVITY AGAINST ALGAE Chlorella pyrenoidosa						
Algaestatic ppm		2	2	2		
Algaecidal ppm		5	5	5		
E.P.A. Reg. No. 10324 -	50%	3	8	6	4	17
	80%	2	9 (E) 13	7 (E) 14	5	16

(1) Meets all requirements of U.S.P. Benzalkonium Chloride.
(2) Not effective against Pseudomonas aeruginosa at the disinfecting concentration providing 400 ppm active quaternary.
(3) Represents 20% Isopropanol or 20% Ethanol when designated (E)
(4) Alkyl group distribution ± 10%
(5) 400 ppm = 1:2500
(6) Phenol Resistance
S. aureus 1:65
S. typhosa 1:90
E. coli 1:70
(7) CAUTION: Be sure to rinse with potable water all surfaces coming in contact with food after applying a sanitizing rinse.

LABELLING:

The Environmental Protection Agency, under the Insecticide, Fungicide, and Rodenticide Act, regulates the movement of "economic poisons" in interstate commerce. These include products that contain quaternary ammonium compounds (Maquats) intended for use as germicides, disinfectants, or sanitizers, on inanimate objects or surfaces. Most states have enacted similar legislation to regulate intra-state commerce. Generally, these states comply with Federal registration. Some maintain their own jurisdiction. In executing the law, the Federal as well as the State Agencies require registration of labels proposed for such products. In pharmaceutical and cosmetic applications, clearance should be obtained from the Food and Drug Administration, Federal Department of Health, Education and Welfare.

In order to register a product, a single copy of PR9-199 (Application for Registration of Economic Poisons) must accompany quintuplicate (5) typewritten copies of the proposed label. These are sent to:

Director Registration Section
Environmental Protection Agency
Pesticides Regulation Division
12th and Independence Avenue
Washington, D. C. 20250

ACCEPTED
4/24/72
UNDER THE [illegible] CIDE
FUNGI[illegible] CIDE ACT
FOR [illegible] REGISTER-
ED UNDER NO. 10324-4 SUBJECT
TO ATTACHED COMMENTS

Please refer to our Environmental Protection Agency registration number when registering a product with the above agency. The correct registration number is listed under each product on our MAQUAT specification page.

The Environmental Protection Agency registration number must be listed on every label for a quaternary-based compound making a germicidal, algaecidal, or sanitizer, claim. It is also necessary that the signal words **"DANGER", "CAUTION"** and **"KEEP OUT OF REACH OF CHILDREN"** be in the required point type based on the size of the label. The following table will serve as a guide for the type-size requirements on various sized labels:

Size of Label on Front Panel in Square Inches	"Danger" & "Caution" Words as Required Minimum Type Size all Capitals	"Keep Out of Reach of Children" as Required
5 and under	6 point	6 point
above 5 to 10	10 point	6 point
above 10 to 15	12 point	8 point
above 15 to 30	14 point	10 point
over 30	18 point	12 point

The ingredients, directions for use, and precautions for handling should be listed on the label. In listing the active ingredients, proper and most exacting identification is required. With quaternaries, the high- molecular weight alkyl group must be identified with a listing of the individual components either with percentages or in their order of dominance.

Option (1) The actual percentages of the major alkyl groups present in the descending order of magnitude, i.e., alkyl (60% C_{14}, 30% C_{16}, 5% C_{12}, 5% C_8-C_{18}) dimethyl benzyl ammonium chlorides, or

Option (2) Each alkyl group in the descending order of magnitude only, i.e., alkyl (C_{14}, C_{16}, C_{12} and related groups from C_8 - C_{18}) dimethyl benzyl ammonium chlorides.

If Option (1) is selected, then only the total percentage of the inert ingredient without any chemical description need be listed: otherwise if Option (2) is selected, then the inert ingredients must be identified.

Sterilizer: Must kill all living microorganisms when used as directed.

Germicide and Disinfectant: Must kill all of a given species of microorganisms except resistant sporeformers.

Fungicide: Must kill all of a given species of fungi.

Sanitizer: Must reduce bacterial count to a safe level in accordance with public health standards or to stated significant level where no standards have been set.

Antiseptic: Covers preparations intended solely for use on living tissue either as a germicide or bacteriostat.

Algaecide: Must kill algae.

Algaestat: For the control of algae.

Bacteriostat: Inhibits the growth of bacteria.

A basic knowledge of the type and strain of the microorganisms used in testing is helpful. The table below gives some of the more common types. A list of the test methods used are also reported below.

MICROORGANISM	MORPHOLOGY	TEST METHODS
Staphlococcus aureus	Gram + Cocci	
Salmonella choleraesuis	Gram – Rod	A.O.A.C. Use Dilution Confirmation Test
Salmonella typhosa	Gram – Rod	A.O.A.C. Phenol Coefficient Test Method
Escherichia coli	Gram – Rod	A.O.A.C. Germicidal and Detergent Sanitizer Official Method (Hard Water)
Pseudomonas aeruginosa	Gram – Rod	

After the label has been reviewed for compliance with the Act, the company submitting the label will be notified of any changes or deficiencies. Mason Chemical Company will be pleased to prepare or advise customers or prospective customers on all labelling procedures, Federal or State.

The following are two representative sample labels of a germicide and algaecide.

ACCEPTED
4/24/72
UNDER THE FEDERAL INSECTICIDE FUNGICIDE AND RODENTICIDE ACT FOR ECONOMIC USE ONLY REGISTERED UNDER NO. 1839-46 SUBJECT TO ATTACHED COMMENTS.

GERMICIDE

(Left Panel)

Recommended Use Dilution

5 - 10 ppm:	Control of microorganisms in secondary oil recovery.
50 - 100 ppm:	Sanitizer for poultry drinking water.
200 ppm:	Sanitization of equipment, dishes, appliances, glassware, utensils in dairy, beverage, food processing, food manufacturing, food dispensing plants, etc. General deodorization due to bacterial decay.
400 ppm:	Disinfection of food storage bins, refrigeration, etc. Sanitization of garbage pails and porous surfaces. Sanitary maintenance of walls, floors, etc. Disinfection and sanitary maintenance of smooth nonporous surfaces. Terminal disinfection.
1400 ppm:	Instrument disinfection.

Preparation of Use Dilution

ppm of active quaternary	For 10% Dilution	Conc. % active quaternary	Fl. oz. per gals.
5	1:20,000	0.0005	1 oz./160 gals.
10	1:10,000	0.001	1 oz./ 80 gals.
100	1: 1,000	0.01	0.5 oz./ 4 gals.
200	1: 500	0.02	1 oz./ 4 gals.
400	1: 250	0.04	2 oz./ 4 gals.
1000	1: 100	0.1	5 oz./ 4 gals.

(Sample Label)
for a 10% product

GERMICIDE

(Center Panel)

(Name of Product)
E. P. A. Reg. No.
Concentrated
Germicide - Sanitizer - Disinfectant

Active Ingredient: (Refer to page 3 of this Bulletin for)
Inert Ingredient: (Ingredient Instructions and Options)

DANGER (See table page 3)

KEEP OUT OF REACH OF CHILDREN (See table page 3)

Corrosive. Causes severe eye and skin damage. Do not get in eyes, on skin, or on clothing. Wear goggles or face shield and rubber gloves when handling. Harmful or fatal if swallowed. Avoid contamination of food.

CAUTION (See table page 3)

Discontinue use of the product as a poultry water sanitizer when treating the flock with drugs such as vaccines, sulfonamides, or sulfaquinoxaline.

FIRST AID

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For eyes, call a physician. Remove and wash contaminated clothing before reuse. If swallowed, drink **promptly** a large quantity of milk, egg whites, gelatin solution or, if these are not available, drink large quantities of water. Avoid alcohol. Call a physician immediately.

NOTE TO PHYSICIAN

Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

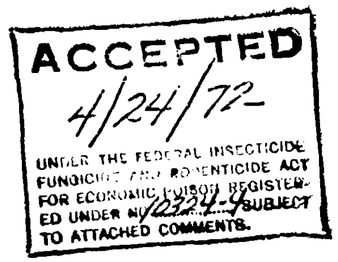
Keep from Freezing **Net Contents**

(Name)
(Address)

(Sample Label)
for a 10% product

GERMICIDE

(Right Panel)



Directions for Use

(Name) is a quaternary ammonium compound which may be used with compatible alkaline builders and sequestering agents. In dairy and food equipment applications, an exposure period of at least two minutes should be maintained when the temperature of the solution is at least 75°F and the pH of the solution is 6.0 or higher.

Sanitization

Clean with suitable detergent, rinse. Immerse food equipment and utensils in a solution containing 200 ppm of active quaternary. Where infectious germs may be present, rinse or immerse in a disinfecting solution containing 400 ppm or more of active quaternary after sanitizing as directed.

Instrument Disinfection

Preclean in suitable detergent removing adhering blood and serous exudates. Immerse in solution containing 1400 ppm of active quaternary.

For Dairy and Restaurant Use

(Name) fulfills the criteria of Appendix F of the Grade "A" Pasteurized Milk Ordinance 1965. Recommendations of the U. S. Public Health Service in waters up to ppm hardness calculated as $CaCo_3$ when tested by the A.O.A.C. Germicidal and Detergent Sanitizers – Official Method.

ALGAECIDE

(Sample Label)
for a 10% product

(Left Panel)

(Name) is: Economical
Efficient
Stable

(Name) is compatible with all swimming pool chemicals and is non-injurious to metal, paint, plastic, and tile.

(Name), when used as directed, will improve the appearance and cleanliness of the pool or water cooling systems.

(Name) prevents unsightly growths of algae.

(Name) may be stored for prolonged periods of time without losing its effectiveness or strength.

(Name) requires no special equipment for treating water. May be added directly to the pool in any spot or added to the water-circulation equipment.

ALGAECIDE

(Center Panel)

(Name of Product)
E.P.A. Reg. No.
Concentrated Algaecide

(Name) for Control of Algae and Algal Slime Growth in Swimming Pools and Water Cooling Systems.

Active Ingredient: (Refer to Page 3 of this Bulletin for)
Inert Ingredient: (Ingredient Instructions and Options)

DANGER (See table page 3)

KEEP OUT OF REACH OF CHILDREN (See table page 3)

Causes severe eye and skin damage. Do not get in eyes, on skin, or on clothing. Wear goggles or face shield and rubber gloves when handling. Harmful or fatal if swallowed. Avoid contamination of food.

CAUTION (See table page 3)

This product is toxic to fish. Do not discharge treated effluent into lakes, streams or ponds.

FIRST AID

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For eyes, call a physician. Remove and wash contaminated clothing before reuse. If swallowed, drink promptly a large quantity of milk, egg whites, gelatin solution or, if these are not available, drink large quantities of water. Avoid alcohol. Call a physician immediately.

NOTE TO PHYSICIAN:

Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

Keep from Freezing

(Name)
(Address)

ACCEPTED
4/24/72
UNDER THE FEDERAL INSECTICIDE FUNGICIDE ... ACT FOR ECO... REGISTERED UNDER NO. 10324-7 SUBJECT TO ATTACHED COMMENTS.

ALGAECIDE

(Right Panel)

Directions for Use in Swimming Pools

Initial Application (original filling): One gallon (Name) to each 50,000 gallons of water or ratio thereof.

Continued Application: One quart (Name) in 50,000 gallons of water every 3-5 days or as needed to maintain 2 ppm active. Quaternary Test Kits are available for this use.

Booster Application: One quart (Name) in 50,000 gallons after a heavy or prolonged rainfall or when there is a heavy bathing load.

THE ABOVE DIRECTIONS SHOULD BE FOLLOWED EVEN WHEN THE POOL IS NOT IN USE.

Directions for Use in Water Cooling Systems

Initial Application: 26 to 52 fluid ounces (20 to 40 ppm on an active quaternary basis) per 1000 gallons of contained water.

Subsequent Application: 7 to 20 fluid ounces (5 to 15 ppm on an active quaternary basis) per 1000 gallons of contained water.

THE ABOVE DIRECTIONS ARE TO BE FOLLOWED TWICE WEEKLY OR AS NEEDED.

If algae growth is noticeable, clean system. When heavy algae growth is present, system will have to be cleaned manually.

ALGAECIDE
(Left Panel)

(Sample Label)
for a 10% product
Maquat MC-1412

(Name) is: Economical
Efficient
Stable

(Name) is compatible with all swimming pool chemicals and is non-injurious to metal, paint, plastic, and tile.
(Name), when used as directed, will improve the appearance and cleanliness of the pool or water cooling systems.
(Name) prevents unsightly growths of algae.
(Name) may be stored for prolonged periods of time without losing its effectiveness or strength.
(Name) requires no special equipment for treating water. May be added directly to the pool in any spot or added to the water-circulation equipment.

ACCEPTED
MAR - 8 1972
UNDER THE FEDERAL INSECTICIDE FUNGICIDE AND RODENTICIDE ACT FOR ECONOMIC POISON REGISTERED UNDER NO. 10324-2 SUBJECT TO ATTACHED COMMENTS.

ALGAECIDE
(Center Panel)

(name of Product)
E.P.A. Reg. No.
Concentrated Algaecide

ACCEPTED
4/24/72
10324-4

(Name) for Control of Algae and Algal Slime Growth in Swimming Pools and water Cooling Systems.
Active Ingredient: (Refer to Page 3 of this Bulletin for)
Inert Ingredient: (Ingredient Instructions and Options)

DANGER (See table page 3)
KEEP OUT OF REACH OF CHILDREN (See table page 3)
Causes severe eye and skin damage. Do not get in eyes, on skin, or on clothing. Wear goggles or face shield and rubber gloves when handling. Harmful or fatal if swallowed. Avoid contamination of food.

CAUTION (See table page 3)
This product is toxic to fish. Do not discharge treated effluent into lakes, streams or ponds.

FIRST AID

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For eyes, call a physician. Remove and wash contaminated clothing before reuse. If swallowed, drink promptly a large quantity of milk, egg whites, gelatin solution or, if these are not available, drink large quantities of water. Avoid alcohol. Call a physician immediately.

NOTE TO PHYSICIAN:

Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

KEEP FROM FREEZING

NET CONTENTS

ALGAECIDE
(Right Panel)

Directions for Use in Swimming Pools

If algae growth is observed add 1 gallon (NAME) algaecide for 20,000 gallons of water, to kill and control the algae most commonly found in swimming pools.

When existing growth is dead and algae have withered, clean the pool, draining and refilling if necessary. Then add 1 gallon (Name) algaecide per 50,000 gallons of water.

If algae growth is absent, use 1 gallon of (Name) algaecide for each 50,000 gallons of water.

Add 1 gallon of (Name) algaecide every 5 - 7 days, or as needed to maintain 2-5 ppm. See service manual for test kit.

THE ABOVE DIRECTIONS SHOULD BE FOLLOWED EVEN WHEN THE POOL IS NOT IN USE.