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## A n a l y t i c a l M e t h o d s

Alkalinity	18	Filmic Amine (aliphatic amine)	40	Peracetic Acid	67
Aluminum	19	Formaldehyde	41	Permanganate	68
Ammonia	20	Glutaraldehyde	43	Persulfate	69
Bromine	22	Glycol	44	pH	70
Calcium (see Hardness)	46	Hardness	46	Phenols	71
Carbohydrazide	23	Hydrazine	47	Phosphate, ortho (reactive)	73
Carbon Dioxide	24	Hydrogen Peroxide	49	Phosphate, Total	75
Chemical Oxygen Demand (COD)	25	Hypochlorite (see chlorine)	30	Quaternary Ammonium Compounds (QACs)	76
Chloride	28	Iron	52	Silica	77
Chlorine	30	Iron in Brine	53	Sulfate	78
Chlorine Dioxide	32	Manganese	55	Sulfide	79
Chromate	33	Mercaptobenzothiazole (MBT)	56	Sulfite	81
Conductivity	35	Molybdate	57	Sulfite in Wine	82
Copper	36	Nitrate	58	Thiosulfate	83
Cyanide	37	Nitrite	60	Total Dissolved Solids (TDS)	84
DEHA	38	Oxygen, dissolved	62	Total Petroleum Hydrocarbons (TPH)	85
Detergents (anionic surfactants)	39	Ozone	65	Turbidity	86
				Zinc	87

# Company Introduction

## No More Problems With Solutions.

If water analysis is your responsibility, your first analysis should start with CHEMetrics® self-filling reagent ampoules. These extraordinarily simple *snap-and-read* test kits actually have a lower cost per test than the labor-intensive versions you may be using now. Measured either instrumentally or by visual color comparison, you can have accurate, reliable, quantitative results for over 45 analytes in just two minutes or less.

## No Mixing. No Measuring. No Mess.

Traditional methods often require sample and reagent preparation, multiple steps, and clean up. With the CHEMetrics systems, you simply immerse the ampoule in the sample, snap the tip, and quickly obtain dependable results.

## Fewer Steps Means Fewer Errors.

Because test preparation is virtually eliminated, our products reduce potential operator error. That saves retesting time and money. And CHEMetrics vacuum-sealing helps you avoid inaccurate results from stale or unstable reagents.



## Safer Testing.

Instead of handling chemicals and samples, you can reduce exposure significantly with CHEMetrics self-filling ampoules. Each contains a unit dose of pre-formulated reagent sealed in glass so that direct contact with chemicals is minimized.

## Portable & Refillable.

Packaged with everything you need to run 30 tests, CHEMetrics products are compact and highly portable, making them ideal for fast, dependable analysis in the lab or in the field. And refill packs of 30 ampoules are always available with a single telephone call or online.

## Our Reputation Is Your Greatest Assurance.

CHEMetrics is known for more than quality products. Our reputation is built on customer service. Expert, prompt, and courteous support is always available from our Technical Services

and Sales Departments. Our rigorous Quality Assurance Program makes certain that our products perform as you expect them to. Our innovative Research and Development Group continuously develops exciting new products to meet emerging water analysis needs. And we stand 100% behind every aspect of every product and service we provide.

## Shelf-life.

The CHEMetrics water analysis product line employs vacuum packaging to ensure the longest possible shelf-life. CHEMetrics shelf-life claims are based on products stored in the dark and at room temperature. For specific shelf-life information, see the individual product page. Unless otherwise specified, all products have a shelf-life of at least 2 years.

## Better Water Testing Is A Snap

Dear Analyst,

For over 40 years CHEMetrics has stood out from the pack providing faster, simpler, and safer solutions to your water analysis needs. We remain committed to continuing that tradition.

But providing test systems that save you time and make your work safer and easier is not our only forte; we are also known for the high level of quality and dependability of our products, the result of meticulous testing by our quality assurance staff. You can be sure of accurate, reliable results whether you are working in the laboratory or out in the field, testing a single sample or dozens.

Service, of course, is important to you, and it's extremely important to us, too. Our technical support staff is just a phone call or an email away, providing fast, helpful answers from knowledgeable, courteous people who are anxious to solve your testing problems. You will also find that they are able to work closely with you to develop a test system that is customized for your particular application when one of our standard

products is not well suited to your special requirements. Whatever your need, please ask—we'll do our best to be of service.

We realize that there are many firms to which you can turn for your water testing needs, but we are working hard to be your supplier of choice. If you are not already one of our many loyal customers, please give us the opportunity to demonstrate that we can provide the best combination of innovation, quality and service you can find anywhere. With CHEMetrics, it's not just about doing it well. It's about doing it better.

Sincerely,

Gordon A. Rampy, Chairman  
CHEMetrics, Inc.



# CHEMetrics Management

## For Custom Or Private-Label Products, Test Us Out.

CHEMetrics® products often originate directly from customers like you—looking for easier ways to perform routine determinations. We have innumerable ways of creating customized, self-filling ampoules methods for almost any lab procedure.

We invite you to challenge us. Just keep in mind that to be considered for a custom product, the test should be run frequently, or it should be a procedure that is performed widely in the industry.

We also have extensive experience with private-label packaging and services. We're very flexible in working with customers' needs, from simply printing labels to creating customized packaging.

For more information on custom products and private labeling, ask for our Vice President of Operations and Product Support, Teresa Neale.

From Center:

Gordon A. Rampy *Chairman*

Teresa Neale *Vice President of Operations and Product Support*

Bruce H. Rampy *President*

Henry B. Castañeda *Vice President of Marketing and Technology*



## Like Water, We Cover The Globe.

Our products are sold around the world by distributors under contract to CHEMetrics. Contact our International Business Manager, Shirley Ward, for more information on distribution in the following countries: Argentina, Australia, Belgium, Brazil, Canada, China,

Colombia, Costa Rica, Czech Republic, Ecuador, France, Germany, Greece, Hong Kong, Iceland, India,

Indonesia, Republic of Ireland, Italy, Japan, Korea,

Malaysia, Mexico, Netherlands, New Zealand, Norway,

Oman, Philippines, Portugal, Russia, Saudi Arabia,

Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland,

Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom,

Vietnam, West Indies.



# Industries & Applications

## POWER GENERATION

CHEMetrics is the worldwide leader in colorimetric, low-level Dissolved Oxygen analysis. Additionally, CHEMetrics' products are used throughout the power generation industry to monitor deposit forming and corrosive elements in water, and to monitor biocides and corrosion inhibitors. CHEMetrics is the worldwide "Gold Standard" in ppb dissolved oxygen determination!

Ammonia	Dissolved Oxygen	Phosphate
Alkalinity	Hardness (Total)	Silica
Carbohydrazide	Hydrazine	Sulfate
Chlorine	Hydrogen Peroxide	Total Dissolved Solids (TDS)
Copper	Iron	Zinc
DEHA	Molybdate	

## PETRO/CHEMICAL INDUSTRY

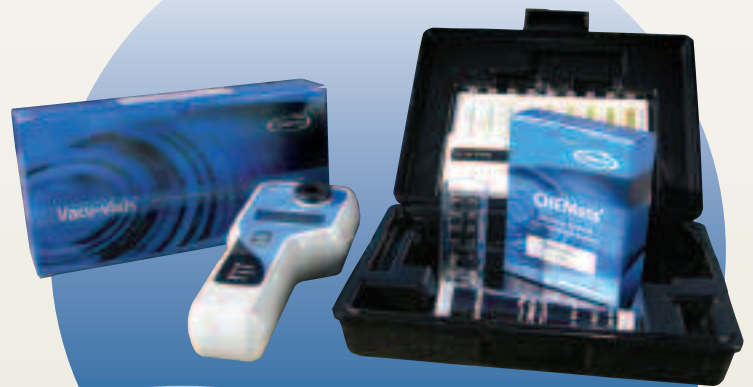
CHEMetrics kits are widely used for influent, process water, and wastewater/effluent water analysis in refineries and chemical plants. From power plant applications to injection water to closed loop systems, field tests to lab testing, CHEMetrics can simplify your testing routine. Leaking underground storage tanks (LUSTs) can be identified with CHEMetrics' Total Petroleum Hydrocarbons (TPH) in soil test kit - RemediAid™.

Ammonia	Hydrazine	Phosphate, ortho
Bromine	Hydrogen Peroxide	Phosphate, Total
Carbon Dioxide	Iron	Sulfide
Chloride	Molybdate	Thiosulfate
Chlorine	Nitrate	Total Petroleum Hydrocarbon (TPH)
COD	Permanganate	
Dissolved Oxygen	pH	
Formaldehyde	Phenols	

## ENVIRONMENTAL/EDUCATION

CHEMetrics kits are used in environmental education, environmental monitoring, site characterization, and remediation programs. Applications include surface water monitoring for nutrient runoff and industrial effluent contamination, groundwater monitoring, and soil monitoring for petroleum hydrocarbon contamination.

Alkalinity	Glycol	Phosphate
Ammonia	Hardness	Sulfide
Carbon Dioxide	Hydrogen Peroxide	Total Dissolved Solids (TDS)
COD	Iron	Total Petroleum Hydrocarbon (TPH)
Conductivity	Nitrate	Turbidity
Copper	Ozone	
Detergents	Persulfate	
Dissolved Oxygen	Phenols	



# Industries & Applications

## WATER/WASTEWATER

CHEMetrics products are applicable in both drinking water and wastewater plants. Wastewater plants monitor influent, settling tanks, and effluent waters. Drinking water treatment plants monitor residual disinfectant products.

Aluminum	Dissolved Oxygen	Phosphate, ortho
Ammonia	Glycol	Phosphate, Total
Bromine	Hardness (total)	Sulfate
Chloride	Iron	Sulfide
Chlorine	Manganese	Turbidity
Chlorine Dioxide	Nitrate	
COD	Nitrite	
Detergents	Phenols	

## WATER TREATMENT

CHEMetrics kits are used to monitor process water, boiler water, cooling water, as well as for the analysis of wastewater and effluents. In addition, in systems that employ on-line analyzers, CHEMetrics kits are used for system confirmation, troubleshooting, and in periods of downtime.

Alkalinity	Glycol
Aluminum	Hardness
Ammonia	Hydrazine
Bromine	Iron
Carbohydrazide	Molybdate
Chlorine	Nitrate
Conductivity	pH
Cyanide	Phenols
DEHA	Phosphate
Dissolved Oxygen	Silica
Filming Amines	Sulfide

## MINING AND MANUFACTURING

Applications for CHEMetrics kits in these industries include everything from metals & pH testing in the mining sector to a variety of tests for manufacturing plants such as textile & steel mills, and electronics & automotive plants. Whether testing for contaminants on the influent side or spot checks of effluent water, CHEMetrics can equip your lab or field personnel with accurate, easy to use, reliable test kits.

Alkalinity	Formaldehyde	Phosphate
Ammonia	Glycol	Sulfide
Chlorine	Hardness	Sulfate
Chromate	Hydrogen Peroxide	Thiosulfate
COD	Iron	Zinc
Copper	Molybdate	
Cyanide	Nitrate	
Dissolved Oxygen	Phenols	



**LAB/CLINIC/MEDICAL**

In hospitals and other medical facilities, CHEMetrics test kits are used to validate sanitization and check for detergent residual, as well as testing for low-level contaminants. Our detergents test method is used to monitor the efficiency of cleaning cycles of manufacturing equipment used in drug research and pilot batch prototyping evaluations.

Ammonia	Detergents	Iron
Bromine	Dissolved Oxygen	Ozone
Chlorine Dioxide	Formaldehyde	Phenols
COD	Hydrogen Peroxide	Silica

**PULP AND PAPER**

The primary applications for CHEMetrics products in pulp and paper plants are in boiler/cooling water and wastewater/effluent water treatment. Since water is used in nearly every mill operation, this industry also requires analytical products for processes including bleaching, cooking and washing, pulp processing, and pulp liquor recovery.

Alkalinity	Dissolved Oxygen	Nitrite
Ammonia	Formaldehyde	Phenols
Chlorine	Hydrogen Peroxide	Phosphate
COD	Hydrazine	Silica
DEHA	Nitrate	Sulfite

**FOOD AND BEVERAGE**

CHEMetrics products are used throughout the food and beverage industry in production, packaging, and sanitizing processes. Bottled water plants, breweries, and carbonated beverage facilities test impurities in their production water. Packaging operations use CHEMetrics kits to verify sterilization and to monitor the efficacy of sterilization solutions. COD vials are used to monitor wastewater conditions. Our ozone test method has been approved for worldwide use by a major bottler to monitor trace ozone levels in bottled water plants.

Ammonia	Glycol	Peracetic Acid
Bromine	Hardness	Phenols
Chlorine	Hydrogen Peroxide	OAC's
Chlorine Dioxide	Iron	Sulfate
COD	Nitrate	Sulfite
Dissolved Oxygen	Nitrite	Thiosulfate
Formaldehyde	Ozone	Zinc



## Visual Colorimetric Analysis

### The CHEMets® Method

To perform a test, immerse the CHEMet™ ampoule into the sample and snap off the tip (Step 1)—the correct volume of sample is automatically drawn in, filling the ampoule; a small inert gas bubble remains in the ampoule. To facilitate mixing the sample and reagent, tilt the ampoule back and forth so the bubble travels from end to end (Step 2). In 2 minutes or less, quantify the result by comparing the filled ampoule to the appropriate color standard(s) (Step 3). For higher concentrations, the flat comparator is used. For lower concentrations, the round comparator is used. The ampoule is compared with the standards until a color match is found.

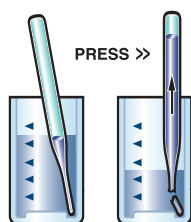


Kits include 30 ampoules, comparator(s), accessory solution(s) (when necessary), a sample cup, and instructions. Refill packs of 30 ampoules and accessory solutions are available separately.

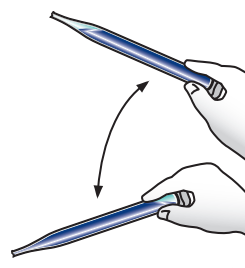
Most comparators have a 2-year shelf-life. Material Safety Data Sheets are provided in test kits.

CHEMets ampoules are designed for maximum simplicity and accuracy. Each glass ampoule is 7 mm in diameter, 100 mm in length, with a tapered, pre-scored tip; reagents are vacuum-sealed inside.

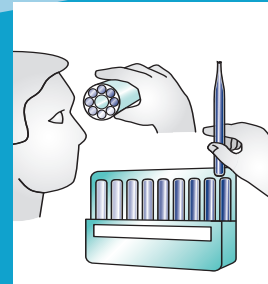
### The CHEMets Test Procedure



STEP 1



STEP 2



STEP 3



# Instrumental Colorimetric Analysis

## The Vacu-vials® Method

The sampling method is the same as the CHEMets method (Steps 1 & 2), but rather than comparing results visually, the user places the filled ampoule in the cell holder of an instrument set to a wavelength for optimal absorbance (Step 3). If you use an instru-



ment that reads absorbance, the absorbance value can be converted to concentration units with the supplied calibration equation. Direct-reading instruments are available (pages 14-15, 17).

Vacu-vials® Kits include 30 ampoules, a zeroing ampoule, accessory solution(s) (when necessary), a sample cup, and instructions.

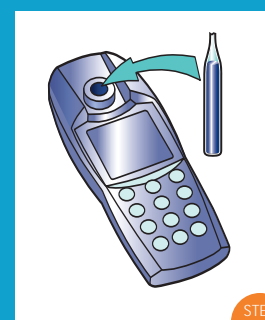
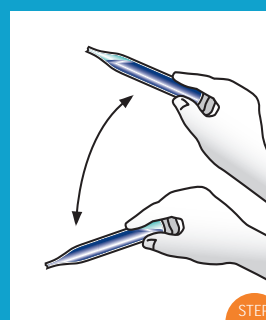
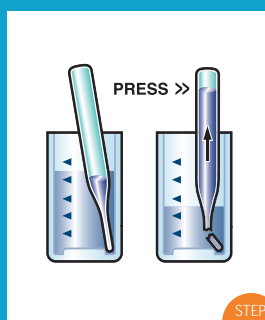
Material Safety Data Sheets are provided in test kits.

Designed with the same technology as the CHEMets ampoules, the Vacu-vials ampoules are 13 mm in diameter with a tapered, pre-scored tip; color forming reagents are vacuum-sealed inside.



View instructional videos  
on our website at  
[www.chemetrics.com](http://www.chemetrics.com)

## The Vacu-vials Test Procedure



## High Range Visual Colorimetric Analysis

### The VACUettes® Auto Dilution Method

Hold the ampoule in a horizontal position while the capillary tip contacts the sample (Step 1). After the capillary fills, immerse it in a diluent (usually deionized water); snap the tip off the ampoule (Step 2). The sample and diluent are drawn into the ampoule where they mix with the reagent (Step 3). The resulting color change can then be compared with the flat or round comparator to quantify results (Step 4).

Kits include 30 ampoules, comparator(s), accessory solution(s) (when necessary), a sample cup, and instructions. Refill packs of 30 ampoules and accessory solutions are available separately.

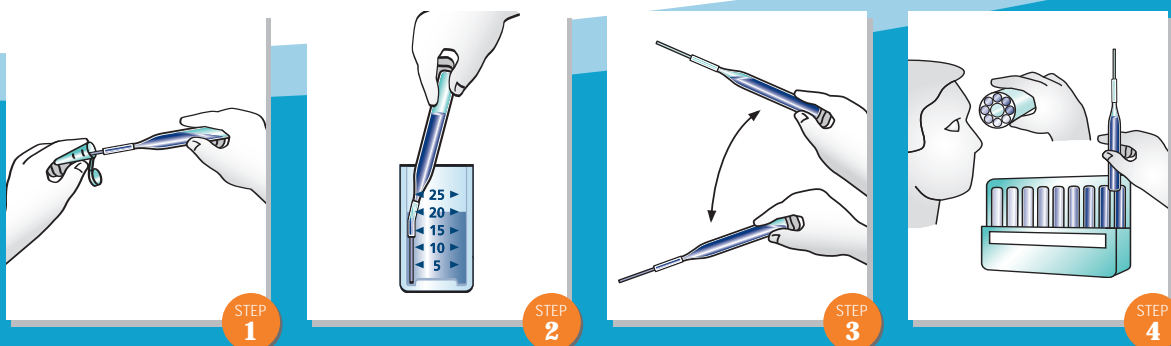
Most comparators have a 2-year shelf-life. Material Safety Data Sheets are provided in test kits.



VACUettes ampoules are designed for highly concentrated samples. They employ a patented auto-dilution feature that eliminates the need for a time-consuming and error-prone preliminary dilution. As a result, the entire test typically takes

only 2 to 3 minutes, with a rate of accuracy comparable to a volumetric procedure. The basic design of these 7 mm ampoules is the same as CHEMets ampoules, however, a capillary tip is attached to the tip of each ampoule.

### The VACUettes Test Procedure



# Titrimetric Analysis

## The Titrets® Method

Titrets ampoules use *reverse titration* to quantify concentrations. After snapping the ampoule tip, the sample is drawn into the ampoule in small doses (with the Titrettor™ device included in each kit that precisely controls the sample) (Step 1), until a color change signals that

the equivalence point has been reached (Step 2). The titration is stopped at the end point and the ampoule is held upright. The liquid level will correspond to a printed scale on the ampoule's outer surface (Step 3).

Kits include 30 ampoules with valve assemblies, a titrettor, accessory solution(s) (when necessary), a sample cup, and instructions.

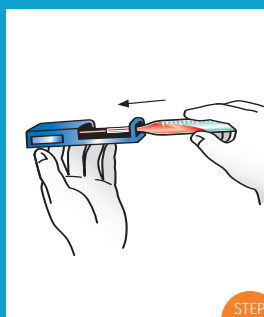
Material Safety Data Sheets are provided in test kits.

Each Titret™ ampoule is 13 mm in diameter and is designed for titrimetric analysis. The ampoule contains vacuum-sealed liquid titrant and has a flexible valve assembly attached.

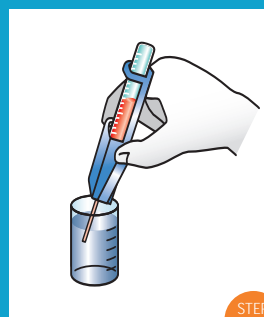


View instructional videos  
on our website at  
[www.chemetrics.com](http://www.chemetrics.com)

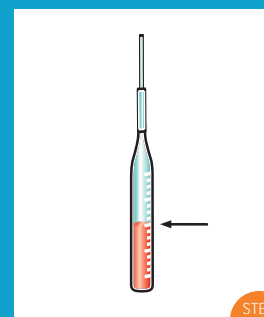
## The Titrets Test Procedure



STEP  
1



STEP  
2



STEP  
3



## CHEMetrics Test Kit for the Determination of Total Phosphate in Wastewater

### *New Instrumental Test Kit using Screw Cap Vials*

Control and monitoring of phosphate concentrations in wastewater are critical before water is released back into the environment. Discharge of wastewater containing high levels of phosphate may cause excessive algae growth which causes taste and odor problems in drinking water supplies, oxygen depletion and death of aquatic organisms in surface water.

CHEMetrics' new Total Phosphate Test Kit, catalog no. K-8540, utilizes the ascorbic acid method and measures those forms of phosphate that are converted to orthophosphate during an acid oxidation digestion. Perform digestion and measurement in the same vial. Use CHEMetrics' V-2000 Photometer for direct read in ppm or a spectrophotometer capable of accepting a 16 mm diameter cell. See page 75 for details.

## greenCOD™ Recycling Program

### *For disposal of CHEMetrics mercury-containing COD Vials*

Through our new partnership with U.S. Waste Industries, a full service environmental company, CHEMetrics now offers an easy, economical method to dispose of CHEMetrics used COD Vials, using our convenient 5-gallon mail-back program. Available to U.S. customers only.

- Documentation and shipping fees in one low cost.
- DOT Approved Recycling Container.
- Holds about 400 used COD Vials.

## Easy 1-2-3 Process

1. Purchase a 5-gallon recycling container from CHEMetrics.
2. U.S. Waste Industries will send recycling container and label for shipping.
3. Collect CHEMetrics' used mercury-containing COD Vials in greenCOD™ recycling container and then ship to designated location.



Catalog no. A-7300  
See page 26 for details

## New Carbohydrazide Test Kits for Boiler Water Treatment

*Test Kits now available for Instrumental and Visual Analysis*

Carbohydrazide is added to boiler system water as an oxygen scavenger to control corrosion. CHEMetrics' new Carbohydrazide Test Kits employ the PDTS chemistry. Carbohydrazide is often used as a direct replacement for hydrazine in boiler systems without the associated safety hazards and handling precautions. See page 23 for details.



## New DPD Method for Peracetic Acid

Now available for instrumental and visual analysis, CHEMetrics offers Peracetic Acid Test Kits using the DPD chemistry. Peracetic Acid is a strong disinfectant widely used throughout the food and beverage industry as a sanitizing agent. See page 67 for details on food and beverage applications.

### Advantages of DPD Chemistry

- Measures Peracetic Acid in the presence of Hydrogen Peroxide.
- Based on USEPA-approved chlorine DPD chemistry.



## Sample Dilution Kit

Extend the range and minimize interferences for many CHEMetrics test kits using the A-0188 Sample Dilution Kit. Kit contains all equipment necessary to perform 30 sample dilutions (10x, 125x, 250x, 500x, 1000x and/or 5000x), except distilled water. Contact [technical@chemetrics.com](mailto:technical@chemetrics.com) to see if dilution is appropriate for your sample.

## CHEMetrics Convenient Carrying Bags

Designed for maximum convenience and built to hold the V-2000 Photometer, test kits, and refill packs. Choose the New CHEMetrics logo canvas carrying bag (A-0190) with detachable shoulder strap, or the durable, black polypropylene carrying case (A-0182).



# CHEMetrics Products for Food & Beverage Industry

## Aseptic Packaging

The use of aseptic packaging in the Food & Beverage industry eliminates the need for refrigeration, and increases product shelf-life for liquids packed in cartons. Hydrogen Peroxide (37% solution) is used to clean and sterilize manufacturing equipment that is used in the processing line. Hydrogen peroxide, peracetic acid and ozone are used to disinfect product packaging. These residuals are routinely measured using CHEMetrics self-filling ampoules by packaging operators on aseptic packaging lines that process fruit juices, milk, wine, yogurt, pudding, fruit desserts and vegetables.

*Custom Private Label and OEM Product Configurations also available.*

Catalog No.	Description	Range (ppm)	For More Information
K-5510	Hydrogen Peroxide (visual)	0-1 & 1-10	Page 49
K-5510D	Hydrogen Peroxide (visual)	0-30 & 30-300	Page 50
K-5543	Hydrogen Peroxide (instrumental)	0.15-6.00	Page 51
K-7404	Ozone (visual)	0-0.6 & 0.6-3	Page 65
K-7423	Ozone (instrumental)	0.20-5.00	Page 65
K-7904	Peracetic Acid (visual)	0-1 & 1-5	Page 67
K-7913	Peracetic Acid (instrumental)	0.40-5.00	Page 67



## V-2000 Multi-Analyte Photometer for Water Quality Analysis

The CHEMetrics® V-2000 Photometer is the most advanced portable microprocessor-based LED colorimeter on the market today. Packed with features, this portable water analyzer automatically tests pre-programmed (50+) analytes using CHEMetrics Vacu-vials® self-filling, pre-measured ampoules. Operator safety is ensured with no sample preparation, mixing or chemical contact. As new tests are available, a simple upload procedure from the CHEMetrics website updates this analyzer with the most recent programs. Uploading takes a few minutes and keeps the V-2000 constantly current. Up to ten user-created custom methods can be stored in the photometer's memory. The simple interface guides a user through setup and measurement.

State-of-the-art technology and research gives this instrument unparalleled capability with push-button ease. The V-2000 displays concentration, absorbance or percent transmittance. Up to 100 data points with their date/time tags can be stored for later download to a lab computer or sent directly to a printer.

A two-year warranty makes the V-2000 a totally reliable field instrument for superior water quality testing.

- **Field Portable**
- **Battery operated**
- **Lightweight**
- **Rugged**
- **Waterproof**

### V-2000 Specifications & Features

<b>Number of Parameters</b>	50+ Factory Calibrations
<b>Wavelengths (nm)</b>	420, 520, 580, 610
<b>Wavelength Accuracy</b>	± 2 nm
<b>Wavelength Selection</b>	Automatic
<b>Photometric Range</b>	0 - 2 A
<b>Light Source</b>	Light Emitting Diode (LED)
<b>Detector</b>	Photodiode
<b>Bandwidth</b>	10 ± 2 nm
<b>Operating Temperature</b>	0.0 to 45.0 °C
<b>Humidity</b>	90% at 50.0 °C max
<b>Waterproof</b>	IP67
<b>Cell Adapter(s)</b>	16 mm, 13 mm
<b>Output Units</b>	mg/L, ppm, µg/L, ppb, g/L, Absorbance, or % Transmittance
<b>Data logging</b>	100 points, Date and Time Tag
<b>Download Capability</b>	Data to Spreadsheet and Printer, RS232 Output
<b>Upload Capability</b>	Web-Based Methods Update
<b>Power Supply</b>	4 AA Alkaline Batteries - 2500 Hours
<b>Compliance</b>	European CE Mark
<b>Programmed Method Capacity</b>	190 and 10 User Defined
<b>Timing Capability</b>	Built-in Timer
<b>Warranty:</b>	2 years





Most kits contain everything needed to perform 30 tests

See Specific Analyte Pages for Contents of Individual Kits

Analyte	Cat. No.	V-2000 Range, ppm		
Aluminum	K-0603	0.04	-	0.25
Ammonia 3	K-1403	0.20	-	30.0
*Ammonia	K-1503	0.50	-	7.00
*Ammonia 2	K-1523	1.0	-	14.0
Bromine	K-1613	0.90	-	12.00
Carbohydrazide	K-1803	0.10	-	2.50
*Chloride	K-2103	2.5	-	40.0
Chlorine 2, free & total <i>USEPA Approved</i>	K-2513	0.40	-	5.00
Chlorine 3, free <i>USEPA Approved</i>	K-2523	0.40	-	5.00
Chlorine Dioxide	K-2703	0.80	-	11.00
Chromate	K-2803	0.20	-	3.50
Chromate 2	K-2823	0.70	-	13.00
*COD LR, <i>USEPA Approved</i>	K-7350S, K-7355	0	-	150
COD LR, <i>Mercury Free</i>	K-7351S, K-7356	0	-	150
*COD HR, <i>USEPA Approved</i>	K-7360S, K-7365	0	-	1500
COD HR, <i>Mercury Free</i>	K-7361S, K-7366	0	-	1500
*COD HR+,	K-7370S, K-7375	0	-	15,000
COD HR+, <i>Mercury Free</i>	K-7371S, K-7376	0	-	15,000
Copper	K-3503	0.50	-	12.00
Cyanide	K-3803	0.040	-	0.400
DEHA 1	K-3903	0.15	-	2.00
Formaldehyde	K-4203	0.40	-	8.00
Glycol (as ethylene glycol)	K-4403	0.60	-	10.00
Glycol 2 (as propylene glycol)	K-4423	5.0	-	65.0
Hydrazine	K-5003	0.10	-	1.20
Peroxide	K-5513	0.15	-	3.00
Peroxide 2	K-5543	0.15	-	6.00
Iron 2, total	K-6023	0.10	-	2.50
Iron 4, total & ferrous	K-6203	0.20	-	6.00
Iron 1, total & soluble	K-6003	0.20	-	6.00
Iron 3, total & soluble	K-6013	1.0	-	25.0
Manganese	K-6503	2.0	-	30.0
Molybdate (as Mo)	K-6703	1.0	-	25.0
Nitrate 4 (as N)	K-6913	0.10	-	1.00
Nitrate (as N)	K-6903	0.20	-	1.50
Nitrate 2 (as N)	K-6923	0.40	-	3.00
Nitrate 3 (as NO <sub>3</sub> )	K-6933	5.0	-	50.0
Nitrite (as N)	K-7003	0.080	-	0.800
Ozone	K-7423	0.20	-	5.00
Ozone 2	K-7413	0.30	-	1.00
Oxygen 3	K-7553	0.100	-	1.400
Oxygen 1	K-7503	0.20	-	2.00
Oxygen 2	K-7513	2.0	-	15.0
Peracetic Acid	K-7913	0.40	-	5.00
Phenols	K-8003	0.40	-	8.00
Phenols 2	K-8023	1.0	-	20.0
Phosphate 2, ortho (as P)	K-8513	0.10	-	2.64
Phosphate 2, ortho (as PO <sub>4</sub> )	K-8513	0.30	-	8.00
Phosphate 1, ortho (as PO <sub>4</sub> )	K-8503	5.0	-	80.0
Phosphate, Total (as P)	K-8540	0	-	2.30
Silica	K-9003	0.50	-	10.00
Sulfate	K-9203	8.0	-	100.0
Sulfide	K-9503	0.20	-	3.00
Sulfide 2	K-9523	0.60	-	6.00
Zinc	K-9903	0.30	-	3.00
Zinc 2	K-9923	0.60	-	6.00

\*Contains mercury. Dispose according to local, state and federal laws.

V-2000 Multi-Analyte Photometer

V-2000

Soft- and hard-sided cases are available for V-2000 photometer and reagents.

See page 12 for details

# Water Industry Application Guide



**Create-A-Lab** by purchasing CHEMetrics' hand-held V-2000 Multi-Analyte Photometer and any number of test kits.

CHEMetrics gives you the freedom to tailor your lab with whatever you need for your application.

The V-2000 is field portable, lightweight, tough, and waterproof. Reading concentration, absorbance, or percent transmittance, this versatile instrument stores up to 100 data points with date/time tags that can be downloaded to a computer or printed to a printer. **See pages 14-15 for details.**

CHEMetrics offers test kits for more than 50 factory calibrated parameters, so you may customize your Create-A-Lab to your application. Each test kit contains everything necessary for up to 30 tests (except

COD kits, which offer 25-, 98- and 150-count tests, and Total Phosphate, which offers 50 tests).

Dedicated meters are also available to measure additional field parameters (pH, conductivity, total dissolved solids (TDS), and turbidity).

Simply purchase the V-2000 and use the guide attached to help you choose what test kits and/or dedicated instruments you need. For personalized service, call one of our expert Customer Service Representatives at 1-800-356-3072 to help you get started.

We also offer carrying cases (A-0182 and A-0190) to hold the V-2000, test kits and refill packs (order separately).





## SAM Single Analyte Meters

### SAMs (Single Analyte Meters): Value and Convenience

Single Analyte Meters (SAMs) provide unprecedented economy, simplicity, and accuracy for dedicated photometers. SAMs provide results equivalent to other meters and probes costing much more. Each kit contains a dedicated instrument and everything required to run 30 tests with the exception of A-7320, A-7325, I-2017 and I-2018.

Analyte	Cat. No.	Range (mg/L)	Replacement Kits
Chlorine	I-2001	0.40-5.00	K-2513
Chlorine Dioxide	I-2005	1.0-11.0	K-2703
COD Low Range	A-7320	0-150	*K-7350S, K-7351S, *K-7355, K-7356
COD High Range	A-7325	0-1500	*K-7360S, K-7361S, *K-7365, K-7366
COD High Range	A-7325	0-15,000	*K-7370S, K-7371S, *K-7375, K-7376
Detergents	I-2017	0.25-2.50	R-9423
Hydrogen Peroxide	I-2016	0.15-6.00	K-5543
Oxygen	I-2002	2.0-15.0	K-7513
Ozone	I-2019	0.20-5.00	K-7423
Ozone 3 (low range)	I-2018	0.15-0.75	K-7463
Peracetic Acid	I-2020	0.40-5.00	K-7913

\*Contains mercury. Dispose according to local, state or federal laws.

### SAM Specifications & Features

**Light Source:** Light-emitting diode / interference filter

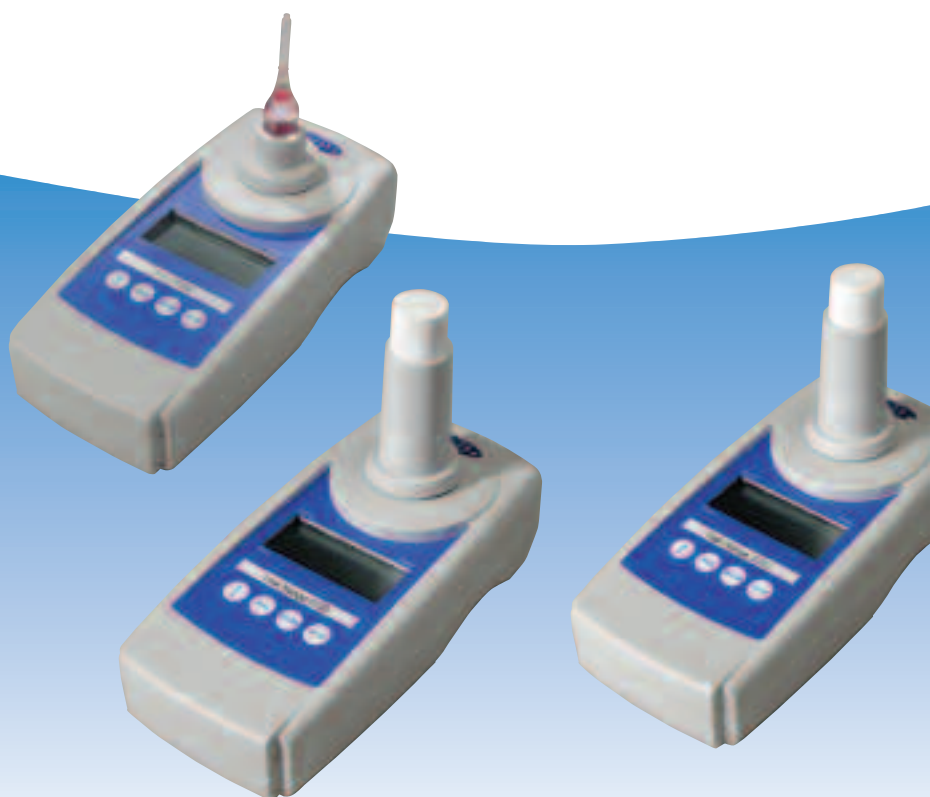
**Optical Paths:** 13-mm light path / 16-mm light path / 22.5 mm light path.

**Power Source:** Battery operated.

**Compliance:** European CE Mark.

**Warranty:** 1 year

See Specific Analyte Pages for Contents of Individual Kits



## Methods

The alkalinity of water is a measurement of its buffering capacity. Alkalinity of natural waters is typically a combination of bicarbonate, carbonate, and hydroxide ions. Sewage and wastewaters usually exhibit higher alkalinities due to the presence of silicates and phosphates.

Alkalinity inhibits corrosion in boiler and cooling waters. It is also measured as a means of controlling water and wastewater treatment processes or the quality of various process waters.

### Alkalinity (total)

References: ASTM D 1067-06, Acidity or Alkalinity of Water, Test Method B. APHA Standard Methods, 21<sup>st</sup> ed., Method 2320 B (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 310.1 (1983).

CHEMetrics' total alkalinity tests determine total or *M* alkalinity using a hydrochloric acid titrant and a bromocresol green/methyl red indicator. The end point of the titration occurs at pH 4.5. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

### Alkalinity (hydrate)

Reference: Developed with Calgon Corporation.

Hydrate alkalinity is a component of total alkalinity. Boiler operators must maintain relatively high hydrate alkalinity levels when phosphate cycle treatments are used to ensure the formation of softer, more easily removable deposits. This specific test for hydrate alkalinity provides a more accurate value than the calculation method.

The hydrate alkalinity reagent has been specially formulated to inhibit interference from carbonate and bicarbonate alkalinity, as well as up to one-third of the phosphate and silicate alkalinity.

For hydrate alkalinity, CHEMetrics developed a titrimetric method that uses a hydrochloric acid titrant with a phenolphthalein indicator and an inhibiting agent. The end point of the titration occurs at pH 8.3. Results are expressed as ppm (mg/L) NaOH.

## Visual Kits

**Range: 10-100 ppm as CaCO<sub>3</sub>**  
MDL: 10 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (total) Titrets Kit	K-9810

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 50-500 ppm as CaCO<sub>3</sub>**  
MDL: 50 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (total) Titrets Kit	K-9815

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 100-1000 ppm as CaCO<sub>3</sub>**  
MDL: 100 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (total) Titrets Kit	K-9820

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 100-1000 ppm as NaOH**  
MDL: 100 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (hydrate) Titrets Kit	K-4710

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Alkalinity

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

## Method

Aluminum forms a variety of minerals in the earth's crust. Aluminum and its alloys have many uses: heat exchangers, construction materials, and aircraft parts. Alum (aluminum potassium sulfate) is used in water treatment to flocculate suspended particles but may raise the level of aluminum in finished drinking water. The maximum secondary contaminant limit for drinking water is 0.05-0.2 mg/L.

### The Eriochrome Cyanine R (ECR) Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 3500-AI B (2005). Rapid Modified Eriochrome Cyanine R (ECR) Method for Determination of Aluminum in Water, Kenneth E. Shull and Gene R. Guthan, pp 1456-1468, J. AWWA, Nov. 1967.

The Aluminum Vacu-vials<sup>®</sup> test method is based on the reaction between aluminum and Eriochrome Cyanine R (ECR), which forms a red dye-lake at approximately pH 6.0 in proportion to the amount of aluminum present in the sample. Results are expressed as ppm (mg/L) aluminum.

## Instrumental Kit

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.04-0.25 ppm  
Method: Eriochrome Cyanine R (ECR)

	Cat#
Vacu-vials Kit	K-0603 <sup>1,2</sup>

Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, Activator Solution, Neutralizer Solution, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup> Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

<sup>2</sup> The Neutralizer Solution is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 3 months if stored in the refrigerator when not in use.

#### Kit Components common to Aluminum

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027

Instructions and MSDS(s) are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 2 years.



## Methods

Low-level ammonia nitrogen may be naturally present in water as a result of the biological decay of plant and animal matter. Higher concentrations in surface waters can indicate contamination from waste treatment facilities, raw sewage, industrial effluents (particularly from petroleum refineries), or fertilizer runoff. Excessive ammonia concentrations are toxic to aquatic life.

### The Direct Nesslerization Method

References: ASTM D 1426-08, Ammonia Nitrogen in Water, Test Method A. APHA Standard Methods, 18<sup>th</sup> ed., Method 4500-NH<sub>3</sub> C (1992).

The test kits employing the well-established Nessler reagent\* to determine ammonia concentrations are applicable to drinking water, clean surface water, good-quality nitrified wastewater effluent, and seawater. In some waters, calcium and magnesium concentrations can cause cloudiness of the reagent. Adding a few drops of stabilizer solution (Rochelle Salt) will prevent this cloudiness. References recommend distilling samples prior to analysis. Results are expressed as ppm (mg/L) ammonia-nitrogen, NH<sub>3</sub>-N.

Shelf-life: although the Nessler reagent is stable, its high alkali content attacks the glass ampoule. The resulting precipitate interferes with color comparison. We recommend stocking quantities of CHEMets® and VACUettes® ampoules that will be used within five months. A two-month supply of Vacu-vials ampoules is suggested. **Refrigeration will dramatically extend the shelf-life of these products.**

\*Contains mercury. Dispose according to local, state or federal laws.

### The Salicylate Method

References: Krom, Michael D., Spectrophotometric Determination of Ammonia: A Study of a Modified Berthelot Reduction Using Salicylate and Dichloroisocyanurate, *The Analyst*, V105, pp. 305-316, 1980.

In the ammonia test method that employs the Salicylate chemistry, free ammonia reacts with hypochlorite to form monochloramine. Monochloramine reacts with salicylate, in the presence of sodium nitro-ferricyanide, to form 5-aminosalicylate, a green-colored complex. This test method measures free ammonia and monochloramine. Results are expressed in ppm (mg/L) ammonia nitrogen, NH<sub>3</sub>-N.

The Salicylate Method offers similar sensitivity to the Nesslerization Method and there is no generation of mercury-containing waste.

## Visual Kits

Range: 0-1 & 1-10 ppm MDL: 0.05 ppm / Method: Direct Nesslerization	
	Cat#
<b>CHEMets Kit</b>	<b>*K-1510</b>
CHEMets Refill, 30 ampoules, Shelf-life 5 months	*R-1501 <sup>2</sup>
Stabilizer Solution Pack, six 10 mL bottles	A-1500 <sup>1</sup>
Stabilizer Solution Pack, six 20 mL bottles	A-1501 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-1501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-1510
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Stabilizer Solutions, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.	

Range: 0-20 ppm (up to 10,000 ppm with A-0188 accessory) MDL: 0.125 ppm / Method: Salicylate	
	Cat#
<b>CHEMets Kit</b>	<b>K-1410</b>
CHEMets Refill, 30 ampoules	R-1401
Activator Solution Pack, six 20 mL bottles, Shelf-life 8 months	A-1400 <sup>1</sup>
Catalyzer Solution Pack, six 20 mL bottles	A-1401 <sup>1</sup>
Stabilizer Solution Pack, six 20 mL bottles	A-1402
Comparator 0, 0.25, 0.50, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0 ppm	C-1402
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solution, Catalyzer Solution, Stabilizer Solution, 25 mL sample cup, 3.0 mL syringe, instructions, and MSDS.	

Range: 0-30 & 30-300 ppm MDL: 5 ppm / Method: Direct Nesslerization	
	Cat#
<b>VACUettes Kit</b>	<b>*K-1510D</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	*R-1501D <sup>2</sup>
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-1501D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-1510D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

\*Contains mercury. Dispose according to local, state or federal laws.

 Instrumental Kits

**V-2000 Multi-Analyte Photometer**  
(See page 14 for instrumental features)

**Range: 0.20-30.0 ppm** (up to 15,000 ppm with A-0188 accessory)  
Method: Salicylate

<b>Cat#</b>
<b>Vacu-vials Kit</b> , Shelf-life 8 months
<b>K-1403</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, Catalyzer Solution, Stabilizer Solution, 25 mL sample cup, ampoule blank, 3.0 mL syringe, instructions, and MSDS.

**Range: 0.50-7.00 ppm**  
Method: Direct Nesslerization

<b>Cat#</b>
<b>Vacu-vials Kit</b> , Shelf-life 2 months
<b>*K-1503<sup>2</sup></b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solutions, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, and MSDS.

**Range: 1.0-14.0 ppm**  
Method: Direct Nesslerization

<b>Cat#</b>
<b>Vacu-vials Kit</b> , Shelf-life 2 months
<b>*K-1523<sup>2</sup></b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solutions, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**Kit Components common to Ammonia**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
Dilution Kit (10X, 125X, 250X, 500X, 1000X, 5000X)	A-0188 <sup>3</sup>

\*Contains mercury. Dispose according to local, state or federal laws.

<b>Range: 0-60 &amp; 60-600 ppm</b> MDL: 10 ppm / Method: Direct Nesslerization	
<b>Cat#</b>	
<b>VACUettes Kit</b>	<b>*K-1510A</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	*R-1501A <sup>2</sup>
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-1501A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-1510A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

<b>Range: 0-120 &amp; 120-1200 ppm</b> MDL: 20 ppm / Method: Direct Nesslerization	
<b>Cat#</b>	
<b>VACUettes Kit</b>	<b>*K-1510B</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	*R-1501B <sup>2</sup>
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-1501B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-1510B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

<b>Range: 0-1000 &amp; 1000-10,000 ppm</b> MDL: 100 ppm / Method: Direct Nesslerization	
<b>Cat#</b>	
<b>VACUettes Kit</b>	<b>*K-1510C</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	*R-1501C <sup>2</sup>
Low Range Comparator 0, 100, 200, 300, 400, 600, 800, 1000 ppm	C-1501C
High Range Comparator 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 10,000 ppm	C-1510C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests. A-1501 accessory pack supplies enough solution to analyze approximately 100 seawater samples.

<sup>2</sup>Shelf-life is based on storage at room temperature and in the dark. This shelf-life can be extended by 18 months if the ampoules are stored in the refrigerator when not in use.

<sup>3</sup>Not included in kits. Must be purchased separately.

Instructions and MSDS(s) are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 2 years.



## Method

Bromine, a less volatile compound than chlorine, is used as a sanitizing agent in drinking water systems, swimming pools, and spas.

### The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl G (2005).

The bromine test method employs the DPD chemistry. Potassium iodide is added to the sample before analysis. Bromine reacts with the iodide to liberate iodine. The iodine reacts with DPD (N, N-diethyl-p-phenylenediamine) to form a pink color. Results are expressed in ppm (mg/L) bromine as Br<sub>2</sub>.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.90-12.00 ppm

Method: DPD

	Cat#
Vacu-vials Kit	K-1613

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Visual Kit

Range: 0-2 & 2-10 ppm  
MDL: 0.1 ppm / Method: DPD

	Cat#
<b>CHEMets Kit</b>	<b>K-1605</b>
CHEMets Refill, 30 ampoules	R-1605
Activator Solution Pack, six 10 mL bottles	A-1600 <sup>1</sup>
Low Range Comparator 0, 0.2, 0.4, 0.6, 0.8, 1.2, 1.6, 2.0 ppm	C-1601
High Range Comparator 2, 3, 4, 5, 6, 7, 8, 9, 10 ppm	C-1605

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Bromine

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023





## Method

Carbohydrazide is added to boiler system water as an oxygen scavenger to control corrosion. It is a safer alternative to hydrazine, which is toxic. Carbohydrazide reacts with oxygen at low temperatures and pressures. The products of the reaction are volatile and do not contribute dissolved solids to the boiler water. Like hydrazine, carbohydrazide will also passivate metal surfaces.

### The PDTS Method

**Reference:** G. Frederick Smith Chemical Co., *The Iron Reagents*, 3rd ed., p. 47 (1980).

The test kits employ the PDTS chemistry. Carbohydrazide reduces ferric iron to the ferrous state, and the ferrous iron reacts with PDTS (3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine disodium salt) to form a peach-pink colored complex in direct proportion to the carbohydrazide concentration. Test results are expressed as ppm (mg/L) carbohydrazide.



## Visual Kit

**Range: 0-0.50 & 0.5-4.0 ppm**  
MDL: 0.05 ppm / Method: PDTS

	Cat#
<b>CHEMets Kit</b>	<b>K-1805</b>
CHEMets Refill, 30 ampoules	R-1805
Activator Solution Pack, six 10 mL bottles	A-1800
Low Range Comparator, Shelf-life 12 months 0, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50 ppm	C-1805
High Range Comparator, Shelf-life 12 months 0.5, 0.75, 1.0, 1.25, 1.5, 2.0, 2.5, 3.0, 4.0 ppm	C-1810
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.	



## Instrumental Kit

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

**Range: 0.10-2.50 ppm**  
Method: PDTS

	Cat#
<b>Vacu-vials Kit</b>	<b>K-1803</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Carbohydrazide

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Dissolved carbon dioxide (CO<sub>2</sub>) is naturally present as a result of animal respiration, the decay of organic matter, and the decomposition of certain minerals. It is the major source of acidity in unpolluted water samples. Surface waters typically contain less than 10 ppm (mg/L) dissolved CO<sub>2</sub>, while ground waters, particularly if deep, may contain several hundred ppm (mg/L).

### The Caustic Titrant with pH Indicator Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-CO<sub>2</sub> C (2005). ASTM D 513-82, Total and Dissolved Carbon Dioxide in Water, Test Method E.

CHEMetrics' carbon dioxide test kits employ a sodium hydroxide titrant and phenolphthalein indicator. The kits contain a neutralizer solution to correct for sulfide interference. Results are expressed as ppm (mg/L) CO<sub>2</sub>.



## Visual Kits

**Range: 10-100 ppm**  
MDL: 10 ppm / Method: Caustic Titrant with pH Indicator

Titrets Kit	Cat#
	<b>K-1910</b>

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.

**Range: 100-1000 ppm**  
MDL: 100 ppm / Method: Caustic Titrant with pH Indicator

Titrets Kit	Cat#
	<b>K-1920</b>

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.

**Range: 250-2500 ppm**  
MDL: 250 ppm / Method: Caustic Titrant with pH Indicator

Titrets Kit	Cat#
	<b>K-1925</b>

Increments:  
250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.

### Kit Components common to Carbon Dioxide

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Syringe Pack, 1.0 mL (6 ea)	A-0027
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

# Come full circle with CHEMetrics COD



- ✓ USEPA approved
- ✓ Less expensive than other brands
- ✓ No need to modify existing equipment, accessories or procedures
- ✓ Reduces operating costs
- ✓ Disposal service offered

## COD Reagent Vials\*

CHEMetrics Part No.	No. of Tests	Range (ppm)	USEPA Approved	Hach <sup>1</sup> Equivalent Cat. No.
K-7350S	25	0-150	Yes	21258-25
K-7360S	25	0-1500	Yes	21259-25
K-7370S	25	0-15,000	No	24159-25
K-7355	150	0-150	Yes	21258-15
K-7365	150	0-1500	Yes	21259-15
K-7375	98	0-15,000	No	24159-15

## Mercury-free COD Reagent Vials

CHEMetrics Part No.	No. of Tests	Range (ppm)	USEPA Approved	Hach <sup>1</sup> Equivalent Cat. No.
K-7351S	25	0-150	No	25650-25
K-7361S	25	0-1500	No	25651-25
K-7371S	25	0-15,000	No	28343-25
K-7356	150	0-150	No	N/A
K-7366	150	0-1500	No	25651-15
K-7376	98	0-15,000	No	N/A

\*USEPA approved COD Vials can be used for NPDES reporting. See next page for description of disposal service program.

<sup>1</sup> NOTE: No endorsement by Hach Company is implied or intended.

## greenCOD™ Recycling Program

For disposal of CHEMetrics mercury-containing COD Vials. Through our new partnership with U.S. Waste Industries, a full service environmental company, CHEMetrics now offers an easy, economical method to dispose of CHEMetrics used COD Vials, using our new convenient 5-gallon mail-back program.

- Free shipping
- Certificate of Recycling provided
- DOT Approved Recycling Container
- \*Holds about 400 used COD Vials
- Available to Conditionally Exempt Small Quantity Generators

\*For disposal of CHEMetrics mercury-containing COD Vials only. For U.S. customers only. Not available for following states: AR, CA, IL, MA, ME, MI, MN, NH, RI, AK, HI. Contact CHEMetrics Customer Service for details.



## Easy 1-2-3 Ordering

1. Place your order for a 5-gallon recycling container, catalog no. A-7300, direct or through CHEMetrics website.
2. U.S. Waste Industries will send recycling container and label for shipping. All documentation and transportation cost to recycling facility are included in purchase.
3. Drop CHEMetrics' used mercury-containing COD vials in greenCOD™ recycling container and ship to designated location.



## Methods

The determination of Chemical Oxygen Demand (COD) is widely used in municipal and industrial laboratories to measure the overall level of organic contamination in wastewater. The contamination level is determined by measuring the equivalent amount of oxygen required to oxidize organic matter in the sample.

References: USEPA Methods of Analysis of Water and Wastes, Method 410.4 (1983). APHA Standard Methods, 21st ed., Method 5220 D (2005). A.M. Jirka and M. J. Carter, "Micro Semi-Automated Analysis of Surface and Wastewaters for Chemical Oxygen Demand," Analytical Chemistry, Vol. 47, p. 1397 (1975). J. A. Winter, "Method Research Study 3, Demand Analysis, An Evaluation of Analytical Methods for Water and Wastewater," USEPA, 1971. ASTM D 1252-00, Chemical Oxygen Demand (Dichromate Oxygen Demand) of Water, Test Method B.



## The Dichromate Reactor Digestion Method

CHEMetrics offers two dichromate reactor digestion methods for fast, easy, safe determinations of low-, mid-, and high-range COD levels in wastewater: the USEPA-approved Method, and a mercury-free method. The products using the USEPA-approved method contain mercuric sulfate in the reagent to eliminate chloride interferences. The more readily disposable mercury-free product line is applicable when chloride interference is not a concern and USEPA reporting is not required.

CHEMetrics' leakproof reagent vials contain pre-measured solutions of sulfuric acid and potassium dichromate. To perform the COD determination, the analyst simply removes the Teflon-lined screw cap from the vial, adds sample to the vial, and replaces the cap. The vial is then heated for two hours at 150°C in a standard digester block. Once digestion is completed, results are obtained using any photometer that accepts 16-mm diameter cells. CHEMetrics COD vials can be directly used in our V-2000 multi-analyte photometer, CHEMetrics' single analyte COD photometers, as well as in Hach<sup>1</sup> spectrophotometers. Built-in Hach COD methods and calibrations can be used without the need for a new calibration. A generic calibration table is included within the CHEMetrics kit for use with other spectrophotometers.

<sup>1</sup>NOTE: No endorsement by Hach Company is implied or intended.

## Instrumental Kit

**Range: 0-40 (ULR)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>Not USEPA Approved</i> ) Vials Kit	*K-7340S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS. Shelf-life 12 months

**Note:** This COD Kit requires the use of a Digester Block and spectrophotometer capable of accepting a 16-mm round cell. The K-7340S cannot be used with CHEMetrics V-2000 Photometer or A-7320 COD Low Range Photometer.

## V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

**Range: 0-150 ppm (LR)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>USEPA Approved</i> ) Vials Kit	*K-7350S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS.

	Cat#
COD ( <i>USEPA Approved</i> ) Vials Kit	*K-7355

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials and instruction book with MSDS.

**Range: 0-150 ppm (LR)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>Mercury Free</i> ) Vials Kit	K-7351S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS.

	Cat#
COD ( <i>Mercury Free</i> ) Vials Kit	K-7356

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials and instruction book with MSDS.

**Range: 0-1500 ppm (HR)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>USEPA Approved</i> ) Vials Kit	*K-7360S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS.

	Cat#
COD ( <i>USEPA Approved</i> ) Vials Kit	*K-7365

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials and instruction book with MSDS.

See Product Price List for COD Quantity Discount Schedule.

**Range: 0-1500 ppm (HR)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>Mercury Free</i> ) Vials Kit	K-7361S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS.

	Cat#
COD ( <i>Mercury Free</i> ) Vials Kit	K-7366

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials and instruction book with MSDS.

**Range: 0-15,000 ppm (HR+)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>Not USEPA Approved</i> ) Vials Kit	*K-7370S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS.

	Cat#
COD ( <i>Not USEPA Approved</i> ) Vials Kit	*K-7375

Kit comes in a cardboard box and contains everything needed to perform up to 97 tests (except distilled water): 98 vials and instruction book with MSDS.

**Range: 0-15,000 ppm (HR+)**  
Method: Dichromate Reactor Digestion

	Cat#
COD ( <i>Mercury Free</i> ) Vials Kit	K-7371S

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials and instruction book with MSDS.

	Cat#
COD ( <i>Mercury Free</i> ) Vials Kit	K-7376

Kit comes in a cardboard box and contains everything needed to perform up to 97 tests (except distilled water): 98 vials and instruction book with MSDS.

**All COD Kits require the use of a Digester Block and the V-2000 Photometer, a COD Photometer, or a spectrophotometer capable of accepting a 16 mm round cell. Instruments sold separately.**

**A fresh reagent ampoule blank must be prepared for each series of tests; therefore the number of samples that can be tested with each kit will vary.**

### Accessories

Description	Cat#
Vial Rack (holds 40 vials)	A-0107
Digester Block (115/230 Volt, 12 cells) - Warranty 1 year	A-0111
greenCOD™ Recycling Program (disposal of used COD Vials)	A-7300
Calibration Standard, 1000 ppm (200 mL), Shelf-life 8 months	A-7301 <sup>1</sup>
Calibration Standard, 10,000 ppm (200 mL), Shelf-life 8 months	A-7310 <sup>1</sup>
Low Range COD Photometer (0-150 ppm)	A-7320
High Range COD Photometer (0-1500 & 0-15,000 ppm)	A-7325

<sup>1</sup> This product must be refrigerated.

Instructions and MSDS(s) are posted on website.

If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

\*Contains mercury. Dispose according to local, state or federal laws.

## Methods

Chloride is the most common inorganic anion found in water and wastewater. The Maximum Secondary Contaminant Level for drinking water for chloride is 250 mg/L. Natural sources of salt are the ocean and various salt deposits above and below ground.

Chloride is very corrosive to most metals in systems with elevated pressures and temperatures such as boilers and oil-drilling equipment.

### The Mercuric Nitrate Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl<sup>-</sup> C (2005). ASTM D 512-04, Chloride Ion in Water, Test Method A. USEPA Methods for Chemical Analysis of Water and Wastes, Method 325.3 (1983).

CHEMetrics employs a mercuric nitrate titrant in acid solution with diphenylcarbazone as the end point indicator. Results are expressed as ppm (mg/L) Cl<sup>-</sup>.

### The Ferric Thiocyanate Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl<sup>-</sup> E (2005). D. Zall, D. Fisher, M. Garner, "Photometric Determination of Chlorides in Water," *Analytical Chemistry*, Vol 28, No. 11, pp. 1665-1668, November 1956. J. O'Brien, "Automatic Analysis of Chlorides in Sewage," *Wastes Engineering*, pp. 670-672, December 1962.

The Chloride Vacu-vials<sup>®</sup> test employs the ferric thiocyanate chemistry. Chloride reacts with mercuric thiocyanate to liberate thiocyanate ion. Ferric ion reacts with thiocyanate ion to produce an orange-brown thiocyanate complex in proportion to the chloride concentration. Results are expressed as ppm (mg/L) Cl<sup>-</sup>.

## Visual Kits

**Range: 2-20 ppm**  
MDL: 2.0 ppm / Method: Mercuric Nitrate

**Titrets Kit**, Shelf-life 6 months Cat#  
\*K-2002

Increments:  
2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Acidifier Solution, Normalizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 20-200 ppm**  
MDL: 20 ppm / Method: Mercuric Nitrate

**Titrets Kit**, Shelf-life 20 months Cat#  
\*K-2020

Increments:  
20, 22, 24, 26, 28, 30, 32, 36, 40, 50, 60, 70, 80, 100, 140, 200 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 50-500 ppm**  
MDL: 50 ppm / Method: Mercuric Nitrate

**Titrets Kit**, Shelf-life 20 months Cat#  
\*K-2050

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

\*Contains mercury. Dispose according to local, state or federal laws.



**Range: 250-2500 ppm**  
**MDL: 250 ppm / Method: Mercuric Nitrate**

	Cat#
<b>Titrets Kit</b> , Shelf-life 20 months	<b>*K-2051</b>
Increments: 250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm	
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.	

**Range: 1000-10,000 ppm**  
**MDL: 1000 ppm / Method: Mercuric Nitrate**

	Cat#
<b>Titrets Kit</b> , Shelf-life 20 months	<b>*K-2055</b>
Increments: 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1800, 2000, 2500, 3000, 3500, 4000, 5000, 7000, 10,000 ppm	
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.	

**Range: 10,000-100,000 ppm**  
**MDL: 10,000 ppm / Method: Mercuric Nitrate**

	Cat#
<b>Titrets Kit</b> , Shelf-life 20 months	<b>*K-2070</b>
Increments: 10,000, 11,000, 12,000, 13,000, 14,000, 15,000, 16,000, 18,000, 20,000, 25,000, 30,000, 35,000, 40,000, 50,000, 70,000, 100,000 ppm	
Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, 3.0 mL syringe, instructions, and MSDS.	

 **Instrumental Kit**

**V-2000 Multi-Analyte Photometer**  
*(See page 14 for instrumental features)*

**Range: 2.5-40.0 ppm**  
**Method: Ferric Thiocyanate**

	Cat#
<b>Vacu-vials Kit</b>	<b>*K-2103<sup>1</sup></b>
Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup>Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

\*Contains mercury. Dispose according to local, state or federal laws.

Kit Components common to Chloride	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Titrettor Pack (1 ea)	A-0053
Syringe Pack, 3.0 mL (6 ea)	A-0063

**Instructions and MSDS(s) are posted on our website.**  
*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





## Visual Kits

## Methods

Because of its strong oxidizing properties, chlorine is an excellent biocide used to treat potable waters, municipal wastes, and swimming pools. When used to treat potable water, chlorine helps alleviate the adverse effects of iron, manganese, ammonia, and sulfide. The Maximum Residual Disinfectant Level for chlorine is 4 mg/L in drinking water.

### The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983).  
 APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl G (2005).



In the USEPA-approved DPD methodology, free chlorine reacts with DPD to form a pink product. When ammonia or amines are present, some

of the chlorine may exist as combined chlorine. Combined chlorine will not interfere with the free chlorine results, provided the readings are taken at one minute. To determine total chlorine (the sum of free and combined), use the A-2500 Activator Solution (potassium iodide) supplied in the kit. Results are expressed as ppm (mg/L) Cl<sub>2</sub>.

### The DDPD™ Method

Reference: Developed by CHEMetrics, Inc.

The DDPD™ method is derived from the DPD method. Test kits that employ this chemistry are well suited for use where biocides and chromate corrosion inhibitors are used simultaneously. DDPD reacts with free chlorine to form a purple product. When ammonia or amines are present in the sample, some of the chlorine may exist as *combined chlorine*. To determine total chlorine (the sum of free and combined), use the A-2500 Activator Solution (potassium iodide) that is supplied in the kit. Results are expressed as ppm (mg/L) Cl<sub>2</sub>.

CHEMetrics' DDPD method is also applicable to the direct determination of hypochlorite concentrations in various cleaning preparations and disinfectants prior to their dilution. The DDPD compound reacts with hypochlorite ions to form a purple color. Results are expressed as percent (%) NaOCl.

Range: 0-0.20 ppm MDL: 0.04 ppm / Method: DDPD	
	Cat#
<b>Chlorine (free &amp; total) ULR CHEMets Kit</b>	<b>K-2511</b>
ULR CHEMets Refill, 30 ampoules	R-2511
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Neutralizer Solution Pack, six 20 mL bottles	A-2501 <sup>1</sup>
Comparator, Shelf-life 12 months 0, 0.04, 0.06, 0.08, 0.10, 0.12, 0.16, 0.20 ppm	C-2511
Kit comes in a cardboard box and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solution, Neutralizer Solution, 25 mL sample cup, instructions, and MSDS.	

Range: 0-1 & 1-5 ppm MDL: 0.05 ppm / Method: DPD	
	Cat#
<b>Chlorine (free &amp; total) CHEMets Kit</b>	<b>K-2504</b>
CHEMets Refill, 30 ampoules	R-2500
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-2504
High Range Comparator 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm	C-2506
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.	

Range: 0-30 & 30-150 ppm MDL: 5 ppm / Method: DDPD	
	Cat#
<b>Chlorine (free &amp; total) VACUettes Kit</b>	<b>K-2505D</b>
VACUettes Refill, 30 ampoules	R-2505D
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Neutralizer Solution Pack, six 20 mL bottles	A-2501 <sup>1</sup>
Low Range Comparator, Shelf-life 12 months 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-2501D
High Range Comparator, Shelf-life 12 months 30, 45, 60, 75, 87.5, 100, 112.5, 125, 150 ppm	C-2505D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

Range: 0-60 & 60-300 ppm MDL: 10 ppm / Method: DDPD	
	Cat#
<b>Chlorine (free &amp; total) VACUettes Kit</b>	<b>K-2505A</b>
VACUettes Refill, 30 ampoules	R-2505A
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Neutralizer Solution Pack, six 20 mL bottles	A-2501 <sup>1</sup>
Low Range Comparator, Shelf-life 12 months 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-2501A
High Range Comparator, Shelf-life 12 months 60, 90, 120, 150, 175, 200, 225, 250, 300 ppm	C-2505A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

\*Approved for drinking and wastewater using CHEMetrics instrumental DPD Vacu-vials products. Please contact us for a copy of the USEPA approval letter.





## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.40-5.00 ppm

Method: DPD

	Cat#
<b>Chlorine (free) Vacu-vials Kit (USEPA Approved)</b>	<b>K-2523</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

Range: 0.40-5.00 ppm

Method: DPD

	Cat#
<b>Chlorine (free &amp; total) Vacu-vials Kit (USEPA Approved)</b>	<b>K-2513</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

### SAM Single-Analyte Photometer

(See page 17 for instrumental features)

Range: 0.40-5.00 ppm

Method: DPD

	Cat#
<b>Chlorine (free &amp; total) SAM Kit</b>	<b>I-2001</b>

Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS. K-2513

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.

*Vacu-vials Kits require the use of the V-2000 Photometer, or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests. The Activator Solution, A-2500, is used to determine Total Chlorine.

#### Kit Components common to Chlorine

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

Range: 0-120 & 120-600 ppm  
MDL: 20 ppm / Method: DDPD

	Cat#
<b>Chlorine (free &amp; total) VACUettes Kit</b>	<b>K-2505B</b>
VACUettes Refill, 30 ampoules	R-2505B
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Neutralizer Solution Pack, six 20 mL bottles	A-2501 <sup>1</sup>
Low Range Comparator, Shelf-life 12 months 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-2501B
High Range Comparator, Shelf-life 12 months 120, 180, 240, 300, 350, 400, 450, 500, 600 ppm	C-2505B

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

Range: 0-1000 & 1000-5000 ppm  
MDL: 100 ppm / Method: DDPD

	Cat#
<b>Chlorine (free &amp; total) VACUettes Kit</b>	<b>K-2505C</b>
VACUettes Refill, 30 ampoules	R-2505C
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Neutralizer Solution Pack, six 20 mL bottles	A-2501 <sup>1</sup>
Low Range Comparator, Shelf-life 12 months 0, 100, 200, 300, 400, 600, 800, 1000 ppm	C-2501C
High Range Comparator, Shelf-life 12 months 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000 ppm	C-2505C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

Range: 0.4-1.9% as NaOCl  
MDL: 0.4% / Method: DDPD

	Cat#
<b>Chlorine (hypochlorite) VACUettes Kit</b>	<b>K-5806</b>
VACUettes Refill, 30 ampoules	R-5806
Comparator, Shelf-life 12 months 0.4, 0.6, 0.8, 1.0, 1.1, 1.3, 1.4, 1.6, 1.9%	C-5806

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, dilutor snapper cup, 1.0 mL syringe, micro test tube, instructions, and MSDS.

Range: 2.5-13% as NaOCl  
MDL: 2.5% / Method: DDPD

	Cat#
<b>Chlorine (hypochlorite) VACUettes Kit</b>	<b>K-5814</b>
VACUettes Refill, 30 ampoules	R-5814
Comparator, Shelf-life 12 months 2.5, 4.0, 5.0, 6.5, 8.0, 9.0, 10.5, 12.0, 13.0%	C-5814

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, dilutor snapper cup, 1.0 mL syringe, micro test tube, instructions, and MSDS.

## Method

Chlorine dioxide is used as an oxidizing microbicide in industrial cooling water treatment, the dairy industry, the meat industry, and many other food and beverage industry applications. It is used as a bleaching agent in the pulp and paper industry, and as a disinfectant in municipal water treatment. Industrial waste treatment facilities use chlorine dioxide because of its selectivity for certain compounds, including phenols, sulfides, cyanides, thiosulfates, and mercaptans. The oil and gas industry uses chlorine dioxide for downhole applications and as a stimulation enhancement additive. The Maximum Residual Disinfectant Level for chlorine dioxide is 0.8 mg/L in drinking water.

### The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 20<sup>th</sup> ed., Method 4500-ClO<sub>2</sub> D (1998) and 21<sup>st</sup> ed., Method 4500-Cl G (2005).

In the standard DPD methodology, chlorine dioxide reacts with DPD (N, N-diethyl-p-phenylenediamine) to form a pink product. Interference from free Cl<sub>2</sub> is prevented (up to 6 ppm Cl<sub>2</sub>) by the addition of glycine to the sample. Results are expressed as ppm (mg/L) ClO<sub>2</sub>.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.80-11.00 ppm  
Method: DPD

	Cat#
Vacu-vials Kit, Shelf-life 8 months	K-2703

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### SAM Single-Analyte Photometer

(See page 17 for instrumental features)

Range: 1.0-11.0 ppm  
Method: DPD

	Cat#
SAM Kit	I-2005

Vacu-vials Kit, 30 ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS. Shelf-life 8 months. K-2703

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.

### Kit Components common to Chlorine Dioxide

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions and MSDS(s) are posted on our website. If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Visual Kit

Range: 0-2 & 2-10 ppm  
MDL: 0.1 ppm / Method: DPD

	Cat#
CHEMets Kit	K-2705
CHEMets Refill, 30 ampoules	R-2705
Neutralizer Solution Pack, six 10 mL bottles, Shelf-life 8 months	A-2700 <sup>1</sup>
Low Range Comparator 0, 0.2, 0.4, 0.6, 0.8, 1.2, 1.6, 2.0 ppm	C-2702
High Range Comparator 2, 3, 4, 5, 6, 7, 8, 9, 10 ppm	C-2710

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, 25 mL sample cup, instructions, and MSDS.



## Method

Hexavalent chromium salts are used in numerous industrial processes. They are also used extensively as corrosion inhibitors in open and closed cooling water systems.

### The Diphenylcarbazide Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 3500-Cr B (2005). ASTM D 1687-02, Chromium in Water, Test Method A.

With the chromate test method, hexavalent chromium reacts with diphenylcarbazide under acid conditions to form a red-violet color. Results are expressed as ppm (mg/L) CrO<sub>4</sub>.



## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Diphenylcarbazide

	Cat#
<b>CHEMets Kit</b>	<b>K-2810</b>
CHEMets Refill, 30 ampoules	R-2810
Acidifier Solution Pack, six 10 mL bottles	A-2800 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-2801
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-2810

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Acidifier Solution, 25 mL sample cup, instructions, and MSDS.

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Diphenylcarbazide

	Cat#
<b>VACUettes Kit</b>	<b>K-2810D</b>
VACUettes Refill, 30 ampoules	R-2810D
Acidifier Solution Pack, six 10 mL bottles	A-2800 <sup>1</sup>
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-2801D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-2810D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Diphenylcarbazide

	Cat#
<b>VACUettes Kit</b>	<b>K-2810A</b>
VACUettes Refill, 30 ampoules	R-2810A
Acidifier Solution Pack, six 10 mL bottles	A-2800 <sup>1</sup>
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-2801A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-2810A

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Diphenylcarbazide

	Cat#
<b>VACUettes Kit</b>	<b>K-2810B</b>
VACUettes Refill, 30 ampoules	R-2810B
Acidifier Solution Pack, six 10 mL bottles	A-2800 <sup>1</sup>
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-2801B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-2810B

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Diphenylcarbazide

	Cat#
<b>VACUettes Kit</b>	<b>K-2810C</b>
VACUettes Refill, 30 ampoules	R-2810C
Acidifier Solution Pack, six 10 mL bottles	A-2800 <sup>1</sup>
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-2801C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-2810C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 14 for instrumental features)

**Range: 0.20-3.50 ppm**  
Method: Diphenylcarbazide

	Cat#
Vacu-vials Kit	K-2803
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

**Range: 0.70-13.00 ppm**  
Method: Diphenylcarbazide

	Cat#
Vacu-vials Kit	K-2823
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**Kit Components common to Chromate**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Conductivity (or Specific Conductance) is the measure of the electrical current carrying capacity of a solution. Ionized dissolved solids in water have the ability to conduct an electric current. The conductivity of pure water is very low and increases proportionally to the level of contamination present. Accurate conductivity measurement is extremely important in industrial water treatment applications, as it allows for the calculation of total dissolved solids in raw water, boiler water, condensate, and other process waters. Conductivity is also frequently tested for in environmental applications.

### Method of Operation.

To operate the CHEMetrics Conductivity Meter, switch unit on, remove the electrode cap, immerse the probe into the sample, making sure that the sensor is fully covered. Wait for the readings to stabilize (Automatic Temperature compensation corrects for temperature changes). Take measurement. To clean the electrode, simply rinse it in tap water.

## FEATURES

**Range:** 0-2000  $\mu$ S and 0-20 mS.

**Resolution:** 10  $\mu$ S; 0.10 mS

**Accuracy:**  $\pm$ 1% full scale.

**Calibration Type:** Manual or Automatic with 1413  $\mu$ S Conductivity Singles

**Operating Temperature:** 0 to 50°C (32 to 122°F).

**Power and battery life:** Four 1.5 V alkaline batteries (supplied). 100 hrs. continuous use (approx).

**Pocket-sized:** 6.5" length x 1.5" diameter

**Weight:** 3.25 oz.(90 g)

**Warranty:** 1 year (electrode: 6 months)



**Range:** 0-2000  $\mu$ S and 0-20 mS (0-20,000  $\mu$ S)

**Conductivity Meter**

**Cat#**  
I-1200

Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.

### Accessories

#### Description

Description	Cat#
Electrode for TDS and Conductivity	A-0176
Conductivity/TDS <i>Singles</i> , (20 ea) 1413 $\mu$ S, Shelf-life 3 months	A-0178
Conductivity <i>Singles</i> , (20 ea) 15,000 $\mu$ S, Shelf-life 3 months	A-0189
Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)	A-0179

*Instructions are posted on our website.*



### FEATURES

- Replaceable electrode
- Waterproof, dustproof
- Push-button calibration
- Automatic temperature compensation (ATC)
- Auto-shutoff

## Method

Copper is naturally present in the earth's crust and in seawater. Copper-containing fungicides are used to control biological growth in water supplies.

The Maximum Contaminant Level Goal for copper is 1.3 mg/L in drinking water.

The measurement of copper is an important means of monitoring the corrosion of condensate systems and heat exchangers.

### The Bathocuproine Method

Reference: APHA Standard Methods, 21<sup>st</sup> ed., Method 3500-Cu C (2005).

CHEMetrics' test kits employ the bathocuproine reagent. Bathocuproine disulfonate forms an orange-colored chelate with copper. The method measures total soluble copper as ppm (mg/L) Cu. The test kits are applicable for analysis of drinking water, surface waters, groundwater, wastewater and seawater.

## Visual Kit

Range: 0-1 & 1-10 ppm  
MDL: 0.05 ppm / Method: Bathocuproine

	Cat#
<b>CHEMets Kit</b>	<b>K-3510</b>
CHEMets Refill, 30 ampoules	R-3510
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-3501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-3510

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions, and MSDS

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: V-2000: 0.50-12.00 ppm / Spec: 0.25-7.00 ppm  
Method: Bathocuproine

	Cat#
<b>Vacu-vials Kit</b>	<b>K-3503</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Copper

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Cyanide is used in many chemical and refining processes. It is found in effluent from electroplating and metal cleaning operations, coke ovens, steel manufacturing facilities, and gas scrubbers. Although cyanide can be safely removed by alkaline chlorination, its acute toxicity to aquatic life necessitates routine monitoring of effluents. The Maximum Contaminant Level for free cyanide in drinking water is 0.2 mg/L.

CHEMetrics' cyanide test kits are applicable to the monitoring of effluents and surface water supplies. It is recommended, however, that the sample be distilled and hydrogen sulfide be removed prior to analysis.

### The Isonicotinic-Barbituric Acid Method

Reference: S. Nagashima, Spectrophotometric Determination of Cyanide with Isonicotinic Acid and Barbituric Acid, *International Journal of Environ. Anal. Chem.*, 1981, Vol. 10, pp. 99-106.

In the Cyanide CHEMets® and Vacu-vials Kit, chlorine is added to a sample that has been buffered to pH 6. The resulting cyanogen chloride reacts with isonicotinic and barbituric acids to form a blue color. Results are expressed as ppm (mg/L) CN.

This chemistry provides two advantages over the more commonly used pyridine methods: (1) The shelf-life of the reagent is extended, and (2) the analyst is not exposed to noxious and hazardous fumes from the pyridine reagent.

### The Silver Nitrate Method

Reference: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-CN<sup>-</sup> D (2005).

The Cyanide Titrets® Kit employs silver nitrate as the titrant and 5-(p-dimethylaminobenzylidene) rhodanine as the indicator. A color change from orange to yellow signals the end of the titration. Results are expressed as ppm (mg/L) CN.

## Visual Kits

Range: 0-0.1 & 0.1-1 ppm MDL: 0.005 ppm / Method: Isonicotinic-Barbituric Acid	
<b>CHEMets Kit,</b>	<b>Cat# K-3810</b>
CHEMets Refill, 30 ampoules	R-3810
Neutralizer Solution Pack, six 20 mL bottles	A-3800 <sup>1</sup>
Activator Solution Pack, six 10 mL bottles, Shelf-life 8 months	A-3801 <sup>1</sup>
Low Range Comparator 0, 0.01, 0.02, 0.03, 0.04, 0.06, 0.08, 0.1 ppm	C-3801
High Range Comparator 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 ppm	C-3810
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, Activator Solution, 5 mL sample cup & top, instructions, and MSDS.	

Range: 5-50 ppm MDL: 5.0 ppm / Method: Silver Nitrate	
<b>Titrets Kit</b>	<b>Cat# K-3815</b>
Increments: 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm	
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.	

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.040-0.400 ppm Method: Isonicotinic-Barbituric Acid	
<b>Vacu-vials Kit, Shelf-life 8 months</b>	<b>Cat# K-3803</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, Activator Solution, 25 mL sample cup, 3.0 mL syringe, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Cyanide

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Titrettor Pack (1 ea)	A-0053
Syringe Pack, 3.0 mL (6 ea)	A-0063
Sample Cup & Top Pack, 5 mL (6 ea)	A-0105

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

## Methods

Dissolved oxygen in boiler system water causes corrosion and pitting of metal surfaces, which can lead to boiler inefficiency, equipment failure, and system downtime. DEHA (N,N-Diethylhydroxylamine) is added to boiler system water as an oxygen scavenger to keep the dissolved oxygen levels as low as possible.

### The PDTS Method

Reference: G. Frederick Smith Chemical Co., *The Iron Reagents*, 3<sup>rd</sup> ed., p. 47 (1980).

The test kits employ the PDTS chemistry, in which DEHA reduces iron III (ferric state) to iron II (ferrous state), which readily reacts with PDTS (3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine disodium salt) to form a pink-purple colored complex in direct proportion to the DEHA concentration. Test results are expressed in ppb (µg/L) or ppm (mg/L) DEHA.

### The Ceric Sulfate Titrimetric Method

Reference: Developed by CHEMetrics, Inc.

CHEMetrics developed a titrimetric method that employs a ceric sulfate titrant and ferroin end point indicator. DEHA reduces ferric iron to the ferrous state, and the resulting ferrous iron is titrated with the ceric sulfate titrant. Test results are expressed in ppm (mg/L) DEHA.



## Visual Kits

Range: 0-400 & 400-3000 ppb MDL: 15 ppb / Method: PDTS	
	Cat#
<b>CHEMets Kit</b>	<b>K-3902</b>
CHEMets Refill, 30 ampoules	R-3902
Activator Solution Pack, six 10 mL bottles	A-3900 <sup>1</sup>
Low Range Comparator 0, 30, 60, 100, 150, 200, 300, 400 ppb	C-3901
High Range Comparator 400, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000 ppb	C-3902
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparator, Activator Solution, 25 mL sample cup, instructions and MSDS.	

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

Range: 25-250 ppm  
MDL: 25 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

Titrets Kit	Cat#
	K-3925

Increments:  
25, 27.5, 30, 32.5, 35, 37.5, 40, 45, 50, 62.5, 75, 87.5, 100, 125, 175, 250 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.15-2.00 ppm  
Method: PDTS

Vacu-vials Kit	Cat#
	K-3903

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to DEHA

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Titrettor Pack (1 ea)	A-0053

Instructions and MSDS(s) are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Detergents can be introduced into the water supply by industry, soap manufacturers, and private households. Environmental analysts often include a determination of anionic detergents when assessing surface water pollution.

### The Methylene Blue Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983). APHA Standard Methods, 21<sup>st</sup> ed., Method 5540 C (2005). ASTM D 2330-02, Methylene Blue Active Substances.

The methylene blue active substances (MBAS) method is used in a 3-minute procedure to measure anionic detergents. The procedure features a unique extraction/sampling technique that eliminates several steps required in other test procedures and provides increased sensitivity.

Anionic detergents react with methylene blue to form a blue-colored complex that is extracted into an immiscible organic solvent. Results are expressed in ppm (mg/L) as linear alkylbenzene sulfonate (LAS), equivalent weight 325.

Shelf-life: eight months. We recommend stocking quantities that will be used within seven months.

## Visual Kit

Range: 0-3 ppm  
MDL: 0.125 ppm / Method: Methylene Blue

	Cat#
<b>CHEMets Kit</b>	<b>K-9400</b>
CHEMets Refill, 20 ampoule sets, Shelf-life 8 months	R-9400
Comparator 0, 0.25, 0.50, 0.75, 1.0, 1.5, 2.0, 3.0 ppm	C-9400

Kit comes in a cardboard box and contains everything needed to perform 20 tests: Refill, Comparator, reaction tube with lid, tip breaking tool, instructions, and MSDS.

Range: 0-1400 ppm  
MDL: 100 ppm / Method: Methylene Blue

	Cat#
<b>CHEMets Kit</b>	<b>K-9404</b>
CHEMets Refill, 20 ampoule sets and 20 pipette tips: Shelf-life 8 months	R-9404
Comparator 0, 100, 200, 400, 600, 800, 1000, 1200, 1400 ppm	C-9404

Kit comes in a cardboard box and contains everything needed to perform 20 tests: Refill, Comparator, 25 uL MiniPet<sup>®</sup> 1, reaction tube with lid, tip breaking tool, instructions, and MSDS.

## Instrumental Kits

### SAM Single-Analyte Photometer

(See page 17 for instrumental features)

Range: 0.25-2.50 ppm  
Method: Methylene Blue

	Cat#
<b>Detergents SAM Kit</b>	<b>I-2017</b>
Instrumental Refill, 20 double-point ampoules, 21 test tubes, dropper bottle with cap, tip-breaking tool, instructions, and MSDS. Shelf-life 8 months.	<b>R-9423</b>

SAM Kit comes in a cardboard box and contains everything needed to perform 20 tests: Instrumental Refill, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.

### Kit Components common to Detergents

Description	Cat#
Tip Breaking Tool Pack (5 ea)	A-0079
Reaction Tube w/Lid, Detergents (1 ea)	A-0087
Pipette Tips Pack (30 ea)	A-0171
MiniPet <sup>®</sup> , 25 µL (1 ea)	A-0191

Instructions and MSDS(s) are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 2 years.



<sup>1</sup> MiniPet<sup>®</sup> is a registered trademark of Tricontinent Scientific, Inc.

## Method

Filming amines are fed continuously into boiler feed-water to protect metal surfaces from corrosion caused by dissolved oxygen and carbon dioxide in condensate water. The amine forms a thin film on the surfaces that repels the potentially corrosive water.

### The Methyl Orange Method

Reference: **ASTM D 2327-80, Mono- and Dioctadecylamines in Water.**

CHEMetrics' 3-minute procedure uses the standard methyl orange chemistry and features a unique extraction technique. The extraction eliminates several steps required in other procedures and provides increased sensitivity.

The filming amine compound reacts with methyl orange to form a yellow-colored complex that is extracted into an immiscible organic solvent. Results are expressed in ppm (mg/L) octadecylamine.

## Visual Kit

**Range: 0-1 ppm**  
MDL: 0.025 ppm / Method: Methyl Orange

	Cat#
<b>CHEMets Kit</b>	<b>K-1001</b>
CHEMets Refill, 20 ampoule sets	R-1000
Comparator 0, 0.05, 0.10, 0.15, 0.25, 0.50, 0.75, 1.0 ppm	C-1001

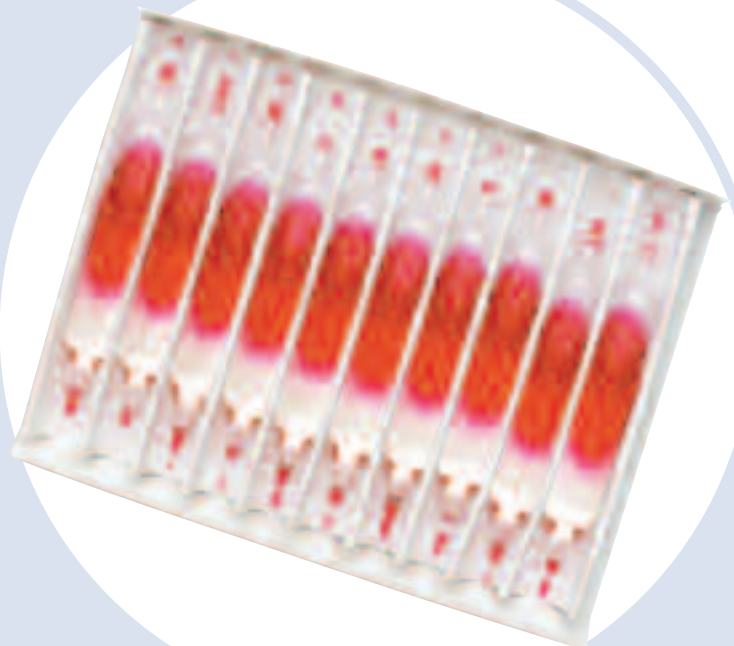
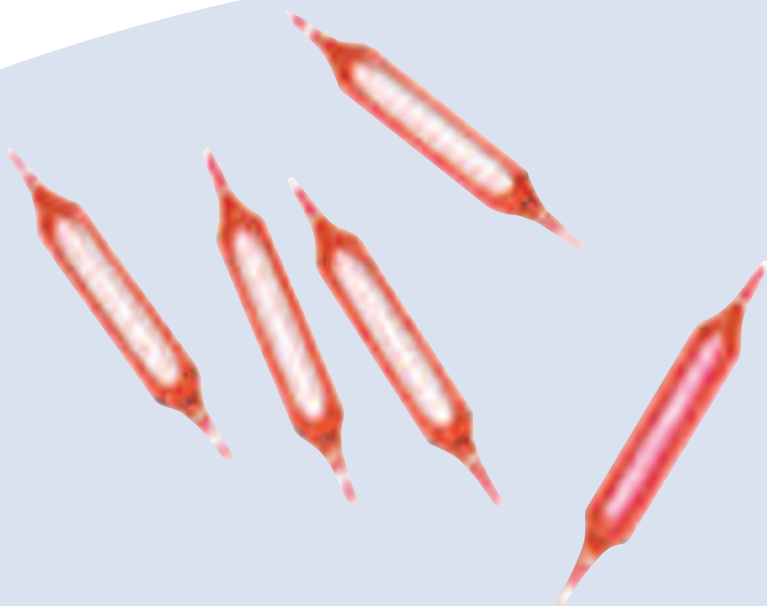
Kit comes in a cardboard box and contains everything needed to perform 20 tests: Refill, Comparator, reaction tube with lid, tip breaking tool, instructions, and MSDS.

### Kit Components common to Filming Amine

Description	Cat#
Tip Breaking Tool Pack (5 ea)	A-0079
Reaction Tube w/Lid, Filming Amine (5 ea)	A-0087F

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Formaldehyde, a toxic substance, is used in the following applications: metal plating baths, textile treatments, biological specimen preservatives, and disinfectants of medical equipment. Commercial formaldehyde gas is readily soluble in water.

### The Purpald Method

Reference: Purpald® developed by Aldrich Chemical Co.

Purpald® is subject to fewer interferences than Shiffs' reagent or chromotropic acid procedures. A purple-colored complex is formed when Purpald in alkaline solution reacts with formaldehyde. Results are expressed as ppm (mg/L) CH<sub>2</sub>O.

Shelf-life of the Purpald Reagent: 5 months. We recommend stocking quantities that will be used within four months.

### The Acid Titrimetric Method

Reference: ASTM D 2194-79, Concentration of Formaldehyde Solutions.

CHEMetrics offers a titrimetric method for formaldehyde, which uses sulfuric acid and sodium sulfite. The end point indicator, thymolphthalein, provides a sharp color change from colorless to bright blue. Results are expressed as percent (%) formaldehyde.



**Range: 0-1 & 1-5 ppm**  
MDL: 0.1 ppm / Method: Purpald

	Cat#
<b>CHEMets Kit</b>	<b>K-4605</b>
CHEMets Refill, 30 ampoules, Shelf-life 5 months	R-4605
Activator Solution Pack, six 20 mL bottles	A-4201 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4202 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-4601
High Range Comparator 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm	C-4605
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, 25 mL sample cup, instructions, and MSDS.	

**Range: 0-30 & 30-150 ppm**  
MDL: 5 ppm / Method: Purpald

	Cat#
<b>VACUettes Kit</b>	<b>K-4605D</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605D
Activator Solution Pack, six 20 mL bottles	A-4201 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4202 <sup>1</sup>
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-4601D
High Range Comparator 30, 45, 60, 75, 87.5, 100, 112.5, 125, 150 ppm	C-4605D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

**Range: 0-60 & 60-300 ppm**  
MDL: 10 ppm / Method: Purpald

	Cat#
<b>VACUettes Kit</b>	<b>K-4605A</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605A
Activator Solution Pack, six 20 mL bottles	A-4201 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4202 <sup>1</sup>
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-4601A
High Range Comparator 60, 90, 120, 150, 175, 200, 225, 250, 300 ppm	C-4605A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

**Range: 0-120 & 120-600 ppm**  
MDL: 20 ppm / Method: Purpald

	Cat#
<b>VACUettes Kit</b>	<b>K-4605B</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605B
Activator Solution Pack, six 20 mL bottles	A-4201 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4202 <sup>1</sup>
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-4601B
High Range Comparator 120, 180, 240, 300, 350, 400, 450, 500, 600 ppm	C-4605B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

<sup>1</sup> The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup> The Activator Solution, A-4201, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 4 months if stored in the refrigerator when not in use.

 Visual Kits

Range: 0-1200 & 1200-6000 ppm MDL: 200 ppm / Method: Purpald	
<b>VACUettes Kit</b>	<b>Cat# K-4605C</b>
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605C
Activator Solution Pack, six 20 mL bottles	A-4201 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4202 <sup>1</sup>
Low Range Comparator 0,200, 300, 400, 600, 800, 1000, 1200 ppm	C-4601C
High Range Comparator 1200, 1800, 2400, 3000, 3500, 4000, 4500, 5000, 6000 ppm	C-4605C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

Range: 0.5-5% MDL: 0.50% / Method: Acid Titrant with Thymolphthalein Indicator	
<b>Titrets Kit</b>	<b>Cat# K-4250</b>
Increments: 0.50, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.90, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.5, 5.0%	
Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.	

 Instrumental Kits

V-2000 Multi-Analyte Photometer (See page 14 for instrumental features)
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Range: 0.40-8.00 ppm Method: Purpald	
<b>Vacu-vials Kit</b> , Shelf-life 5 months	<b>Cat# K-4203<sup>2</sup></b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Activator Solutions, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

Kit Components common to Formaldehyde	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Titrettor Pack (1 ea)	A-0053

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>The Activator Solution, A-4201, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 4 months if stored in the refrigerator when not in use.

*Instructions and MSDS(s) are posted on our website. If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Glutaraldehyde-based disinfectants are used throughout the healthcare industry for cleaning and sterilizing. Many surfaces found in the medical, surgical, and dental environments are cleaned by dipping, wiping, or rinsing with glutaraldehyde solutions. Glutaraldehyde-based disinfectants are also used to clean dialysis machines and reusable dialyzers.

### The Acid Titrant with Phenolphthalein Indicator Method

Reference: Method developed by CHEMetrics based on ASTM D 2194-79, Concentration of Formaldehyde Solutions.

In CHEMetrics' test, glutaraldehyde concentrations are determined by titration with sulfuric acid in the presence of sodium sulfite. Phenolphthalein is used as the end point indicator. A color change from colorless to pink signals the end of the titration. Results are expressed in percent (%) glutaraldehyde.

## Visual Kit

**Range: 0.1-1%**  
MDL: 0.10% / Method: Acid Titrant with Phenolphthalein Indicator

<b>Titrets Kit</b>	<b>Cat#</b> K-4302
--------------------	-----------------------

Increments:  
0.10, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.18, 0.20, 0.25, 0.30, 0.35, 0.40, 0.50, 0.70, 1.0%

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Glutaraldehyde

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Ethylene glycol and propylene glycol are the primary ingredients in commercially-available antifreezes. They are used with various corrosion inhibitors to protect metal surfaces in cooling water systems.

CHEMetrics glycol kits are used to monitor potable waters for glycol contamination originating from glycol in cooling systems. They are also used to detect glycol in storm water effluent and to monitor glycol recycling operations.

### The Purpald-Periodate Method

Reference: Purpald® developed by Aldrich Chemical Company. Fritz, James S. and Schenk, George H., *Quantitative Analytical Chemistry*, 4<sup>th</sup> ed., p. 277 (1979).

In the colorimetric chemistry, periodic acid oxidizes ethylene glycol and/or propylene glycol to formaldehyde, which reacts with Purpald in alkaline solution. Test kits are available that report test results in either ppm (mg/L) ethylene or propylene glycol. Correction factors are supplied with all kits to convert to the alternate glycol form.

This test requires much less time to perform and involves fewer manipulations than the standard chromotropic acid procedure.

Shelf-life: five months. We recommend stocking quantities that will be used within four months.

## Visual Kits

**Range: 1-15 ppm as ethylene glycol**  
MDL: 1 ppm / Method: Purpald-Periodate

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules, Shelf-life 5 months	R-4815
Activator Solution Pack, six 10 mL bottles	A-4400 <sup>1</sup>
Activator Solution Pack, six 20 mL bottles	A-4401 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4402 <sup>1</sup>
Comparator 1, 2, 3, 4, 5, 6, 8, 10, 15 ppm	C-4815

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solutions, 25 mL sample cup, sample cup top, instructions, and MSDS.

**Range: 1000-15,000 ppm as ethylene glycol**  
MDL: 1000 ppm / Method: Purpald-Periodate

VACUettes Kit	Cat#
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4815C
Activator Solution Pack, six 10 mL bottles, Shelf-life 12 months	A-4404 <sup>1</sup>
Activator Solution Pack, six 20 mL bottles	A-4401 <sup>1,2</sup>
Activator Solution Pack, six 10 mL bottles	A-4402 <sup>1</sup>
Comparator 1000, 2000, 3000, 4000, 5000, 6000, 8000, 10,000, 15,000 ppm	C-4815C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solutions, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.



 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 14 for instrumental features)

**Range: 0.60-10.00 ppm as ethylene glycol**

Method: Purpald-Periodate

Cat#

Vacu-vials Kit, Shelf-life 5 months

K-4403<sup>2</sup>

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Activator Solutions, 25 mL sample cup, sample cup top, ampoule blank, instructions, and MSDS.

**Range: 5.0-65.0 ppm as propylene glycol**

Method: Purpald-Periodate

Cat#

Vacu-vials Kit, Shelf-life 5 months

K-4423<sup>2</sup>

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Activator Solutions, Stabilizer Solution, 25 mL sample cup, sample cup top, 10 mL syringe, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**Kit Components common to Glycol**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 10 mL (6 ea)	A-0104

<sup>1</sup> The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup> The Activator Solution, A-4401, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 4 months if stored in the refrigerator when not in use.

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Hardness is a measure of the mineral content of water. Calcium and magnesium are the most common minerals that contribute to hardness. Hard water causes scaling in boilers and other industrial equipment, and diminishes the effectiveness of soaps and detergents.

### The EGTA Method (calcium)

Reference: West, T. S., DSC, Ph.D., *Complexometry with EDTA and Related Reagents*, 3<sup>rd</sup> ed., pp. 46, 164 (1969).

The EGTA method is specific for calcium hardness. The EGTA titrant in alkaline solution is employed with a zircon indicator. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

Shelf-life: eight months. Although the reagent itself is stable, the end point indicator has a limited shelf-life. We recommend stocking quantities that will be used within seven months.

### The EDTA Method (total)

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 2340 C (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 130.2 (1983).

The total hardness method is applicable to drinking, surface, boiler, and brine waters.

The EDTA titrant is employed in alkaline solution with a calmagite indicator. This method determines the combined calcium and magnesium concentration of a sample. If no magnesium is present, the end point of the titration normally appears sluggish. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

## Visual Kits

Range: 50-500 ppm as CaCO<sub>3</sub>  
MDL: 50 ppm / Method: EGTA

<b>Hardness (calcium) Titrets Kit</b> , Shelf-life 8 months	<b>Cat#</b> <b>K-1705</b>
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Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 100-1000 ppm as CaCO<sub>3</sub>  
MDL: 100 ppm / Method: EGTA

<b>Hardness (calcium) Titrets Kit</b> , Shelf-life 8 months	<b>Cat#</b> <b>K-1710</b>
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Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 2-20 ppm as CaCO<sub>3</sub>  
MDL: 2.0 ppm / Method: EDTA

<b>Hardness (total) Titrets Kit</b>	<b>Cat#</b> <b>K-4502</b>
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Increments:  
2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 20-200 ppm as CaCO<sub>3</sub>  
MDL: 20 ppm / Method: EDTA

<b>Hardness (total) Titrets Kit</b>	<b>Cat#</b> <b>K-4520</b>
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Increments:  
20, 22, 24, 26, 28, 30, 32, 36, 40, 50, 60, 70, 80, 100, 140, 200 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 100-1000 ppm as CaCO<sub>3</sub>  
MDL: 100 ppm / Method: EDTA

<b>Hardness (total) Titrets Kit</b>	<b>Cat#</b> <b>K-4585</b>
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Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 250-2500 ppm as CaCO<sub>3</sub>  
MDL: 250 ppm / Method: EDTA

<b>Hardness (total) Titrets Kit</b>	<b>Cat#</b> <b>K-4530</b>
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Increments:  
250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Hardness

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





## Method

Hydrazine is a powerful reducing agent that is used in various chemical processes and in boiler water as an oxygen scavenger. To control corrosion, residual hydrazine typically is maintained in the 0.05 to 0.1 mg/L range. Higher levels may be used to guard against corrosion when the boiler is out of service for an extended period.

### The PDMAB Method

References: ASTM D 1385-07, Hydrazine in Water. L. C. Thomas and G. J. Chamberlin, Colorimetric Chemical Analytical Methods, 8<sup>th</sup> ed., pp. 194-195, Method I (1974).

CHEMetrics' hydrazine test kits employ the PDMAB, paradimethylaminobenzaldehyde chemistry. PDMAB in acid solution reacts with hydrazine to form a yellow product. Results are expressed as ppb ( $\mu\text{g/L}$ ) or ppm ( $\text{mg/L}$ )  $\text{N}_2\text{H}_4$ .

## Visual Kits

**Range: 0-50 ppb**  
MDL: 2 ppb / Method: PDMAB

	Cat#
<b>ULR CHEMets Kit</b>	<b>K-5011</b>
ULR CHEMets Refill, 30 ampoules	R-5011
Comparator 0, 2, 5, 10, 20, 30, 40, 50 ppb	C-5011

Kit comes in a cardboard box and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 0-0.5 ppm**  
MDL: 0.005 ppm / Method: PDMAB

	Cat#
<b>CHEMets Kit</b>	<b>K-5005</b>
CHEMets Refill, 30 ampoules	R-5005
Comparator 0, 0.01, 0.03, 0.05, 0.07, 0.1, 0.3, 0.5 ppm	C-5005

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 0-12.5 ppm**  
MDL: 0.25 ppm / Method: PDMAB

	Cat#
<b>VACUettes Kit</b>	<b>K-5005D</b>
VACUettes Refill, 30 ampoules	R-5005D
Comparator 0, 0.25, 0.75, 1.25, 1.75, 2.5, 7.5, 12.5 ppm	C-5005D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-25 ppm**  
MDL: 0.5 ppm / Method: PDMAB

	Cat#
<b>VACUettes Kit</b>	<b>K-5005A</b>
VACUettes Refill, 30 ampoules	R-5005A
Comparator 0, 0.5, 1.5, 2.5, 3.5, 5, 15, 25 ppm	C-5005A

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.





## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

**Range: V-2000: 0.10-1.20 ppm / Spec: 0.070-0.700 ppm**  
**Method: PDMAB**

	Cat#
<b>Vacu-vials Kit</b>	<b>K-5003</b>

Kit comes in a cardboard box and contains everything needed to perform up to 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Hydrazine

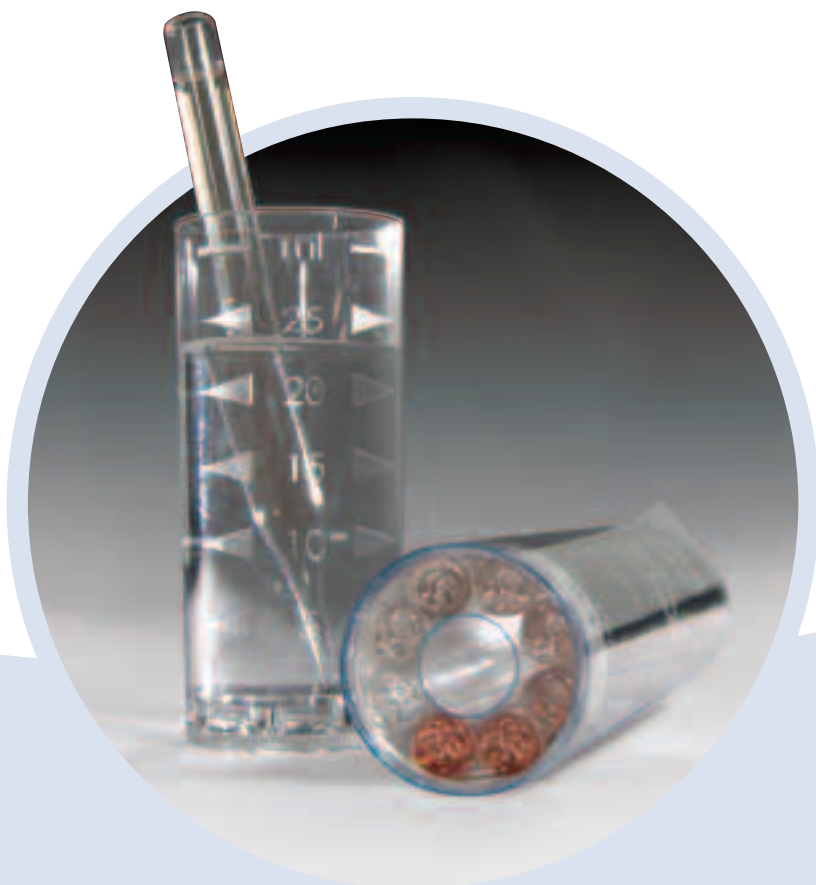
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

<b>Range: 0-50 ppm</b> MDL: 1 ppm / Method: PDMAB	
<b>VACUettes Kit</b>	<b>K-5005B</b>
VACUettes Refill, 30 ampoules	R-5005B
Comparator 0, 1, 3, 5, 7, 10, 30, 50 ppm	C-5005B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.	

<b>Range: 0-500 ppm</b> MDL: 10 ppm / Method: PDMAB	
<b>VACUettes Kit</b>	<b>K-5005C</b>
VACUettes Refill, 30 ampoules	R-5005C
Comparator 0, 10, 30, 50, 70, 100, 300, 500 ppm	C-5005C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.	



## Methods

Hydrogen peroxide is a strong oxidizing agent with a variety of uses. Applications include the treating of industrial effluents and domestic waste and serving as a disinfectant in aseptic packaging.

For the food and beverage industry, CHEMetrics Hydrogen Peroxide CHEMets® and Vacu-vials® products are used extensively to monitor sterilization solutions in the packaging and sanitizing processes.

### The Ferric Thiocyanate Method

Reference: D. F. Boltz and J. A. Howell, eds., *Colorimetric Determination of Nonmetals*, 2<sup>nd</sup> ed., Vol. 8, p. 304 (1978).

The ferric thiocyanate method consists of ammonium thiocyanate and ferrous iron in acid solution. Hydrogen peroxide oxidizes ferrous iron to the ferric state, resulting in the formation of a red thiocyanate complex. Chlorine will not interfere with this method. Ferric iron will interfere. Results are expressed as ppm (mg/L) H<sub>2</sub>O<sub>2</sub>.

### The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl G (2005). D.F. Boltz and J.A. Howell, eds., *Colorimetric Determination of Nonmetals* 2<sup>nd</sup> ed., Vol. 8, p. 303 (1978).

With the DPD Method, hydrogen peroxide reacts with DPD (N, N-diethyl-p-phenylenediamine) in the presence of potassium iodide and ammonium molybdate to form a pink product. Results are expressed as ppm (mg/L) H<sub>2</sub>O<sub>2</sub>.

### The Ceric Sulfate Titrimetric Method

Reference: Developed by CHEMetrics, Inc.

CHEMetrics developed a titrimetric method using ceric sulfate as the titrant and ferroin as the end point indicator. A color change from green to orange signals the end of the titration. Results are expressed as percent (%) H<sub>2</sub>O<sub>2</sub>.

### The Ceric Sulfate Go-No-Go Method

Reference: Developed by CHEMetrics, Inc.

Developed for clinical applications where hydrogen peroxide in sterilizing/disinfecting solutions with a MEC (minimum effective concentration) of 6.0 ± 1.0% must be monitored for efficacy. A single, small dose of sample is added to a screw cap vial containing ceric sulfate and the endpoint indicator ferroin.

An immediate color change occurs to signal that the hydrogen peroxide level in the sample is either above or below 6.0%.

## Visual Kits

Range: 0-0.5 ppm MDL: 0.025 ppm / Method: DPD	
<b>CHEMets Kit</b>	<b>Cat#</b>
CHEMets Refill, 30 ampoules	R-5502
Activator Solution Pack, six 10 mL bottles	A-5500 <sup>1</sup>
Activator Solution Pack, six 10 mL bottles	A-5501 <sup>1</sup>
Comparator 0, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.50 ppm	C-5502
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solutions, 25 mL sample cup, instructions, and MSDS.	

Range: 0-1 & 1-10 ppm MDL: 0.05 ppm /Method: Ferric Thiocyanate	
<b>CHEMets Kit</b>	<b>Cat#</b>
CHEMets Refill, 30 ampoules	R-5510
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-5501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-5510
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions, and MSDS.	

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.



**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Ferric Thiocyanate

	Cat#
<b>VACUettes Kit</b>	<b>K-5510D</b>
VACUettes Refill, 30 ampoules	R-5510D
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-5501D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-5510D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Ferric Thiocyanate

	Cat#
<b>VACUettes Kit</b>	<b>K-5510C</b>
VACUettes Refill, 30 ampoules	R-5510C
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-5501C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-5510C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Ferric Thiocyanate

	Cat#
<b>VACUettes Kit</b>	<b>K-5510A</b>
VACUettes Refill, 30 ampoules	R-5510A
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-5501A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-5510A

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 2-20%**  
MDL: 2.0% Method: Ceric Sulfate Titrant with Ferroin Indicator

	Cat#
<b>Titrets Kit</b>	<b>K-5530</b>
Increments: 2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20%	

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, 1.0 mL syringe, titrettor, 50 mL sample cup, instructions, and MSDS.

## Go-No-Go Kit

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Ferric Thiocyanate

	Cat#
<b>VACUettes Kit</b>	<b>K-5510B</b>
VACUettes Refill, 30 ampoules	R-5510B
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-5501B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-5510B

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 6.0% Control Point**  
Method: Ceric Sulfate Titrant with Ferroin Indicator

	Cat#
<b>Go-No-Go Kit</b>	<b>K-5500C</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty 16-mm vials with caps, thirty pipette tips, 100 uL MiniPet<sup>®</sup>, Indicator Solution, instructions, and MSDS.

MiniPet<sup>®</sup> is a registered trademark of Tricontinent Scientific, Inc.



 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 14 for instrumental features)

Range: 0.15-3.00 ppm  
Method: DPD

Vacu-vials Kit	Cat# K-5513
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Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solutions, 25 mL sample cup, ampoule blank, instructions, and MSDS.

Range: V-2000: 0.15-6.00 ppm /Spec: 0.15-4.00 ppm  
Method: Ferric Thiocyanate

Vacu-vials Kit	Cat# K-5543
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Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**SAM Single-Analyte Photometer**

(See page 17 for instrumental features)

Range: 0.15-6.00 ppm  
Method: Ferric Thiocyanate

Hydrogen Peroxide SAM Kit	Cat# I-2016
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Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

K-5543

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.

**Kit Components common to Hydrogen Peroxide**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Titrettor Pack (1 ea)	A-0053
Sample Cup & Cap Pack, 50 mL (6 ea)	A-0058
MiniPet®, 100 µL (1 ea)	A-0170
Pipette Tips Pack, (30 ea)	A-0171

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Iron is present in nature in the form of its oxides, or in combination with silicon or sulfur. The soluble iron content of surface waters rarely exceeds 1 mg/L, while ground waters often contain higher concentrations. The National Secondary Drinking Water Standard for iron is 0.3 mg/L, as iron concentrations in excess of 0.3 mg/L impart a foul taste and cause staining. High concentrations in surface waters can indicate the presence of industrial effluents or runoff.

Iron contamination in oil field brines are typically a result of corrosion processes of iron-containing metallic components and equipment. Accumulation of insoluble iron salts in a brine completion fluid can result in substantial formation damage and can significantly affect the productivity of an oil well. Quantifying total iron in brine is critical.

### The Phenanthroline Method (total & soluble; total & ferrous)

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 3500-Fe B (2005). ASTM D 1068-77, Iron in Water, Test Method A. J.A. Tetlow and A.L. Wilson, "The Absorptiometric Determination of Iron in Boiler Feed-water", *Analyst*. Vol. 89, p. 442 (1964).

With the Phenanthroline Method, ferrous iron reacts with 1,10-phenanthroline to form an orange-colored chelate. To determine total iron, thioglycolic acid solution is added to reduce ferric iron to the ferrous state. The reagent formulation minimizes interferences from various metals. Results are expressed as ppm (mg/L) Fe.

### The PDTS Method (total)

References: G. Frederick Smith Chemical Co., The Iron Reagents, 3<sup>rd</sup> ed., p. 47 (1980). J.A. Tetlow and A.L. Wilson, "The Absorptiometric Determination of Iron in Boiler Feed-water", *Analyst*. Vol. 89, p. 442 (1964).

CHEMetrics' colorimetric method for determining total iron uses thioglycolic acid to dissolve particulate iron and to reduce iron from the ferric to the ferrous state. Ferrous iron then reacts with PDTS (3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine disodium salt) in acid solution to form a purple-colored chelate. Results are expressed as ppm (mg/L) Fe.

### The Ferric Thiocyanate (Iron in Brine)

References: D. F. Boltz and J. A. Howell, eds., *Colorimetric Determination of Nonmetals*, 2<sup>nd</sup> ed., Vol. 8, p. 304 (1978). Carpenter, J.F. "A New Field Method for Determining the Levels of Iron Contamination in Oilfield Completion Brine", *SPE International Symposium* (2004).

The Iron in Brine test employs the ferric thiocyanate chemistry. In an acidic solution, hydrogen peroxide oxidizes ferrous iron. The resulting ferric iron reacts with ammonium thiocyanate forming a red-orange colored thiocyanate complex, in direct proportion to the iron concentration.

Results, expressed in mg/L, can be converted to mg/kg by dividing by the density of the brine.

## Visual Kits

Range: 0-1 & 1-10 ppm  
MDL: 0.05 ppm / Method: Phenanthroline

	Cat#
<b>Iron (total &amp; ferrous) CHEMetrics Kit</b>	<b>K-6210</b>
CHEMetrics Refill, 30 ampoules	R-6201
Activator Solution Pack, six 10 mL bottles	A-6000 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-6001
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-6010
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.	

Range: 0-1 & 1-10 ppm  
MDL: 0.05 ppm / Method: Phenanthroline

	Cat#
<b>Iron (total &amp; soluble) CHEMetrics Kit</b>	<b>K-6010</b>
CHEMetrics Refill, 30 ampoules	R-6001
Activator Solution Pack, six 10 mL bottles	A-6000 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-6001
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-6010
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.	

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Phenanthroline

	Cat#
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>K-6010D</b>
VACUettes Refill, 30 ampoules	R-6001D
Activator Solution Pack, six 10 mL bottles	A-6000 <sup>1</sup>
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-6001D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-6010D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Phenanthroline

	Cat#
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>K-6010C</b>
VACUettes Refill, 30 ampoules	R-6001C
Activator Solution Pack, six 10 mL bottles	A-6000 <sup>1</sup>
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-6001C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-6010C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS.

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Phenanthroline

	Cat#
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>K-6010A</b>
VACUettes Refill, 30 ampoules	R-6001A
Activator Solution Pack, six 10 mL bottles	A-6000 <sup>1</sup>
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-6001A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-6010A

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS.

**Range: 0-100 & 100-1000 mg/L**  
MDL: 5 mg/L / Method: Ferric Thiocyanate

	Cat#
<b>Iron in Brine CHEMets Kit</b>	<b>K-6002</b>
CHEMets Refill, 30 ampoules	R-6002
Acidifier Solution Pack, six 20 mL bottles	A-6001 <sup>1</sup>
Activator Solution Pack, six 20 mL bottles	A-6002 <sup>1</sup>
Low Range Comparator 0, 10, 20, 30, 40, 60, 80, 100 mg/L	C-6002
High Range Comparator 100, 200, 300, 400, 500, 600, 700, 800, 1000 mg/L	C-6012

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, Activator Solution, 50 mL sample cup with cap, 1.0 mL syringe (2 ea), instructions, and MSDS.

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Phenanthroline

	Cat#
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>K-6010B</b>
VACUettes Refill, 30 ampoules	R-6001B
Activator Solution Pack, six 10 mL bottles	A-6000 <sup>1</sup>
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-6001B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-6010B

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS.

**Instructions and MSDS(s) are posted on our website.**  
*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 14 for instrumental features)

Range: 0.10-2.50 ppm

Method: PDTS

Iron (total) Vacu-vials Kit

Cat#  
K-6023

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

Range: 0.20-6.00 ppm

Method: Phenanthroline

Iron (total & ferrous) Vacu-vials Kit

Cat#  
K-6203

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

Range: 0.20-6.00 ppm

Method: Phenanthroline

Iron (total & soluble) Vacu-vials Kit

Cat#  
K-6003

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

Range: 1.0-25.0 ppm

Method: Phenanthroline

Iron (total & soluble) Vacu-vials Kit

Cat#  
K-6013

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

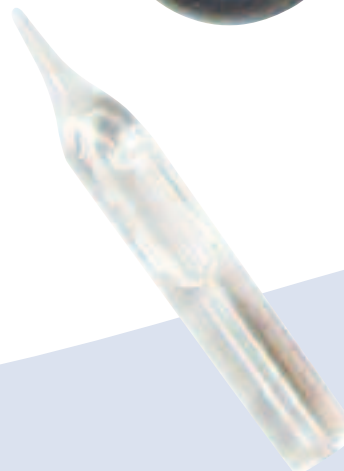
*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**Kit Components common to Iron**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Sample Cup & Cap Pack, 50 mL (6 ea)	A-0058
Sample Cup & Top Pack, 5 mL (6 ea)	A-0105

<sup>1</sup>The accessory pack supplies enough solution to perform at least 100 CHEMet or Vacu-vial tests and 42 VACUette tests. A-6000 Activator Solution is required for total iron analysis only.

*Instructions and MSDS(s) are posted on our website. If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





## Method

Surface and ground waters rarely contain more than 1 mg/L of soluble or suspended manganese. Manganese can act as an oxidizing or a reducing agent depending on its valence state. Manganese is also used in the manufacture of batteries and as an alloying metal in the manufacture of steel and aluminum. The National Secondary Drinking Water Standard for manganese is 0.05 mg/L, as higher concentrations will impart a foul taste to water and discolor laundry and porcelain surfaces.

### The Periodate Method

Reference: APHA Standard Methods, 14<sup>th</sup> ed. Method 314 C (1975).

CHEMetrics' tests employ the periodate chemistry that measures soluble manganese compounds but does not differentiate the various valence states. Results are expressed as ppm (mg/L) Mn.

## Visual Kits

**Range: 0-2 ppm**  
MDL: 0.15 ppm / Method: Periodate

	Cat#
<b>CHEMets Kit</b>	<b>K-6502</b>
CHEMets Refill, 30 ampoules	R-6502
Activator Solution Pack, six 20 mL bottles	A-6500 <sup>1</sup>
Comparator, Shelf-life 1 year: 0, 0.3, 0.6, 0.8, 1.0, 1.5, 1.8, 2.0 ppm	C-6502

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solution, 5 mL sample cup with top, instructions, and MSDS.

**Range: 0-50 ppm**  
MDL: 7.5 ppm / Method: Periodate

	Cat#
<b>VACUettes Kit</b>	<b>K-6502D</b>
VACUettes Refill, 30 ampoules	R-6502D
Activator Solution Pack, six 20 mL bottles	A-6500 <sup>1</sup>
Comparator, Shelf-life 1 year: 0, 7.5, 15, 20, 25, 37.5, 45, 50 ppm	C-6502D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

**Range: 2.0-30.0 ppm**  
Method: Periodate

	Cat#
<b>Vacu-vials Kit</b>	<b>K-6503</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, 1.0 mL syringe, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Manganese

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Sample Cup and Top Pack, 5 mL (6 ea)	A-0105

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Mercaptobenzothiazole (MBT) is formulated with various water treatment products to prevent corrosion of copper and copper-containing metals. These tests are particularly well suited to the monitoring of closed-loop cooling water systems and utility condensers where high MBT concentrations are usually maintained.

### The Permanganate Method

Reference: Developed by CHEMetrics, Inc.

CHEMetrics employs a titrimetric chemistry in which MBT is titrated with potassium permanganate in an acidic medium. No additional end point indicator is required. A color change from pink to straw yellow signals the end of the titration. Results are expressed as ppm (mg/L) MBT.



## Visual Kits

Range: 50-500 ppm  
MDL: 50 ppm Method: Permanganate

Titrets Kit	Cat#
	K-6810

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to MBT

Description	Cat#
Sample Cup Pack , 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Molybdate is used throughout the industrial water treatment and power generation industries as a corrosion inhibitor in both open- and closed-loop cooling water systems. In solution, molybdate anions complex with oxidized iron to form a protective film of molybdate and ferric-oxide. Molybdate is considered an effective, environmentally acceptable alternative to chromate treatment. Unlike many other transition elements, molybdenum exhibits low or even negligible toxicity.

### The Catechol Method

References: G. P. Haight and V. Paragamian, *Analytical Chemistry*, pp. 32, 642 (1960). H. Onishi and E. B. Sandell, *Photometric Determination of Trace Metals*, 4<sup>th</sup> ed., Part 1, p. 295 (1978).

The molybdate test method employs the catechol chemistry. In a mildly reducing alkaline solution, catechol reacts with hexavalent molybdenum to form a yellow-orange colored chelate in direct proportion to the hexavalent molybdenum concentration. Test results are expressed in ppm (mg/L) molybdenum (Mo).



## Visual Kits

Range: 0-7 ppm as Mo MDL: 0.5 ppm / Method: Catechol	
<b>CHEMets Kit</b>	<b>Cat# K-6701</b>
CHEMets Refill, 30 ampoules	R-6702
Comparator 0, 1, 2, 3, 4, 5, 6, 7 ppm	C-6701
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.	

Range: 2-24 ppm as Mo MDL: 2 ppm / Method: Catechol	
<b>CHEMets Kit</b>	<b>Cat# K-6702</b>
CHEMets Refill, 30 ampoules	R-6702
Comparator 2, 4, 6, 8, 10, 12, 16, 20, 24 ppm	C-6702
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.	

Range: 20-200 ppm as Mo MDL: 20 ppm / Method: Catechol	
<b>CHEMets Kit</b>	<b>Cat# K-6720</b>
CHEMets Refill, 30 ampoules	R-6720
Comparator 20, 40, 60, 80, 100, 120, 140, 160, 200 ppm	C-6720
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.	



## Instrumental Kits

V-2000 Multi-Analyte Photometer (See page 14 for instrumental features)	
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Range: 1.0-25.0 ppm as Mo Method: Catechol	
<b>Vacu-vials Kit</b>	<b>Cat# K-6703</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

Kit Components common to Molybdate	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website. If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Nitrate is the most completely oxidized form of nitrogen. It is formed during the final stages of biological decomposition, either in wastewater treatment facilities or in natural water supplies. Low-level nitrate concentrations may be present in natural waters. However, a Maximum Contaminant Level of 10 ppm nitrate-nitrogen has been established for drinking water by the USEPA.

### The Cadmium Reduction Method

References: ASTM D 3867-09, Nitrate-Nitrite in Water, Test Method B. APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-NO<sub>3</sub><sup>-</sup> E (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 353.3 (1983).

Nitrate is reduced to nitrite using cadmium as the reducing agent. The resulting nitrite concentration is then determined colorimetrically. This method is applicable to drinking and surface waters, as well as domestic and industrial wastes. Nitrite will interfere with this test. Results are expressed as ppm (mg/L) NO<sub>3</sub>-N or NO<sub>3</sub>.

### The Zinc Reduction Method

References: ASTM D 3867-09, Nitrate-Nitrite in Water, Test Method B. APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-NO<sub>3</sub>E (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 353.3 (1983). Nelson, J.L., Kurtz, L.T., and R.H. Bray, "Rapid Determination of Nitrates and Nitrites", *Anal. Chem.*, V26, p. 1081-1082, (1954).

Nitrate is reduced to nitrite using zinc as the reducing agent. The resulting nitrate concentration is then determined colorimetrically. This method is applicable to industrial wastewaters, drinking, and surface waters. **These test kits can also be used for the analysis of seawater.** This method will measure nitrate in the presence of low levels of nitrite (by difference). Results are expressed as ppm (mg/L) NO<sub>3</sub>-N.



## Visual Kits

Range: 0-3 ppm as N MDL: 0.25 ppm / Method: Zinc Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6905</b>
CHEMets Refill, 30 ampoules and 30 zinc foil packs, Shelf-life 12 months	R-6905
Acidifier Solution Pack, six 20 mL bottles	A-6901 <sup>1</sup>
Comparator, Shelf-life 12 months 0, 0.25, 0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0 ppm	C-6906
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Acidifier Solution, reaction tube and cap, 25 mL sample cup, instructions, and MSDS.	

Range: 0-3 ppm as N MDL: 0.4 ppm / Method: Cadmium Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6904</b>
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, Shelf-life 12 months	R-6902
Comparator, Shelf-life 12 months 0, 0.4, 0.6, 0.8, 1.0, 1.2, 1.5, 2.0, 3.0 ppm	C-6904
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, reaction tube with cap, instructions, and MSDS.	

Range: 0-30 ppm as N MDL: 4 ppm / Method: Cadmium Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6909D</b>
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, Shelf-life 12 months	R-6904
Comparator, Shelf-life 12 months 0, 4, 6, 8, 10, 12, 15, 20, 30 ppm	C-6909D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 3.0 mL syringe, reaction tube with cap, instructions, and MSDS.	

Range: 0-150 ppm as N MDL: 20 ppm / Method: Cadmium Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6909A</b>
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, Shelf-life 12 months	R-6904
Comparator, Shelf-life 12 months 0, 20, 30, 40, 50, 60, 75, 100, 150 ppm	C-6909A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 1.0 mL syringe, reaction tube with cap, instructions, and MSDS.	

Range: 0-450 ppm as N MDL: 60 ppm / Method: Cadmium Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6909B</b>
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, and 30 pipette tips, Shelf-life 12 months	R-6909
Comparator, Shelf-life 12 months 0, 60, 90, 120, 150, 180, 225, 300, 450 ppm	C-6909B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 100 uL MiniPet <sup>®</sup> , reaction tube with cap, instructions, and MSDS.	

Range: 0-1800 ppm as N MDL: 240 ppm / Method: Cadmium Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6909C</b>
CHEMets Refill, 30 ampoules, 30 cadmium foil packs, and 30 pipette tips, Shelf-life 12 months	R-6909
Comparator, Shelf-life 12 months 0, 240, 360, 480, 600, 720, 900, 1200, 1800 ppm	C-6909C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 25 uL MiniPet <sup>®</sup> , reaction tube with cap, instructions, and MSDS.	

MiniPet<sup>®</sup> is a registered trademark of Tricontinent Scientific, Inc.

 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 14 for instrumental features)

**Range: 0.10-1.00 ppm as N**

**Method: Zinc Reduction**

**Cat#**

**Vacu-vials Kit**, Shelf-life 12 months

**K-6913**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty zinc foil packs, Acidifier Solution, reaction tube and cap, 25 mL sample cup, ampoule blank, instructions, and MSDS.

**Range: 0.20-1.50 ppm as N**

**Method: Cadmium Reduction**

**Cat#**

**Vacu-vials Kit**, Shelf-life 12 months

**K-6903**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, reaction tube with lid, ampoule blank, instructions, and MSDS.

**Range: 0.40-3.00 ppm as N**

**Method: Cadmium Reduction**

**Cat#**

**Vacu-vials Kit**, Shelf-life 12 months

**K-6923**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, reaction tube with lid, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**Range: 5.0-50.0 ppm as NO<sub>3</sub>**

**Method: Cadmium Reduction**

**Cat#**

**Vacu-vials Kit**, Shelf-life 12 months

**K-6933**

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, 3.0 mL syringe, reaction tube with lid, ampoule blank, instructions, and MSDS.

**Kit Components common to Nitrate**

**Description**

**Cat#**

Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
MiniPet®, 100 µL (1 ea)	A-0170
Pipette Tips Pack (30 ea)	A-0171
Reaction Tube Pack, (6 ea)	A-0187
MiniPet®, 25 µL (1 ea)	A-0191

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Nitrite, an intermediate in the nitrogen cycle, is formed during the decomposition of organic matter but readily oxidizes to form nitrate. These processes occur in wastewater treatment plants, water distribution systems, and natural waters. Nitrites are useful as corrosion inhibitors, preservatives, pigments, and in manufacturing many organic preservative chemicals. A Maximum Contaminant Level of 1 mg/L has been established by the USEPA for nitrite-nitrogen in drinking water.

### Azo Dye Formation Method

References: APHA Standard Methods, 21<sup>st</sup>. ed., Method 4500-NO<sub>2</sub><sup>-</sup> B (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 354.1 (1983).

Nitrite diazotizes with a primary aromatic amine in an acidic solution to produce a highly colored azo dye. The intensity of the color is directly proportional to the concentration of nitrite in the sample. Nitrate will not interfere. Results are expressed as ppm (mg/L) NO<sub>2</sub>-N.

### The Ceric Sulfate Titrimetric Method

Reference: Developed by CHEMetrics, Inc.

Ceric sulfate is the titrant and ferroin is the end point indicator. The method is free from glycol interference in samples that contain up to 75% glycol, making it particularly applicable to systems that contain nitrite corrosion inhibitors. Results are expressed as ppm (mg/L) NaNO<sub>2</sub>.



## Visual Kits

**Range: 0-2.2 ppm as N**  
MDL: 0.25 ppm / Method: Azo Dye Formation

	Cat#
<b>CHEMets Kit</b>	<b>K-7004</b>
CHEMets Refill, 30 ampoules, Shelf-life 12 months	R-7002
Comparator, Shelf-life 12 months 0, 0.25, 0.5, 0.75, 1.0, 1.3, 1.6, 1.8, 2.2 ppm	C-7004

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 0-70 ppm as N**  
MDL: 5 ppm / Method: Azo Dye Formation

	Cat#
<b>VACUettes Kit</b>	<b>K-7004D</b>
VACUettes Refill, 30 ampoules, Shelf-life 12 months	R-7002D
Comparator, Shelf-life 12 months 0, 5, 10, 20, 30, 40, 50, 60, 70 ppm	C-7004D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-150 ppm as N**  
MDL: 12.5 ppm / Method: Azo Dye Formation

	Cat#
<b>VACUettes Kit</b>	<b>K-7004A</b>
VACUettes Refill, 30 ampoules, Shelf-life 12 months	R-7002A
Comparator, Shelf-life 12 months 0, 12.5, 25, 40, 70, 90, 110, 130, 150 ppm	C-7004A

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-260 ppm as N**  
MDL: 25 ppm / Method: Azo Dye Formation

	Cat#
<b>VACUettes Kit</b>	<b>K-7004B</b>
VACUettes Refill, 30 ampoules, Shelf-life 12 months	R-7002B
Comparator, Shelf-life 12 months 0, 25, 50, 90, 110, 150, 180, 220, 260 ppm	C-7004B

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.

 Instrumental Kits

**Range: 0-2600 ppm as N**  
MDL: 250 ppm / Method: Azo Dye Formation

<b>VACUettes Kit</b>	<b>Cat#</b> K-7004C
VACUettes Refill, 30 ampoules, Shelf-life 12 months	R-7002C
Comparator, Shelf-life 12 months 0, 250, 500, 900, 1300, 1700, 1900, 2200, 2600 ppm	C-7004C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 250-2500 ppm as NaNO<sub>2</sub>**  
MDL: 250 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

<b>Titrets Kit</b>	<b>Cat#</b> K-7025
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Increments:  
250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 500-5000 ppm as NaNO<sub>2</sub>**  
MDL: 500 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

<b>Titrets Kit</b>	<b>Cat#</b> K-7050
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Increments:  
500, 550, 600, 650, 700, 750, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, 3500, 5000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

**V-2000 Multi-Analyte Photometer**  
(See page 14 for instrumental features)

**Range: 0.080-0.800 ppm as N**  
Method: Azo Dye Formation

<b>Vacu-vials Kit</b> , Shelf-life 12 months	<b>Cat#</b> K-7003
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Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

Kit Components common to Nitrite	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

The level of dissolved oxygen in natural waters is often a direct indication of quality, since aquatic plants produce oxygen, while microorganisms generally consume it as they feed on pollutants. At low temperatures the solubility of oxygen is increased; during summer, saturation levels can be as low as 4 ppm. Dissolved oxygen (D.O.) is essential for the support of fish and other aquatic life and aids in the natural decomposition of organic matter. Waste treatment plants that employ aerobic digestion must maintain a level of at least 2 ppm dissolved oxygen.

At elevated temperatures, oxygen is highly corrosive to metals, causing *pitting* in ferrous systems such as high-pressure boilers and deep well oil recovery equipment. To prevent costly corrosion damage, the liquids in contact with the metal surfaces must be treated, usually by a combination of physical and chemical means. Deaeration can reduce the dissolved oxygen concentration of boiler feedwater from several ppm to a few ppb. Chemical reducing agents such as hydrazine, DEHA, or sodium sulfite, may be used instead of or in conjunction with deaeration.

### The Indigo Carmine Method

References: ASTM D 888-87, Colorimetric Indigo Carmine, Test Method A. Gilbert, T. W., Behymer, T. D., Castañeda, H. B., "Determination of Dissolved Oxygen in Natural and Wastewaters," *American Laboratory*, March 1982, pp. 119-134.

Test kits for environmental and drinking water applications (ppm range) employ the indigo carmine method. The reduced form of indigo carmine reacts with D.O. to form a blue product. The indigo carmine methodology is not subject to interferences from temperature, salinity, or dissolved gases such as sulfide, which plague users of D.O. meters. Results are expressed as ppm (mg/L) O<sub>2</sub>.

### The Rhodazine D™ Method

References: Developed by CHEMetrics, Inc. ASTM Power Plant Manual, 1<sup>st</sup>. ed. p. 169 (1984). ASTM D 5543-09, Low Level Dissolved Oxygen in Water. Department of the Navy, Final Report of NAVSECPHI-LADIV Project A-1598, Evaluation of CHEMetrics Feedwater Dissolved Oxygen Test Kit (1975).

Test kits for boiler waters and applications requiring trace levels of D.O. (ppb range) employ the Rhodazine D methodology. Developed by CHEMetrics, Inc., and approved by ASTM as the reference method for ppb D.O. determination, the Rhodazine D compound in reduced form reacts with dissolved oxygen to form a bright pink reaction product. The method is not subject to salinity or dissolved gas interferences. Oxidizing agents, including benzoquinone, can cause high results. Reducing agents such as hydrazine and sulfite do not interfere. Results are expressed as ppm (mg/L) or ppb (µg/L) O<sub>2</sub>.

Low-range dissolved oxygen test kits include a special *sampling tube* (diagram) for use with boiler feedwater. This device allows the user to break the tip of the ampoule in a flowing sample stream in order to preclude error from contamination by atmospheric oxygen.







## Visual Kits

Range: 0-20 ppb MDL: 1 ppb / Method: Rhodazine D	
	<b>Cat#</b>
<b>ULR CHEMets Kit</b>	<b>K-7511</b>
ULR CHEMets Refill, 30 ampoules	R-7511
Comparator 0, 2, 4, 6, 8, 12, 16, 20 ppb	C-7511
Kit comes in a cardboard box and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS.	

Range: 5-180 ppb MDL: 5 ppb / Method: Rhodazine D	
	<b>Cat#</b>
<b>CHEMets Kit</b>	<b>K-7518</b>
CHEMets Refill, 30 ampoules, Shelf-life 12 months	R-7518
Comparator 5, 20, 40, 60, 80, 110, 140, 180 ppb	C-7518
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS.	

Range: 0-40 ppb MDL: 2.5 ppb / Method: Rhodazine D	
	<b>Cat#</b>
<b>CHEMets Kit</b>	<b>K-7540</b>
CHEMets Refill, 30 ampoules	R-7540
Comparator 0, 5, 10, 15, 20, 25, 30, 40 ppb	C-7540
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS.	

Range: 0-1 ppm MDL: 0.025 ppm / Method: Rhodazine D	
	<b>Cat#</b>
<b>CHEMets Kit</b>	<b>K-7501</b>
CHEMets Refill, 30 ampoules	R-7501
Comparator 0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-7501
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, 25 mL sample cup, instructions, and MSDS.	

Range: 0-100 ppb MDL: 5 ppb / Method: Rhodazine D	
	<b>Cat#</b>
<b>CHEMets Kit</b>	<b>K-7599</b>
CHEMets Refill, 30 ampoules	R-7540
Comparator 0, 10, 20, 30, 40, 60, 80, 100 ppb	C-7599
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS.	

Range: 1-12 ppm MDL: 1 ppm / Method: Indigo Carmine	
	<b>Cat#</b>
<b>CHEMets Kit</b>	<b>K-7512</b>
CHEMets Refill, 30 ampoules	R-7512
Comparator 1, 2, 3, 4, 5, 6, 8, 10, 12 ppm	C-7512
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.	

**Instructions and MSDS(s) are posted on our website.**  
*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 14 for instrumental features)

Range: 0.100-1.000 ppm  
Method: Rhodazine D

Vacu-vials Kit	Cat# K-7553
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Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, sampling tube, adhesive mounting clamp, permanent mounting clamp, ampoule blank, instructions, and MSDS.

Range: 0.20-2.00 ppm  
Method: Indigo Carmine

Vacu-vials Kit	Cat# K-7503
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Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, sampling tube, adhesive mounting clamp, permanent mounting clamp, ampoule blank, instructions, and MSDS.

Range: 2.0-15.0 ppm  
Method: Indigo Carmine

Vacu-vials Kit	Cat# K-7513
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Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**SAM Single-Analyte Photometers**

(See page 17 for instrumental features)

Range: 2.0-15.0 ppm  
Method: Indigo Carmine

SAM Kit	Cat# I-2002
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Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS. K-7513

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 4 AAA batteries, screwdriver, light shield, and instructions.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

**Kit Components common to Oxygen**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sampling Tube Pack (3 ea)	A-0020
Mounting Clamp Pack, Adhesive (6 ea)	A-0022
Ampoule Blank Pack (5 ea)	A-0023
Mounting Clamp Pack, Permanent (6 ea)	A-0034

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Ozone is a strong oxidizing agent and is used as an alternative to chlorine as a biocide in the disinfection of drinking water. Ozone is used to remove odor, decolorize, and to control algae and other aquatic growths.

Ozone is also used in various disinfectant and sterilization processes in the food & beverage and pharmaceutical industries.

### The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl G (2005).

Potassium iodide is added to the sample before analysis. Ozone reacts with the iodide to liberate iodine. The iodine reacts with DPD (N, N-diethyl-p-phenylenediamine) to form a pink color. Results are expressed as ppm (mg/L) O<sub>3</sub>.

### The Indigo Method

References: Bader H. and J. Hoigne, "Determination of Ozone in Water by the Indigo Method," Water Research Vol. 15, pp. 449-456, 1981. APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-O<sub>3</sub> B (2005).

With the indigo method, indigo trisulfonate reacts instantly and quantitatively with ozone, bleaching the blue color in direct proportion to the amount of ozone present. Malonic acid is included in the ampoule to prevent interference from up to 3 ppm chlorine. Results are expressed as ppm (mg/L) O<sub>3</sub>.

## Visual Kits

Range: 0-0.6 & 0.6-3 ppm  
MDL: 0.025 ppm / Method: DPD

	Cat#
<b>CHEMets Kit</b>	<b>K-7404</b>
CHEMets Refill, 30 ampoules	R-7404
Activator Solution Pack, six 10 mL bottles	A-7400 <sup>1</sup>
Low Range Comparator 0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 ppm	C-7404
High Range Comparator 0.6, 0.8, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0 ppm	C-7405

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.

## Instrumental Kits

**V-2000 Multi-Analyte Photometer**  
(See page 14 for instrumental features)

Range: 0.20-5.00 ppm  
Method: DPD

	Cat#
<b>Vacu-vials Kit</b>	<b>K-7423</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.



<b>Range: 0.30-1.00 ppm</b> Method: Indigo	
	<b>Cat#</b>
<b>Vacu-vials Kit</b> , Shelf-life 6 months	<b>K-7413<sup>2</sup></b>
Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

## SAM Single-Analyte Photometer

*(See page 17 for instrumental features)*

<b>Range: 0.15-0.75 ppm</b> Method: Indigo	
	<b>Cat#</b>
<b>SAM Low Range Photometer (Instrument only)</b>	<b>I-2018</b>
SAM comes in a cardboard box with 4 AAA batteries, screwdriver light shield, and instructions.	
<b>TRACE Vacu-vials Kit (for use with I-2018)</b> , Shelf-life 6 months	<b>K-7463</b>
Kit comes in a cardboard box and contains 86 TRACE Vacu-vials, instructions and MSDS.	
<b>NOTE: K-7463 TRACE Vacu-vials Kit must be purchased separately from I-2018 photometer.</b>	

<b>Range: 0.20-5.00 ppm</b> Method: DPD	
	<b>Cat#</b>
<b>SAM Kit</b>	<b>I-2019</b>
Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.	
	<b>K-7423</b>
SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.	

Kit Components common to Ozone	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Because it is a strong disinfectant, peracetic acid is an excellent sanitizing agent for the food and beverage industry. Peracetic acid is used to disinfect equipment, pasteurizers, tanks, pipelines, evaporators, fillers, and contact surfaces in food processing plants. The pulp and paper industry uses peracetic acid as a delignification and bleaching agent. Peracetic Acid is also coming into use as a biocide in wastewater applications.

### The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983) APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-Cl G (2005).

In the Peracetic Acid DPD test method, the sample is treated with an excess of potassium iodide. Peracetic acid oxidizes the DPD (N, N-diethyl-p-phenylenediamine) to form a pink-colored species that is directly proportional to the peracetic acid concentration in the sample. Results are expressed as ppm (mg/L) peracetic acid.

Various oxidizing agents such as halogens, ozone, ferric ions, and cupric ions will produce high test results. Hydrogen peroxide does not interfere if present at levels comparable to the peracetic acid levels.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.40-5.00 ppm  
Method: DPD

	Cat#
Vacu-vials Kit	K-7913

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### SAM Single-Analyte Photometer

(See page 17 for instrumental features)

Range: 0.40-5.00 ppm  
Method: DPD

	Cat#
SAM Kit	I-2020

Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

K-7913

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.

### Kit Components common to Peracetic Acid

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions and MSDS (s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Visual Kits

Range: 0-1 & 1-5 ppm  
MDL: 0.05 ppm / Method: DPD

	Cat#
CHEMets Kit	K-7904
CHEMets Refill, 30 ampoules	R-7904
Activator Solution Pack, six 10 mL bottles	A-7900 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-7902
High Range Comparator 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm	C-7904

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.

## Method

Potassium permanganate is a very strong oxidizing agent. Its primary use is in the treatment of industrial and domestic water to remove various compounds.

### The Ferrous Ammonium Sulfate Method

Reference: Developed by CHEMetrics, Inc.

The CHEMetrics' permanganate test kit is applicable to monitoring the concentration of permanganate in feed solutions used to treat potable water and wastewaters. The test method employs a titrimetric chemistry in which ferrous ammonium sulfate is the titrant. No additional indicator is required. A color change from colorless to pink signals the end of the test. Results are expressed as percent (%)  $\text{KMnO}_4$ .

## Visual Kits

**Range: 0.3-3%**  
**MDL: 0.30% / Method: Ferrous Ammonium Sulfate**

	Cat#
<b>Titrets Kit</b>	<b>K-7630</b>

Increments:  
 0.30, 0.33, 0.36, 0.39, 0.42, 0.45, 0.48, 0.54, 0.60, 0.75, 0.90, 1.05,  
 1.2, 1.5, 2.1, 3.0 %

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Permanganate

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Persulfate is a strong oxidizer that is commonly used for clarifying swimming pools and spas and for the destruction of a broad range of soil and groundwater contaminants. Sodium persulfate is frequently used for environmental applications.

### The Ferric Thiocyanate Method

Reference: D.F. Boltz and J.A. Howell, eds. *Colorimetric Determination of Nonmetals, 2<sup>nd</sup> Ed., Vol. 8, p. 304 (1978).*

CHEMetrics' persulfate test kit employs the ferric thiocyanate method. In an acidic solution, persulfate oxidizes ferrous iron. The resulting ferric ion reacts with ammonium thiocyanate to form ferric thiocyanate, a red-orange colored complex, in direct proportion to the persulfate concentration. Chlorine does not interfere with this chemistry. Ferric iron, hydrogen peroxide, and ozone will interfere. Results are expressed in ppm (mg/L) sodium persulfate ( $\text{Na}_2\text{S}_2\text{O}_8$ ).

### Visual Kits

Range: 0-7 & 7-70 ppm as  $\text{Na}_2\text{S}_2\text{O}_8$   
MDL: 0.35 ppm / Method: Ferric Thiocyanate

	Cat#
<b>CHEMets Kit</b>	<b>K-7870</b>
CHEMets Refill, 30 ampoules	R-7870
Low Range Comparator 0, 0.7, 1.4, 2.1, 2.8, 4.2, 5.6, 7.0 ppm	C-7807
High Range Comparator 7, 14, 21, 28, 35, 42, 49, 56, 70 ppm	C-7870

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions, and MSDS.

#### Kit Components common to Persulfate

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013

Instructions and MSDS(s) are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

The measurement of pH is one of the most frequently performed water quality determinations. Water softening, precipitation, disinfection, and corrosion control are some of the many operations that depend on the careful measurement and control of pH. CHEMetrics' pH meter is applicable to the monitoring of drinking water, natural water supplies, boiler waters, make-up waters, condensate returns, swimming pools, aquariums, wastewaters, and similar samples.

CHEMetrics' double-junction pH meter was specifically developed for water conditioning and purification applications.

### Method of Operation.

Turn the meter on. Remove the protective cap from the tip of the probe. Dip the probe into the sample and stir the sample gently with the probe until the display stabilizes.

Calibration should be done regularly, typically every day that the meter is used.

## FEATURES

**Range:** -1.00 to 15.00 pH

**Resolution:** 0.01 pH

**Accuracy:**  $\pm 0.01$  pH

**Operating Temperature:** 0 to 50°C (32 to 122°F).

**Power and battery life:** Four 1.5 V alkaline batteries (included). 500 hrs. (approx).

**Pocket-sized:** 6.5" length x 1.5" diameter

**Weight:** 4.5 oz. (135 g)

**Warranty:** 1 year (electrode: 6 months)



## Instruments

**Range:** -1.00-15.00 pH Units

	Cat#
pH Double Junction Meter	I-1000

Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.

### Accessories

Description	Cat#
Electrode for pH Meter	A-0174
pH <i>Singles</i> buffer solution assortment (5 ea), 4.0, 7.0, 10.0, and rinse, Shelf-life 3 months	A-0175
Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)	A-0179

*Instructions are posted on our website.*



### FEATURES

- Accuracy with push-button three-point calibration
- Temperature readout & compensation
- Replaceable electrode
- Waterproof, dustproof
- Error messages; Hold function
  - Auto-shutoff
- For harsh applications!



## Method

Phenol (hydroxybenzene) is the simplest of a group of similar organic chemicals, which includes cresols, xylenols, and catechols. Phenol itself is a common ingredient of disinfectants. In drinking water, low-level phenolic concentrations impart a foul taste and odor, especially upon chlorination. High phenol concentrations can indicate contamination from industrial effluents or waste discharge.

### The 4-Aminoantipyrine Method

References: APHA Standard Methods, 14<sup>th</sup> ed., Method 510 C (1975). ASTM D 1783-01, Phenolic Compounds in Water, Test Method B. USEPA Methods for Chemical Analysis of Water and Wastes, Method 420.1 (1983).

CHEMetrics' phenols kits employ the well-established 4-aminoantipyrine (4-AAP) method. Phenolic compounds react with 4-AAP in alkaline solution in the presence of ferricyanide to produce a red reaction product. Phenol, meta-, and ortho-substituted phenols, and some para-substituted phenols, under proper pH conditions, are detected with this method. The method is applicable to the monitoring of phenolic compounds in wastewater. Results are expressed as ppm (mg/L) phenol.



**Range: 0-1 & 0-12 ppm**  
MDL: 0.05 ppm / Method: 4-Aminoantipyrine

	Cat#
<b>CHEMets Kit</b>	<b>K-8012</b>
CHEMets Refill, 30 ampoules	R-8012
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-8001
High Range Comparator 0, 1, 2, 3, 4, 6, 8, 10, 12 ppm	C-8012
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions and MSDS.	

**Range: 0-30 & 0-350 ppm**  
MDL: 5 ppm / Method: 4-Aminoantipyrine

	Cat#
<b>VACUettes Kit</b>	<b>K-8012D</b>
VACUettes Refill, 30 ampoules	R-8012D
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-8001D
High Range Comparator 0, 30, 75, 100, 150, 200, 250, 300, 350 ppm	C-8012D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

**Range: 0-60 & 0-700 ppm**  
MDL: 10 ppm / Method: 4-Aminoantipyrine

	Cat#
<b>VACUettes Kit</b>	<b>K-8012A</b>
VACUettes Refill, 30 ampoules	R-8012A
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-8001A
High Range Comparator 0, 60, 150, 200, 300, 400, 500, 600, 700 ppm	C-8012A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

**Range: 0-120 & 0-1400 ppm**  
MDL: 20 ppm / Method: 4-Aminoantipyrine

	Cat#
<b>VACUettes Kit</b>	<b>K-8012B</b>
VACUettes Refill, 30 ampoules	R-8012B
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-8001B
High Range Comparator 0, 120, 300, 400, 600, 800, 1000, 1200, 1400 ppm	C-8012B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

**Range: 0-1000 & 0-13000 ppm**  
MDL: 100 ppm / Method: 4-Aminoantipyrine

	Cat#
<b>VACUettes Kit</b>	<b>K-8012C</b>
VACUettes Refill, 30 ampoules	R-8012C
Low Range Comparator 0, 100, 200, 300, 400, 600, 800, 1000 ppm	C-8001C
High Range Comparator 0, 1000, 2000, 3000, 5000, 7000, 9000, 11,000, 13,000 ppm	C-8012C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.	

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

*(See page 14 for instrumental features)*

**Range: 0.40-8.00 ppm**  
**Method: 4-Aminoantipyrine**

**Vacu-vials Kit** **Cat#**  
**K-8003**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

**Range: 1.0-20.0 ppm**  
**Method: 4-Aminoantipyrine**

**Vacu-vials Kit** **Cat#**  
**K-8023**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

**Kit Components common to Phenols**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.  
 If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



*No need to dispense.  
 The ferricyanide powder  
 is right on the tip.*

## Methods

Phosphorus occurs naturally in rock formations in the earth's crust, usually as phosphate. High phosphate concentrations in surface waters may indicate fertilizer runoff, domestic waste discharge, or the presence of industrial effluents or detergents. Although phosphates from these sources are usually poly-phosphates or organically bound, all will degrade to *ortho* or reactive phosphates with time.

Phosphate measurement is used to control scale and corrosion inhibitor levels in boilers and cooling towers. Both methods described below measure reactive phosphate, which will give a positive reaction prior to hydrolysis, and is usually termed *ortho-phosphate*.

### The Vanadomolybdophosphoric Acid Method

References: ASTM D 515-82, Phosphorous in Water, Test Method C. APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-P C (2005).

In test kits employing the vanadomolybdophosphoric acid method, phosphate reacts with ammonium molybdate under acid conditions and in the presence of vanadium to form a yellow-colored product. Results are expressed as ppm (mg/L) PO<sub>4</sub>.

### The Stannous Chloride Method

Reference: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-P D (2005).

Test kits employing this chemistry utilize a stannous chloride reduction. Phosphate reacts with ammonium molybdate and is then reduced by stannous chloride to form a blue complex. Results are expressed as ppm (mg/L) PO<sub>4</sub>.

## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Stannous Chloride

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-8510
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-8501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-8510

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, sample cup top, instructions, and MSDS.

**Range: 2-30 ppm**  
MDL: 2 ppm / Method: Vanadomolybdophosphoric Acid

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-8515
Comparator 2, 4, 6, 8, 10, 15, 20, 30 ppm	C-8530

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 10-150 ppm**  
MDL: 10 ppm / Method: Vanadomolybdophosphoric Acid

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-8515
Comparator 10, 20, 30, 40, 60, 80, 100, 120, 150 ppm	C-8515

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

Range: 0-30 & 30-300 ppm MDL: 5 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510D</b>
VACUettes Refill, 30 ampoules	R-8510D
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-8501D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-8510D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

Range: 0-60 & 60-600 ppm MDL: 10 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510A</b>
VACUettes Refill, 30 ampoules	R-8510A
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-8501A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-8510A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

Range: 0-120 & 120-1200 ppm MDL: 20 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510B</b>
VACUettes Refill, 30 ampoules	R-8510B
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-8501B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-8510B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

Range: 0-1200 & 1200-12,000 ppm MDL: 200 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510C</b>
VACUettes Refill, 30 ampoules	R-8510C
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-8501C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-8510C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	



### Instrumental Kits

#### V-2000 Multi-Analyte Photometer (See page 14 for instrumental features)

Range: V-2000: 0.30-8.00 ppm / Spec: 0.20-5.00 ppm  
Method: Stannous Chloride

Range: V-2000: 0.30-8.00 ppm / Spec: 0.20-5.00 ppm Method: Stannous Chloride	
<b>Vacu-vials Kit</b> , Shelf-life 20 months	<b>Cat# K-8513</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, sample cup top, ampoule blank, instructions, and MSDS.	

Range: 5.0-80.0 ppm  
Method: Vanadomolybdophosphoric Acid

Range: 5.0-80.0 ppm Method: Vanadomolybdophosphoric Acid	
<b>Vacu-vials Kit</b>	<b>Cat# K-8503</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Phosphate

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Method

Phosphorous occurs in natural waters and wastewaters mainly as phosphates and is widely distributed in the environment as orthophosphates, condensed phosphates (pyro-, meta- and other polyphosphates), and organically-bound phosphates. Sources of phosphate include surface-applied fertilizers, commercial cleaning preparations, boiler water conditioners, and drinking water treatment chemicals. Phosphorous is an essential nutrient for the growth of organisms. However, discharge of wastewater containing high levels of phosphate may cause excessive algae growth which causes taste and odor problems in drinking water supplies and oxygen depletion and death of aquatic organisms in surface water. Therefore, control and monitoring of phosphate concentrations in wastewater are critical.

### The Persulfate Digestion-Ascorbic Acid Method

References: APHA Standard Methods, 21st ed. Method 4500-P B.5&E (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Methods 365.2 and 365.4 (1983). Murphy, J., and Riley, J.P., "A Modified Single Solution Method for the Determination of Phosphate in Natural Waters", Anal. Chim. Acta., Vol. 27 pp 31-36 (1962).

The Total Phosphate Vials measure those forms of phosphate that are converted to orthophosphate during an acid oxidation digestion. This includes many organically bound and condensed phosphates. Once converted to orthophosphate, the reaction with molybdate in acidic solution produces phosphomolybdic acid, which is reduced by ascorbic acid to a blue complex. Results are expressed as ppm (mg/L) P or PO<sub>4</sub>.



## V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: V-2000: 0-2.30 as P / 0 – 7.00 ppm as PO<sub>4</sub>  
 Method: Ascorbic Acid

	Cat#
Total Phosphate Vials Kit, shelf-life: 12 months	K-8540
Kit comes in a cardboard box and contains everything needed to perform 50 tests: 50 ampoules sets, Oxidizer Powder, Neutralizer Solution, Stabilizer Solution, Activator Powder, Oxidizer Powder Dispenser Cap, 3 mL syringe with tip, tip breaking tool, funnel, instructions and MSDS.	

All Total Phosphate Kits require the use of a Digester Block and the V-2000 Photometer, or a spectrophotometer capable of accepting a 16 mm round cell. Instruments sold separately.

Kit Components common to Total Phosphate	
Description	Cat#
Digester Block (115/230 Volt, 12 Cells)	A-0111
Phosphate Standard, 250 ppm as P (125 mL), Shelf-life 12 months	A-8577

Instructions and MSDS(s) are posted on our website.  
 If no shelf-life is listed for a product, then the shelf-life is at least 2 years.



## Method

QACs are known for their bactericidal and disinfecting qualities. They are used extensively throughout the healthcare and food processing industries to sanitize, deodorize, and disinfect surfaces and equipment. QACs are also routinely formulated with various water treatments to inhibit algal growth in cooling towers, humidifiers, and swimming pools.

### The Polyvinyl Sulfate Method

References: Wang, L. K., Shuster, W. W., "Polyelectrolyte Determination at Low Concentration," *Ind. Eng. Chem., Prod. Res. Dev.*, Vol. 14, No. 4, 1975, pp. 312-314. Parazak, D. P., Burkhardt, C. W., McCarthy, K. J., "Determination of Low Levels of Cationic Polyelectrolytes in Water," *Analytical Chemistry*, Vol. 59, No. 10, May 15, 1987, pp. 1444-1445.

These tests are applicable to the monitoring of QACs in cleaning solutions and cooling waters. CHEMetrics employs a titrimetric chemistry in which stabilized polyvinyl sulfate is the titrant and toluidene blue is the end point indicator.

A color change from pink to blue signals the end of the titration. Results are expressed as ppm (mg/L) QAC.

## Visual Kits

Range: 100-1000 ppm MDL: 100 ppm / Method: Polyvinyl Sulfate	
<b>Titrets Kit</b>	<b>Cat# K-8810</b>
Increments: 100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm	
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.	

Range: 2000-20,000 ppm MDL: 2000 ppm / Method: Polyvinyl Sulfate	
<b>Titrets Kit</b>	<b>Cat# K-8820</b>
Increments: 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3600, 4000, 5000, 6000, 7000, 8000, 10,000, 14,000, 20,000 ppm	
Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.	

Kit Components common to QACs	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Syringe Pack, 1.0 mL (6 ea)	A-0027
Titrettor Pack (1 ea)	A-0053

Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.



## Method

Silica (SiO<sub>2</sub>) is the oxide of silicon, the second most abundant element in the earth's crust. Silica is present as silicates in most natural waters. Typical concentrations lie between 1 and 30 mg/L. Higher concentrations may exist in brackish waters and brines. The silica content of water should be determined prior to its use in a variety of industrial applications. Silica can form a harmful scale on equipment and heat transfer surfaces, particularly steam turbine blades.

### The Heteropoly Blue Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-SiO<sub>2</sub> D (2005). ASTM D 859-05, Silica in Water. USEPA Methods for Chemical Analysis of Water and Wastes, Method 370.1 (1983).

CHEMetrics' test method determines *molybdate reactive silica*. The heteropoly blue chemistry is employed. Silica reacts with ammonium molybdate under acidic conditions to produce heteropoly acids, which are then reduced to form a blue color. Phosphate interferences are masked with the addition of citric acid. Results are expressed as ppm (mg/L) SiO<sub>2</sub>.



## Visual Kits

Range: 0-0.20 ppm  
MDL: 0.02 ppm / Method: Heteropoly Blue

	Cat#
<b>ULR CHEMetrics Kit</b>	<b>K-9011</b>
ULR CHEMetrics Refill, 30 ampoules, Shelf-life 2 months	R-9011 <sup>2</sup>
Neutralizer Solution Pack, six 10 mL bottles	A-9000 <sup>1</sup>
Activator Solution Pack, six 20 mL bottles	A-9001 <sup>1</sup>
Comparator 0, 0.02, 0.04, 0.06, 0.08, 0.12, 0.16, 0.20 ppm	C-9011

Kit comes in a cardboard box and contains everything needed to perform 30 tests: Refill, Comparator, Neutralizer Solution, Activator Solution, 25 mL sample cup, sample cup top, instructions, and MSDS.

Range: 0-1 & 1-10 ppm  
MDL: 0.05 ppm / Method: Heteropoly Blue

	Cat#
<b>CHEMetrics Kit</b>	<b>K-9010</b>
CHEMetrics Refill, 30 ampoules, Shelf-life 11 months	R-9010 <sup>2</sup>
Neutralizer Solution Pack, six 10 mL bottles	A-9000 <sup>1</sup>
Activator Solution Pack, six 20 mL bottles	A-9001 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-9001
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-9010

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, Activator Solution, 25 mL sample cup, sample cup top, instructions, and MSDS.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: V-2000: 0.50-10.00 ppm / Spec: 0.25-4.00 ppm  
Method: Heteropoly Blue

	Cat#
<b>Vacu-vials Kit</b>	<b>K-9003</b>

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, Activator Solution, 25 mL sample cup, sample cup top, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Silica

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Ampoule Blank Pack (5 ea)	A-0023

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>Shelf-life is based on storage at room temperature and in the dark. This shelf-life can be extended by 18 months if the ampoules are stored in the refrigerator when not in use.

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Sulfate is present at widely varying concentrations in natural waters. The USEPA has established a Secondary Drinking Water Standard of 250 mg/L for sulfate in potable water, as higher concentrations affect odor and taste. Sulfate levels are also measured in the beverage industry due to its effect on odor and taste. Sulfate levels must be monitored in cooling water and ion exchange systems in order to prevent calcium sulfate scale formation.

### The Turbidimetric Method

References: APHA Standard Methods, 15<sup>th</sup> ed., Method 426 C (1980). USEPA Methods for Chemical Analysis of Water and Wastes, Method 375.4 (1983). ASTM D 516-07, Sulfate Ion in Water.

The Sulfate Vacu-vials<sup>®</sup> test kit employs the turbidimetric method. Sulfate ion reacts with barium chloride in an acidic solution to form a suspension of barium sulfate crystals of uniform size. The resulting turbidity is proportional to the sulfate concentration of the sample. Results are expressed as ppm (mg/L) SO<sub>4</sub>.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 8.0-100.0 ppm  
Method: Turbidimetric

	Cat#
Vacu-vials Kit	K-9203

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, Activator Powder, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Component common to Sulfate

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





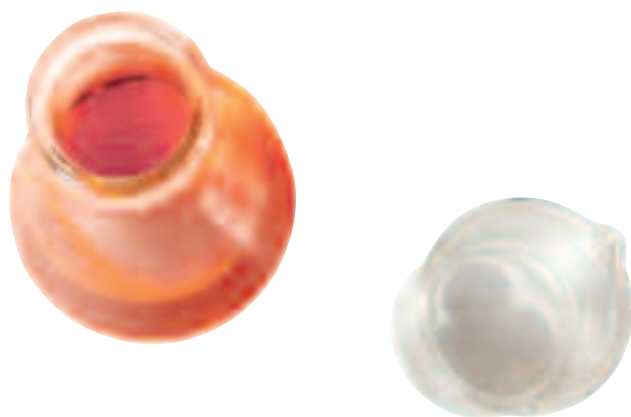
## Method

Sulfides are naturally present in ground waters as a result of leaching from sulfur-containing mineral deposits. Surface waters do not usually contain high sulfide concentrations. Sulfides result from the decomposition of organic matter, from bacterial sulfate reduction under anaerobic conditions and from various chemical processes.

### The Methylene Blue Method

**References:** USEPA Methods for Chemical Analysis of Water and Wastes, Method 376.2 (1983). APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-S<sup>2</sup>-D (2005).

CHEMetrics test kits measure total acid soluble sulfides (including hydrogen sulfide) and employ the methylene blue methodology. Sulfides react with dimethyl-p-phenylenediamine in the presence of ferric chloride to produce methylene blue. Results are expressed as ppm (mg/L) S.



## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Methylene Blue

	Cat#
<b>CHEMets Kit</b>	<b>K-9510</b>
CHEMets Refill, 30 ampoules	R-9510
Activator Solution Pack, six 10 mL bottles	A-9500 <sup>1</sup>
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-9501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-9510
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.	

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Methylene Blue

	Cat#
<b>VACUettes Kit</b>	<b>K-9510D</b>
VACUettes Refill, 30 ampoules	R-9510D
Activator Solution Pack, six 10 mL bottles	A-9500 <sup>1</sup>
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-9501D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-9510D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Methylene Blue

	Cat#
<b>VACUettes Kit</b>	<b>K-9510A</b>
VACUettes Refill, 30 ampoules	R-9510A
Activator Solution Pack, six 10 mL bottles	A-9500 <sup>1</sup>
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-9501A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-9510A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

 Instrumental Kits

Range: 0-120 & 120-1200 ppm MDL: 20 ppm / Method: Methylene Blue	
<b>VACUettes Kit</b>	<b>Cat# K-9510B</b>
VACUettes Refill, 30 ampoules	R-9510B
Activator Solution Pack, six 10 mL bottles	A-9500 <sup>1</sup>
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-9501B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-9510B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

Range: 0-1200 & 1200-12,000 ppm MDL: 200 ppm / Method: Methylene Blue	
<b>VACUettes Kit</b>	<b>Cat# K-9510C</b>
VACUettes Refill, 30 ampoules	R-9510C
Activator Solution Pack, six 10 mL bottles	A-9500 <sup>1</sup>
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-9501C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-9510C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS.	

**V-2000 Multi-Analyte Photometer**  
(See page 14 for instrumental features)

Range: V-2000: 0.20-3.00 ppm / Spec: 0.10-1.00 ppm Method: Methylene Blue	
<b>Vacu-vials Kit</b>	<b>Cat# K-9503</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

Range: 0.60-6.00 ppm Method: Methylene Blue	
<b>Vacu-vials Kit</b>	<b>Cat# K-9523</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

Kit Components common to Sulfide	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Sulfite is not usually present in surface waters. If sulfite is discharged in effluents or from domestic wastewaters, it readily oxidizes to form sulfate. Sodium sulfite is the most common form of sulfite and is an excellent reducing agent with applications as an oxygen scavenger. Sulfite concentrations in boiler and process waters must be monitored routinely to avoid overtreatment. Waste treatment plants that use sulfur dioxide to remove excess chlorine must monitor their effluents for sulfite.

Sulfites have been used for centuries to sanitize and preserve foods. They are used worldwide in the wine industry as antioxidant and antimicrobial agents. However, sulfites have been identified as causative agents in certain allergic reactions suffered by asthmatics. As a result, the FDA and the Bureau of Alcohol, Tobacco, and Firearms have mandated that sulfites in foods and beverages, at levels of 10 ppm or higher, be identified on the label.

### The Iodometric Method (Sulfite)

References: ASTM D 1339-84, Sulfite Ion in Water, Test Method C. APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-SO<sub>3</sub><sup>2-</sup>-B (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 377.1 (1983).

CHEMetrics' sulfite test kits employ the iodometric chemistry in which sulfite is titrated with iodide-iodate titrant in an acid solution using a starch indicator. Thiosulfate will titrate as sulfite. Results are expressed as ppm (mg/L) SO<sub>3</sub>.

### The Ripper Method (Sulfite in Wine)

References: ASTM D 1339-84, Sulfite Ion in Water, Test Method C. APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-SO<sub>3</sub><sup>2-</sup>-B (2005). USEPA Methods for Chemical Analysis of Water and Wastes, Method 377.1 (1983).

CHEMetrics' sulfite test kit is based on the *Ripper* method, which the wine industry has used for years as a standard for rapid sulfite analysis. Sulfite is titrated with an iodide-iodate solution, using a starch end point indicator. Phosphoric acid is used to adjust the pH of the sample. Results are quantified using direct-reading titration cells. The test determines free sulfite as ppm (mg/L) SO<sub>2</sub>.

Results for this test kit are acceptable for dry white wines (although they can have an error of up to 10 ppm). ***This test kit is not recommended for use with red wines or white wines containing ascorbic acid or tannin. These wines often give false high test results.***

## Visual Kits

**Range: 2-20 ppm as SO<sub>3</sub>**  
MDL: 2.0 ppm / Method: Iodometric

**Sulfite Titrets Kit** Cat#  
K-9602

Increments:  
2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 5-50 ppm as SO<sub>3</sub>**  
MDL: 5.0 ppm / Method: Iodometric

**Sulfite Titrets Kit** Cat#  
K-9605

Increments:  
5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 10-100 ppm as SO<sub>3</sub>**  
MDL: 10 ppm / Method: Iodometric

**Sulfite Titrets Kit** Cat#  
K-9610

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 50-500 ppm as SO<sub>3</sub>**  
MDL: 50 ppm / Method: Iodometric

**Sulfite Titrets Kit** Cat#  
K-9650

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 10-100 ppm as SO<sub>2</sub>  
 MDL: 10 ppm / Method: Ripper

**Sulfite in Wine Titrets Kit** Cat#  
K-9610W

Increments:  
 10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 10 tests: ten ampoules, ten valve assemblies, instructions, and MSDS.

**Kit Components common to Sulfite**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

Thiosulfate is an excellent reducing agent. It is used primarily as an *antichlor* or chlorine-removing agent in various chemical processes, including the bleaching of pulp, paper, and textiles.

### The Iodometric Method

Reference: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-SO<sub>3</sub><sup>2-</sup>-B (2005).

CHEMetrics' method employs the iodometric chemistry. Although sulfite usually titrates as thiosulfate, the reagent has been formulated to inhibit high-level sulfite interferences. Thiosulfate is titrated with iodide-iodate titrant in acid solution using a starch indicator. Results are expressed as ppm (mg/L) S<sub>2</sub>O<sub>3</sub>.

## Visual Kits

Range: 5-50 ppm  
MDL: 5.0 ppm / Method: Iodometric

Titrets Kit	Cat# K-9705
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Increments:  
5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0,  
25.0, 35.0, 50.0 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solutions, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Thiosulfate

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Titrettor Pack (1 ea)	A-0053

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

In industrial water systems, it is important to accurately measure and control the amount of dissolved solids present, as they can form deposits on the system components and decrease overall system efficiency. The National Secondary Drinking Water Standard for TDS is 500 mg/L.

### Method of Operation.

To operate the CHEMetrics Total Dissolved Solids (TDS) Meter (Cat. No. I-1100), switch unit on, remove the electrode cap, immerse the probe into the sample, making sure that the sensor is fully covered. Wait for the readings to stabilize (Automatic Temperature compensation corrects for temperature changes). Take measurement. To clean the probe, simply rinse it in tap water. Tester is factory calibrated. However, to ensure accuracy, calibrate the TDS meter on a regular basis.

## FEATURES

**Range:** 0 - 2000 ppm and 0-10 ppt.

**Resolution:** 10 ppm; 0.10 ppt.

**Accuracy:** ± 1% full scale.

**Calibration Type:** Manual

**Operating Temperature:** 0 to 50°C (32 to 122°F).

**Power and battery life:** Four 1.5 V alkaline batteries (supplied). 100 hrs. continuous use (approx.).

**Pocket-sized:** 6.5" length x 1.5" diameter

**Weight:** 3.25 oz.(90 g)

### FEATURES

- Replaceable electrode
- Waterproof, dustproof
- Push-button calibration
- Automatic temperature compensation (ATC)
- Auto-shutoff



**Range: 0-2000 ppm and 0-10 ppt**

	Cat#
Total Dissolved Solids (TDS) Meter	I-1100

Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.

### Accessories

Description	Cat#
Electrode for TDS and Conductivity	A-0176
Conductivity/TDS <i>Singles</i> (20 ea), 1413 μS, Shelf-life 3 months	A-0178
Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)	A-0179

*Instructions are posted on our website.*



## Method

Detection of total petroleum hydrocarbons (TPH) in soil can indicate contamination from leaking underground storage tanks (USTs), petroleum refineries, or other fuel sources.

### The Friedel Crafts Method

References: U.S. Patent #5,834,655. U.S. Patent #4,992,379. EPO Application #94 302 944. Roberts, R. M. and Khalaf, A. A., Friedel Crafts Alkylation Chemistry: A Century of Discovery, Marcel Dekker, Inc., NY, (1984). Schmid, George H., Organic Chemistry, Mosby-Yearbook, Inc., QD251.2S354, p. 935 (1996).

The RemediAid™ Total Petroleum Hydrocarbon Test is a rapid, simple field test for measuring aromatic petroleum hydrocarbon contamination in soil. The patented test is based upon the Friedel-Crafts Reaction with one fundamental difference—the intermediate that is formed in the solvent is the colored species that is measured.

The RemediAid Test determines TPH across a wide range of soil types and petroleum products. RemediAid allows the user to analyze for specific fractions, including: BTEX, PAH, diesel fuel, leaded and unleaded gasoline, brent crude, and lubricating oil.

In the test method, a pre-measured sample of soil is added to a reaction tube that contains anhydrous sodium sulfate, a drying agent. A pre-measured volume of dichloromethane is then added to the reaction tube. This organic solvent extracts the petroleum hydrocarbons from the soil sample. In order to remove polar hydrocarbons and color interferences, the soil extract is treated with Florisil. Finally, a vacuum-sealed ampoule, containing aluminum chloride, draws in a predetermined volume of the hydrocarbon-containing solvent. The hydrocarbons in the solvent react with the aluminum chloride to produce a soluble colored product directly proportional to the petroleum hydrocarbon concentration in the sample. The absorbance of the sample is measured in a portable, battery-powered, LED-based colorimeter and converted to mg/kg hydrocarbon in the soil by use of a formula.

## Instrumental Kit

### Ranges<sup>1</sup>:

Unleaded Gasoline: 80-600 mg/kg

Diesel: 60-400 mg/kg

Brent Crude: 40-400 mg/kg

Lube Oil: 120-1000 mg/kg

BTEX: 16-140 mg/kg

Leaded Gasoline: 80-520 mg/kg

PAH (16 component mixture): 8-60 mg/kg

Method: Friedel Crafts

	Cat#
RemediAid (TPH) Starter Kit (No Consumables)	I-9312

RemediAid (TPH) Starter Kit comes in a plastic case and contains TPH Photometer, pocket scale, 3-channel timer, TPH reaction tube plug/snapper, tip-breaking tool, 4 AAA batteries, screwdriver, and instruction booklet.

RemediAid (TPH) Refill (for use with I-9312)	R-9310
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Refill comes in a cardboard box and contains 16 tests, two 30 g bottles of sodium sulfate, reagent blank ampoule, and MSDS.

**NOTE:** R-9310 TPH Refill must be purchased separately from I-9312.

### Kit Components common to TPH

Description	Cat#
Tip Breaking Tool (5 ea)	A-0079
Reagent Blank Ampoule Pack (2 ea)	A-0161
Sodium Sulfate, two 30 g bottles	A-0162 <sup>2</sup>
TPH Reaction Tube Plug/Snapper (1 ea)	A-0168

<sup>1</sup>Expected dynamic range of the test in soil sample matrix (The instructions include dilution procedures, if an extended range is required.).

<sup>2</sup>Consumption of this accessory is solely dependent on the moisture content of the soil being tested. If the soil being tested has a moisture content above 10%, the bottle of sodium sulfate will be depleted after approximately 8 tests.

*Instructions and MSDS(s) are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Method

Designed for portability and durability, the waterproof CHEMetrics Turbidity Meter is ideal for monitoring turbidity of water in chemical, food, and industrial applications. The microprocessor-based turbidity meter uses an infrared LED light source and delivers unprecedented repeatability and accuracy while offering resolution as low as 0.01 NTU. This light-weight meter is a valuable analytical tool for field-testing and quality control.

### Method of Operation.

The turbidity meter is equipped with an infrared LED as its source of light and meets all testing requirements of ISO-7027 (DIN EN 27027) method (Nephelometric Turbidity Units). The wavelength peaks at 850 nm, which provides the required intensity of diffused light even in samples with low turbidity values and also reduces interference from any colors.

The meter determines the sample turbidity level and automatically adjusts to the appropriate measurement range (0-1000 NTU), eliminating guesswork. Pressing the CAL button initiates the quick and simple calibration procedure. The instrument automatically prompts the user for the next calibration standard. The meter comes with four primary calibration standards (0.02, 20.0, 100, and 800 NTU). The meter also comes with three borosilicate sample cuvettes with light-shield caps.

## FEATURES

**Measurement Range:** 0 to 1000 NTU.

**Automatic Range Selection:** 0.01-19.99 NTU, 20.0-99.9 NTU, 100-1000 NTU.

**Resolution:** 0.01 NTU (0-19.99 NTU), 0.1 NTU (20.0-99.9 NTU), 1 NTU (100-1000 NTU).

**Accuracy:**  $\pm 2\%$  of measurement  $\pm 1$  LSD for 0 to 500 NTU,  $\pm 3\%$  of measurement  $\pm 1$  LSD for 501 to 1000 NTU.

**Light Source:** Infrared-emitting diode (850 nm wavelength).

**Operating Temperature Range:** 32°F to 122°F (0 to 50°C).

**Power Supply:** Four AAA Alkaline batteries (>1200 measurements).

**Dimensions:** 2.7" width x 6.1" length x 1.8" height (6.8 x 15.5 x 4.6 cm)

**Weight:** 7 oz. (200 g)

**Warranty:** 1 year



**Range: 0-1000 NTU**

	Cat#
Turbidity Meter	I-1300

Instrument comes in carrying case with calibration standards, cuvettes, four AAA alkaline batteries, and instructions.

### Accessories

Description	Cat#
Turbidity Calibration Set, Shelf-life 6 months Increments: 0.02, 20.0, 100, and 800 NTU	A-0180
Turbidity Cuvettes Pack (3 ea)	A-0181

Instructions are posted on our website.



### FEATURES

- Waterproof
- Auto-Ranging
- Push-button calibration
- Advanced power-supply management
- Auto-shutoff

Instruments are manufactured and guaranteed by Oakton Instruments, Inc.



## Method

Zinc deposits are present in much of the earth's crust. The metal provides an effective protective coating for steel (galvanized coatings) and is useful as an alloying agent. Zinc salts are useful as corrosion inhibitors in cooling water treatment formulations. The USEPA has established a Maximum Secondary Drinking Water Standard of 5 mg/L for zinc.

### The Zincon Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 3500-Zn B (2005). ASTM D 1691-84, Zinc in Water, Test Method A.

CHEMetrics' method determines soluble zinc in drinking water and wastewater. Zinc reacts with the reagent *zincon* in a buffered alkaline solution to form a blue complex. Interference from other heavy metals can be eliminated by the addition of cyanide. However, for safety, cyanide has not been included in the reagent formulation. Results are expressed as ppm (mg/L) Zn.

Shelf-life: although the reagent in the ampoule is stable, the indicator solution has an eight-month shelf-life. We recommend stocking quantities that will be used within seven months.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 14 for instrumental features)

Range: 0.30-3.00 ppm  
Method: Zincon

	Cat#
Vacu-vials Kit, Shelf-life 8 months	K-9903

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Indicator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

Range: 0.60-6.00 ppm  
Method: Zincon

	Cat#
Vacu-vials Kit, Shelf-life 8 months	K-9923

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Indicator Solution, 25 mL sample cup, ampoule blank, instructions, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately*

### Kit Components common to Zinc

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023

*Instructions and MSDS(s) are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

**To Place an Order** ● Write: CHEMetrics, Inc.  
4295 Catlett Road  
Midland, VA 22728  
Call: 1-800-356-3072  
1-540-788-9026  
Fax: 1-540-788-4856  
E-Mail: [orders@chemetrics.com](mailto:orders@chemetrics.com)  
Web: [www.chemetrics.com](http://www.chemetrics.com)

**E-Mail** ● TECHNICAL SUPPORT: [technical@chemetrics.com](mailto:technical@chemetrics.com)  
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**Hours** ● 8:00 AM to 4:30 PM Eastern Time, Monday through Friday, except holidays.

**Terms** ● Net 30 days from date of shipment, with approved credit. Ex Works Midland, VA. VISA, MasterCard, and American Express accepted.

**Quantity Discounts** ● Quantity discounts off list price are as follows for identical items:

Test Kits, Refills, and Components		V-2000 photometer and SAM photometric kits:	
Quantity	Discount	Quantity	Discount
50-99	10%	5-9	5%
100-199	15%	10-19	10%
200 or more	20%	20 or more	15%

Quantity discounts are not available for the following products: A-0111 COD Digester, I-1000 pH Tester, I-1100 Total Dissolved Solids Tester, I-1200 Conductivity Tester, I-1300 Turbidity Meter, Total Petroleum Hydrocarbons (TPH), A-7300 greenCOD™ recycling program, and ULR CHEMetrics® products.

**Substantially higher discounts are available for large quantity orders. Contact the Marketing Department for details. See Product Price List or Website for Quantity Discount Schedule for COD kits.**

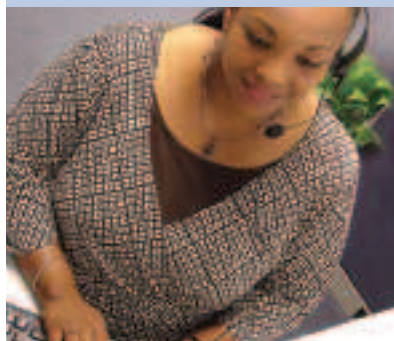
**Shipping** ● In the absence of instructions from the customer, merchandise will be shipped via UPS whenever possible. Freight cost plus \$4.00 handling will be added to the invoice. Claims for transportation damage must be submitted to the common carrier.

**Returns of Merchandise** ● CHEMetrics generally accepts returns of resellable merchandise for credit when such merchandise is returned within 60 days. Products with a shelf-life of less than 1 year may need to be returned within 30 days to be considered "resellable" and receive credit. Customers who wish to return merchandise should call CHEMetrics in advance to obtain authorization. Restocking fees of 20% may be imposed except on instruments returned within 30 days of purchase. Additional fees may be imposed for special handling.

**Warranty** ● CHEMetrics generally warrants its products to be free from defects in materials and workmanship for two years from manufacture, except as follows. Those reagent products that we identify as having shelf-lives shorter than two years are warranted through the expiration dates printed on the merchandise. Instrument products, other than their expendable components, are warranted for one year from receipt by the customer. This warranty does not apply to merchandise improperly stored or handled by a party other than CHEMetrics. Our V-2000 Photometer offers a two-year warranty.

**THIS WARRANTY SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

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are covered by U.S. patents  
3,634,038, 4,332,769, 4,537,747,  
and 4,596,780.

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