



SIMPLICITY IN WATER ANALYSIS



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# PREMIXED PREMEASURED PRECISE



## Why CHEMetrics?

At CHEMetrics, we aim to deliver faster, simpler, safer solutions for your water analysis needs. Traditional methods often require sample and reagent preparation, multiple steps, and cleanup. With 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. CHEMetrics vacuum-sealed products further help you, the analyst, avoid inaccurate results from unstable or expired reagents.

### Safer Testing

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

### Portable, Disposable & Refillable

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

### Our Reputation Is Your Greatest Assurance

CHEMetrics is known for more than quality products. Our reputation is also built on customer service. Expert, prompt, courteous support is always available from our Technical Services and Sales teams. Our rigorous Quality Assurance Program makes certain our products perform as expected. Our innovative Research and Development team continuously develops new products to meet emerging water analysis needs. And we stand 100% behind every aspect of every product and service we deliver.



## Analytical Methods

Alkalinity	18	Detergents (anionic surfactants)	36	Oxygen, dissolved	54
Ammonia	19	Filming Amine (aliphatic amine)	37	Ozone	57
Bromine	21	Formaldehyde	37	Peracetic Acid	58
Carbohydrazide	22	Freshwater Monitoring	38	Persulfate	60
Carbon Dioxide	23	Glycol	38	pH	61
Chemical Oxygen Demand (COD)	24	Hardness	39	Phenols	62
Chloride	26	Hydrazine	40	Phosphate, ortho	64
Chlorine	28	Hydrogen Peroxide	41	Silica	66
Chlorine Dioxide	30	Iron	44	Sulfate	67
Chromate	31	Manganese	47	Sulfide	68
Conductivity	32	Molybdate	48	Sulfite	70
Copper	33	Monochloramine	49	Zinc	72
Cyanide	34	Nitrate	50		
DEHA	35	Nitrite	52		

# World Leaders

Our products are sold worldwide thanks to affiliation with trusted distributors in the following countries:

Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Denmark, Ecuador, Finland, France, Germany, Greece, Hong Kong, Iceland, India, Indonesia, Republic of Ireland, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, New Zealand, Norway, Oman, Peru, Philippines, Portugal, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom, and Vietnam.

Visit our website ([www.chemetrics.com/about-us/export/](http://www.chemetrics.com/about-us/export/)) for distributor information or contact [marketing@chemetrics.com](mailto:marketing@chemetrics.com) to learn more about becoming a distributor.



## Industries & Applications

### POWER GENERATION

CHEMetrics is the worldwide leader in colorimetric, low-level (ppb) 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.

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

### PETRO/CHEMICAL INDUSTRY

CHEMetrics kits are widely used for influent, process water, and waste-water/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.

Ammonia	Dissolved Oxygen	Nitrate
Bromine	Formaldehyde	Nitrite
Carbon Dioxide	Hydrazine	pH
Chloride	Hydrogen Peroxide	Phenols
Chlorine	Iron	Phosphate, ortho
COD	Molybdate	Sulfide

### 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 and groundwater monitoring.

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



# 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.

Ammonia	Dissolved Oxygen	Nitrite
Bromine	Glycol	Ozone
Chloride	Hardness (total)	Peracetic Acid
Chlorine	Iron	Phenols
Chlorine Dioxide	Manganese	Phosphate, ortho
COD	Monochloramine	Sulfate
Detergents	Nitrate	Sulfide

## 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	Hardness
Ammonia	Hydrazine
Bromine	Iron
Carbohydrazide	Molybdate
Chlorine	Nitrate
Conductivity	Nitrite
Cyanide	pH
DEHA	Phenols
Dissolved Oxygen	Phosphate
Filming Amines	Silica
Glycol	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	Dissolved Oxygen	Nitrate
Ammonia	Formaldehyde	Phenols
Chlorine	Glycol	Phosphate
Chromate	Hardness	Sulfide
COD	Hydrogen Peroxide	Sulfate
Copper	Iron	Zinc
Cyanide	Molybdate	

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

## 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	Sulfate
Chlorine Dioxide	Iron	Sulfite
COD	Nitrate	Zinc
Dissolved Oxygen	Nitrite	
Formaldehyde	Ozone	



## 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. Comparator shelf lives are at least 1 year.

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.



## 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 a spectrophotometer

that reads absorbance, the absorbance value can be converted to concentration units with the supplied calibration equation. Also, a calculator to convert spectrophotometer absorbance readings to test results (ppm) for all CHEMetrics instrumental test kits is posted under the

“Support” tab on our website. Direct-reading instruments are available (pages 14-16).

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

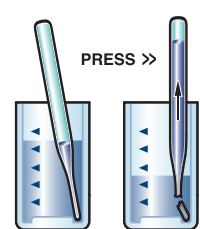


Designed with the same technology as the CHEMets ampoules, the Vacu-vials ampoules are 13 mm in diameter with a tapered, pre-scored tip; color forming reagents are vacuum-sealed inside.

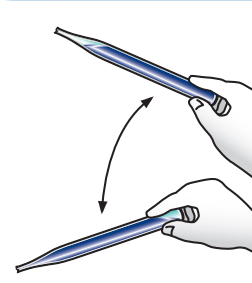


View instructional videos on our website at [www.chemetrics.com](http://www.chemetrics.com)

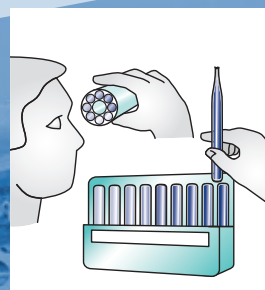
The CHEMets Test Procedure



STEP 1

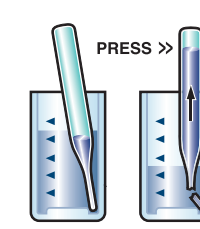


STEP 2

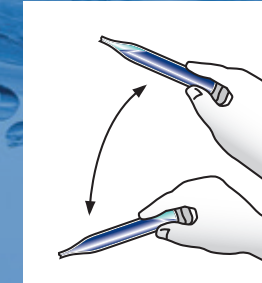


STEP 3

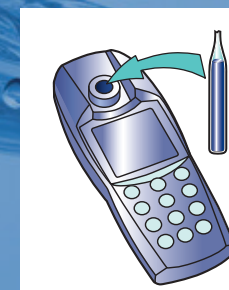
The Vacu-vials Test Procedure



STEP 1



STEP 2



STEP 3

## 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 of 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.

Comparator shelf lives are at least 1 year.



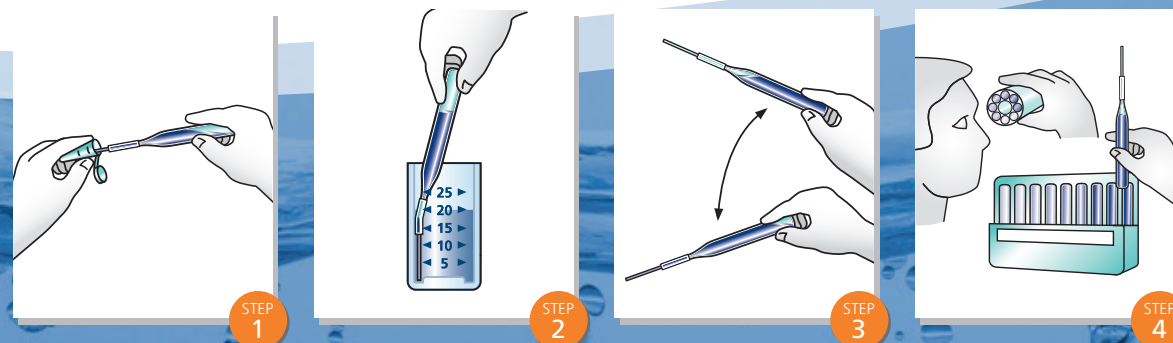
VACUettes ampoules are designed for highly concentrated samples. They employ a patented auto-dilution feature that eliminates the need for a time-consuming and error-prone preliminary dilution. As a result, the entire test typically takes only

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 CHEMetrics 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.

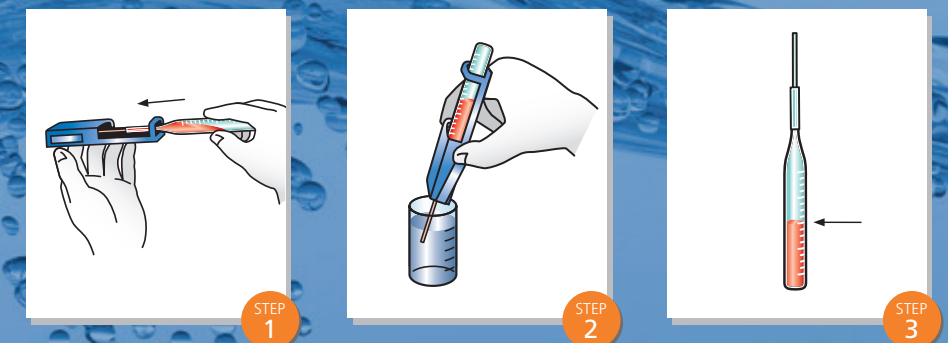


Each Titret ampoule is 13 mm in diameter and is designed for titrimetric analysis. The ampoule contains vacuum-sealed liquid titrant and has a flexible valve assembly attached.



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

The Titrets Test Procedure





◀ **Measuring Dissolved Oxygen in Boiler Water**

CHEMetrics ppb (parts per billion) Dissolved Oxygen CHEMetrics ampoules employ the only method approved by ASTM for detecting trace concentrations of dissolved oxygen in boiler applications. With sensitivity down to 2 ppb, Dissolved Oxygen CHEMetrics ampoules provide power plant operators with a rapid, reliable means to determine ppb levels of dissolved oxygen.

The CHEMetrics ampoules are perfect for use as the primary testing method for dissolved oxygen or to verify readings obtained from online equipment. Easily obtain test results even in low-light conditions using CHEMetrics A-0004 Comparator Light Source (CLS) accessory. **See pages 54-56 for more information.**

**Measuring COD in Municipal and Industrial Labs ▶**

CHEMetrics offers two methods (USEPA-accepted and Mercury-free) for the determination of COD levels in wastewater—at about **30% lower cost than competitive vials**. Our COD Vials can be used with CHEMetrics photometers and with spectrophotometers that accept 16 mm diameter round bottom cells. Furthermore they may be used with Hach® photometers and spectrophotometers without modification of the factory calibrations<sup>1</sup>.

**See pages 24-25 for details.**



**Measuring Ammonia in Wastewater, Surface Water and more...**

Ammonia concentrations are routinely measured in wastewater effluent, drinking water, surface water and seawater. CHEMetrics offers two methods for measuring

Ammonia levels in water, with ranges covering 0.5 ppm to 10,000 ppm. The Nessler reagent (mercury containing) provides test results in two minutes or less. The HBA reagent (hydroxybenzyl alcohol) is mercury-free and provides test results in six minutes or less. Both methods are available in visual and instrumental kit configurations. **Information on our Ammonia kits can be found on pages 19-20.**



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

# Hydrogen Peroxide Testing for the Food & Beverage Industry

CHEMetrics Hydrogen Peroxide test kits are routinely used by operators on packaging lines to monitor the sterilization solution residuals in Extended Shelf Life (ESL) and Aseptic Packaging applications.

The product cartons are sprayed with hydrogen peroxide to pre-sterilize them, then heated to remove the hydrogen peroxide. CHEMetrics Hydrogen Peroxide Kits are used by plant operators to ensure that the critical residual concentration limit of 0.5 ppm specified by the US FDA is not exceeded. The most commonly used Hydrogen Peroxide test kits for Aseptic and ESL packaging applications are shown below.



Catalog No.	Description	Range (PPM)	For More Information
K-5510	Hydrogen Peroxide (visual)	0-0.8 & 1-10 ppm	Page 41
K-5543	Hydrogen Peroxide (instrumental)	0-6.00 PPM	Page 43

**Other products of interest include our Ozone and Peracetic Acid Kits. See pages 57 and 58 for more information on available test kits and ranges.**

## Ozone Testing For Bottled Water

*Instrumental Test Kit offers accuracy, savings and speed.*

- Savings up to 62% over leading brand
- Range matches FDA requirements for bottled water
- Faster & simpler self-zeroing test
- Works with most spectrophotometers



CHEMetrics Ozone Vacu-vials Test Kit (K-7433), employs the broadly accepted indigo method and is designed to enable bottled water producers to quickly and accurately measure ozone residuals between 0 and 0.75 ppm. The self-zeroing feature eliminates the need to generate a reagent blank every time a test is performed. Only one ampoule is needed per test, providing accurate and repeatable test results.

**See page 57 for details.**



## Verifying Performance of CHEMetrics Photometers

### Verification Kits

CHEMetrics Verification Kits allow you to quickly and routinely check the performance of your CHEMetrics photometer on-site without returning the photometer to CHEMetrics. Verification kits employ NIST traceable standard ampoules that contain stable dye solutions. Each kit is packaged in a compact, durable carrying case and includes a Certificate of Conformance that reports the range of permissible test values for each standard ampoule in the kit. Contact [technical@chemetrics.com](mailto:technical@chemetrics.com) for details.



Verification Kit	Applicable for
I-0003	I-2001 Chlorine SAM I-2002 Dissolved Oxygen SAM I-2005 Chlorine Dioxide SAM I-2019 Ozone (DPD) SAM I-2020 Peracetic Acid SAM
I-5543	I-2016 Hydrogen Peroxide SAM V-2000 or V-3000 Photometers (Hydrogen Peroxide program 95 only)
I-7433	I-2022 Ozone (indigo) SAM
V-0002	V-2000 Multi-Analyte Photometer

### Photometer Verification Service

CHEMetrics offers a Photometer Verification Service for verifying the performance of your CHEMetrics photometer. Return your photometer to CHEMetrics for service that includes verification at three check-points across the test range. We will also update the photometer to the current calibration version where applicable and provide a Certificate of Conformance. Please visit [www.chemetrics.com/support](http://www.chemetrics.com/support) for additional details and to download a Return Authorization Form. Email [technical@chemetrics.com](mailto:technical@chemetrics.com) to schedule the return of your photometer to CHEMetrics.

### Analytical Standards

CHEMetrics offers calibration standards for COD (A-7301 and A-7310), peracetic acid (A-7925), and hydrogen peroxide (A-5505). Each stable, certified standard offers the analyst an easy method to confirm the accuracy and reliability of measurements for the specific analytes listed.

## Flexibility and Convenience Use Vacu-vials Kits with Other Instruments

No CHEMetrics photometer? No problem. Vacu-vials Kits can be used in any spectrophotometer capable of accepting a 13 mm diameter round cell. Simply set your spectrophotometer to the absorbance mode, select the wavelength designated in the Vacu-vials kit instructions, and follow the test procedure.

### To convert from absorbance to concentration in ppm...

...use the calibration equation provided in kit instructions. Better yet, use the **Concentration Calculator** found under the "Support" tab on our website.



## NEW! CHEMetrics Sample Zeroing Accessory Packs

Before a photometric instrument can be used to obtain test results, it must be set to zero. A sealed ZERO ampoule is already supplied in CHEMetrics Vacu-vials test kits for use when samples are colorless and clear, but what about when they're colored or turbid? Introducing CHEMetrics' new Sample Zeroing Accessory packs, designed to help the analyst correct for potential errors that may occur when samples are cloudy or colored.



A-0025



A-0503



A-0504

Each Accessory Pack includes 30 vacuum-sealed ampoules or ten test tubes for sample zeroing along with instructions. Refer to the table to determine the appropriate Sample Zeroing Accessory Pack to use with your particular Vacu-vials kit.

### To use our Sample Zeroing Accessory Packs:

- For the A-0025, fill the test tube with the sample to be tested and use in place of the supplied ZERO ampoule.
- For the A-0503 and A-0504, fill the sample cup with the sample to be tested. Snap the tip of the self-filling ampoule in the sample, mix and use in place of the supplied ZERO ampoule.

For colored or turbid samples, use of the Sample Zeroing Accessory Pack provides a marked accuracy improvement over use of the ZERO ampoule supplied in Vacu-vials test kits.

To see our video and learn more, visit [CHEMetrics.com/SZAP](http://CHEMetrics.com/SZAP).

Analyte	Vacu-vials kit Cat. No.	Sample Zeroing Accessory Pack Cat. No.
Ammonia	K-1413	A-0025
	K-1503	A-0503
	K-1523	A-0504
Chloride	K-2103	A-0503 – CHEMetrics Photometers Only
	K-2513	A-0025
Chlorine	K-2523	A-0025
	K-2703	A-0025
Chlorine Dioxide	K-2703	A-0025
Chromate	K-2803	A-0503
Copper	K-3503	A-0503
Cyanide	K-3803	A-0503 – CHEMetrics Photometers Only
DEHA	K-3903	A-0503
Hydrazine	K-5003	A-0503
Hydrogen Peroxide	K-5543	A-0503
	K-6003	A-0503
	K-6023	A-0503
Iron	K-6203	A-0503
	K-6503	A-0503
Manganese	K-6503	A-0503
Molybdate	K-6703	A-0503
Monochloramine	K-6803	A-0025
	K-6903	NOT APPLICABLE
	K-6913	A-0025
Nitrate	K-6923	NOT APPLICABLE
	K-6933	NOT APPLICABLE
	K-7003	A-0025
Nitrite	K-7013	A-0025
	K-7423	A-0025
Ozone	K-7433	NOT APPLICABLE
	K-7513	A-0503
Dissolved Oxygen	K-7553	A-0503
Peracetic Acid	K-7913	A-0025
Phenols	K-8003	A-0503
	K-8023	A-0504
Phosphate	K-8503	A-0503
	K-8513	A-0503
Silica	K-9003	A-0503
Sulfate	K-9203	NOT APPLICABLE
	K-9503	A-0503
Sulfide	K-9523	A-0504
	K-9903	A-0503 – CHEMetrics Photometers Only
Zinc	K-9923	A-0503 – CHEMetrics Photometers Only



## Multi-Analyte Photometers for Water Analysis

CHEMetrics' handheld, portable multi-analyte photometers are rugged and dependable solutions for your water testing needs in the field, the plant, or the laboratory. Intuitive and easy to use, these photometers allow for a quick and easy menu selection of 40+ pre-programmed analytes featuring the convenience of CHEMetrics Vacu-vials "snap and read" self-filling ampoules.

As new tests are available, a simple upload procedure from the CHEMetrics website updates the photometer with the most recent programs. Uploading takes only a few minutes and keeps the V-2000 and V-3000 current. The optional Power LabStation upgrades the portable V-3000 Photometer to a benchtop laboratory instrument.



### Optional Accessories for V-3000

- A-0301** Data Management Software
- A-0302** Power LabStation
- A-0306** 28 mm cell with lid
- A-0307** RS232 to USB Adapter (for V-2000 & V-3000)

### Specifications & Features

Features	V-2000 Photometer	V-3000 Photometer
<b>Instrument Applicability</b>	Portable	Portable / Benchtop
<b>Display</b>	LCD	Graphics / Backlit
<b>Control Auto Shutoff</b>	No	Yes
<b>Power Supply Options</b>	Battery	Battery Rechargeable Battery* Universal Cable / Plug*
<b>Wavelengths (nm)</b>	420, 520, 580, 610	436, 517, 557, 594, 610, 690
<b>Data Interface Software</b>	No	Yes
<b>Cell Size</b>	13 mm, 16 mm	13 mm, 28 mm
<b>Language Selection</b>	No	Yes: English, German, French, Spanish
<b>Web-based Methods Update</b>	Yes	Yes
<b>Waterproof</b>	IP67	IP67
<b>Operating Temperature</b>	0 to 45° C	0 to 50° C
<b>Data Logging</b>	100 points	100 points
<b>Warranty</b>	2 years	2 years

\*Requires purchase of Power LabStation (A-0302)

### CHEMetrics V-0002 Verification Kit to check the performance of CHEMetrics V-2000 Photometer.

See page 12 for more information.

Catalog No.	Product Description
V-2000	Multi-Analyte Photometer
V-0002	V-2000 Verification Kit
V-3000	Multi-Analyte Photometer

**Most kits contain everything needed to perform 30 tests**

**See Specific Analyte Pages for Contents of Individual Kits**

### Multi-Analyte Photometers: V-2000 V-3000

Hard-sided cases available for photometers and reagents

Analyte	Cat. No.	V-2000	V-3000
Ammonia (Hydroxybenzyl Alcohol)	K-1413	0-3.00	0-3.00
Ammonia (Hydroxybenzyl Alcohol)	K-1413	0-60.0	0-60.0
*Ammonia (Direct Nesslerization)	K-1503	0-7.00	0-7.00
*Ammonia (Direct Nesslerization)	K-1523	0-14.0	0-14.0
*Chloride	K-2103	0-40.0	0-40.0
Chlorine, free & total <i>USEPA-accepted</i>	K-2513	0-5.00	0-5.00
Chlorine, free <i>USEPA-accepted</i>	K-2523	0-5.00	0-5.00
Chlorine Dioxide	K-2703	0-11.0	0-11.0
Chromate	K-2803	0-3.50	0-3.50
*COD LR, <i>USEPA-accepted</i>	K-7350S, K-7355	0-150	N/A
COD LR, <i>Mercury-free</i>	K-7351S, K-7356	0-150	N/A
*COD HR, <i>USEPA-accepted</i>	K-7360S, K-7365	0-1500	N/A
COD HR, <i>Mercury-free</i>	K-7361S, K-7366	0-1500	N/A
*COD HR+,	K-7370S, K-7375	0-15,000	N/A
COD HR+, <i>Mercury-free</i>	K-7371S, K-7376	0-15,000	N/A
Copper	K-3503	0-12.00	0-12.00
Cyanide	K-3803	0-0.400	0-0.400
DEHA	K-3903	0-2.00	0-2.00
Hydrazine	K-5003	0-1.20	0-1.20
Hydrogen Peroxide	K-5543	0-6.00	0-6.00
Iron, total	K-6023	0-2.50	0-2.50
Iron, total & ferrous	K-6203	0-6.00	0-6.00
Iron, total & soluble	K-6003	0-6.00	0-6.00
Manganese	K-6503	0-30.0	0-30.0
Molybdate (as Mo)	K-6703	0-25.0	0-25.0
Monochloramine	K-6803	0-15.0	0-8.00
Nitrate (as N)	K-6913	0-1.50	0-1.50
Nitrate (as N)	K-6903	0-1.50	0-1.50
Nitrate (as N)	K-6923	0-7.50	0-7.50
Nitrate (as NO <sub>3</sub> )	K-6933	0-50.0	0-50.0
Nitrite (as N)	K-7003	0-1.00	0-1.00
Nitrite (as N)	K-7013	0-0.75	0-0.75
Ozone (DPD)	K-7423	0-5.00	0-5.00
Oxygen, dissolved	K-7553	0-1.000	0-1.000
Oxygen, dissolved	K-7513	0-15.0	0-15.0
Peracetic Acid	K-7913	0-5.00	0-5.00
Phenols	K-8003	0-8.00	0-8.00
Phenols	K-8023	0-20.0	0-20.0
Phosphate, ortho (as P)	K-8513	0-2.64	0-1.63
Phosphate, ortho (as PO <sub>4</sub> )	K-8513	0-8.00	0-5.00
Phosphate, ortho (as PO <sub>4</sub> )	K-8503	0-80.0	0-80.0
Silica	K-9003	0-10.00	0-10.00
Sulfate	K-9203	0-100.0	0-100.0
Sulfide	K-9503	0-3.00	0-3.00
Sulfide	K-9523	0-6.00	0-6.00
Zinc	K-9903	0-3.00	0-3.00
Zinc	K-9923	0-15.0	0-15.0

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



## Single Analyte Meters (SAMs)

### Portable Value & Convenience

Single Analyte Meters, in conjunction with Vacu-vials™ “snap-and-read” self-filling ampoules or COD vials, offer unbeatable economy, simplicity, and accuracy for field testing. SAMs provide results equivalent to other meters and probes costing much more. Except for COD (photometer only), SAM kits contain a photometer and a consumable test kit.



### SAM Specifications & Features

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

**Operating Conditions:** Temperature 5 - 40° C / 41 - 104° F, Relative humidity 30 - 90% (noncondensing)

**Power Source:** Battery operated

**Compliance:** European CE Mark

**Waterproof:** IP68

**Warranty:** 1 year

Analyte	SAM Kit No.	Range (mg/L)	Replacement Kit No.	Verification Kit No.	Standards Kit No.
Chlorine	I-2001	0-5.00	K-2513	I-0003	
Chlorine Dioxide	I-2005	0-11.0	K-2703	I-0003	
COD Low Range	<sup>1</sup> A-7320	0-150	<sup>2</sup> K-7350S, K-7355 K-7351S, K-7356		A-7301
COD High Range	<sup>1</sup> A-7325	0-1500	<sup>2</sup> K-7360S, K-7365 K-7361S, K-7366		A-7301, A-7310
COD High Range	<sup>1</sup> A-7325	0-15,000	<sup>2</sup> K-7370S, K-7375 K-7371S, K-7376		A-7310
Detergents	I-2017	0-2.50	R-9423		
Hydrogen Peroxide	I-2016	0-6.00	K-5543	I-5543	A-5505
Oxygen, dissolved	I-2002	0-15.0	K-7513	I-0003	
Ozone (DPD)	I-2019	0-5.00	K-7423	I-0003	
Ozone (indigo)	I-2022	0-0.75	K-7433	I-7433	
Peracetic Acid	I-2020	0-5.00	K-7913	I-0003	A-7925

<sup>1</sup> Photometer only. COD Reagent Vials sold separately. See pages 24-25.

<sup>2</sup> Contains mercury. Dispose according to local, state or federal laws.

### CHEMetrics offers two easy ways for you to verify product performance:

- Verification kits that allow you to quickly and routinely check the performance of your CHEMetrics photometers, and
- analytical standards for select analytes to confirm the accuracy and reliability of your test results.

For more information, visit [www.chemetrics.com/SAMs](http://www.chemetrics.com/SAMs).



# Save up to 35% with CHEMetrics COD Vials



**No Difference**—CHEMetrics COD Vials can be used directly with any Hach factory-programmed instrument calibrations, at savings of up to 35%. Request the Performance Data Report showing CHEMetrics COD Vial performance in Hach instrumentation.

- ✓ USEPA-accepted for wastewater analysis
- ✓ Lower cost per test—save up to 35%
- ✓ Mercury-free method available
- ✓ Compact and eco-friendly packaging
- ✓ No need to modify existing equipment or procedures
- ✓ Product support with a personal touch

## Cross Reference to Hach COD Products

### COD Reagent Vials\*

CHEMetrics Cat. No.	No. of Tests	Range (ppm)	USEPA-accepted	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 Cat. No.	No. of Tests	Range (ppm)	USEPA-accepted	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-accepted COD Vials can be used for NPDES reporting.

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

See pages 24-25 for details

## 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, 23<sup>rd</sup> ed., Method 2320 B -1997. 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>.

## Visual Kits

Range: 10-100 ppm as CaCO <sub>3</sub> MDL: 10 ppm / Method: Acid Titrant with pH Indicator	
Alkalinity (total) Titrets Kit	Cat# 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 and instructions.	

Range: 50-500 ppm as CaCO <sub>3</sub> MDL: 50 ppm / Method: Acid Titrant with pH Indicator	
Alkalinity (total) Titrets Kit	Cat# 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 and instructions.	

Range: 100-1000 ppm as CaCO <sub>3</sub> MDL: 100 ppm / Method: Acid Titrant with pH Indicator	
Alkalinity (total) Titrets Kit	Cat# 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 and instructions.	

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

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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-1988.

The ammonia 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 ammonia 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.

CHEMetrics and VACUettes: 5 month limit on supply is recommended, however refrigeration can extend shelf life.

K-1503 and K-1523 Vacu-vials: 2 month limit on supply is recommended, however refrigeration can extend shelf life.

K-1513 Vacu-vials: Stable for at least 1 year without refrigeration.

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

\*\*Seawater analysis requires additional accessory solutions (sold separately).

### The Hydroxybenzyl Alcohol (HBA) 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 hydroxybenzyl alcohol chemistry, free ammonia reacts with hypochlorite to form monochloramine. Monochloramine reacts with HBA, in the presence of sodium nitro-ferricyanide, to form a green-colored complex.

This test method measures the sum of free ammonia and monochloramine. Results are expressed in ppm (mg/L) ammonia nitrogen, NH<sub>3</sub>-N. The HBA Method offers similar sensitivity to the Nesslerization Method and there is no generation of mercury-containing waste.

**WARNING!** The products employing the Direct Nesslerization method can expose you to chemicals including mercury, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Visual Kits

Range: 0-1 & 1-10 ppm MDL: 0.05 ppm / Method: Direct Nesslerization	
CHEMetrics Kit	Cat# *K-1510
CHEMetrics Refill, 30 ampoules, Shelf life 5 months *R-1501 <sup>2</sup>	
Stabilizer Solution Pack, six 10 mL bottles A-1500 <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 Solution, 25 mL sample cup, and instructions.	

Range: 0-4 & 0-80 ppm MDL: 0.125 ppm/ Method: Hydroxybenzyl Alcohol (HBA)	
CHEMetrics Kit	Cat# K-1420
CHEMetrics Refill, 30 ampoules R-1402	
Activator Solution Pack, Shelf life 8 months A-1410 <sup>3</sup>	
A-1404 Stabilizer Solution, two 10 mL bottles	
A-1405 Catalyzer Solution, two 10 mL bottles	
A-1406 Activator Solution, two 10 mL bottles	
Dual Range Comparator 0, 0.25, 0.50, 0.75, 1.0, 1.5, 2.0, 3.0, 4.0 ppm 0, 5, 10, 15, 20, 30, 40, 60, 80 ppm	C-1404
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Stabilizer Solution, Catalyzer Solution, Activator Solution, 25 mL sample cup, 3 mL syringe, and instructions.	

Range: 0-30 & 30-300 ppm MDL: 5 ppm / Method: Direct Nesslerization	
VACUettes Kit	Cat# *K-1510D
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 and instructions.	

Range: 0-60 & 60-600 ppm MDL: 10 ppm / Method: Direct Nesslerization	
VACUettes Kit	Cat# *K-1510A
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 and instructions.	

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



Range: 0-120 & 120-1200 ppm MDL: 20 ppm / Method: Direct Nesslerization	
<b>VACUettes Kit</b>	<b>Cat#</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 and instructions.	

Range 0-1000 & 1000-10,000 ppm MDL: 100 ppm / Method: Direct Nesslerization	
<b>VACUettes Kit</b>	<b>Cat#</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 and instructions.	

Range: 0-125 & 0-2500 ppm MDL: 8 ppm / Method: Hydroxybenzyl Alcohol (HBA)	
<b>VACUettes Kit</b>	<b>Cat#</b> <b>K-1420D</b>
VACUettes Refill, 30 ampoules	R-1402D
Activator Solution Pack, Shelf life 8 months	A-1410 <sup>3</sup>
A-1404 Stabilizer Solution, two 10 mL bottles	
A-1405 Catalyzer Solution, two 10 mL bottles	
A-1406 Activator Solution, two 10 mL bottles	
Dual Range Comparator 0, 8, 15, 25, 35, 50, 70, 100, 125 ppm	C-1404D
0, 160, 300, 500, 700, 1000, 1400, 2000, 2500 ppm	
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Stabilizer Solution, Catalyzer Solution, Activator Solution, 25 mL sample cup, 3 mL syringe, dilutor snapper cup, sample cup top, micro test tube and instructions.	

Range: 0-500 & 0-10,000 ppm MDL: 30 ppm / Method: Hydroxybenzyl Alcohol (HBA)	
<b>VACUettes Kit</b>	<b>Cat#</b> <b>K-1420B</b>
VACUettes Refill, 30 ampoules	R-1402B
Activator Solution Pack, Shelf life 8 months	A-1410 <sup>3</sup>
A-1404 Stabilizer Solution, two 10 mL bottles	
A-1405 Catalyzer Solution, two 10 mL bottles	
A-1406 Activator Solution, two 10 mL bottles	
Dual Range Comparator 0, 30, 60, 100, 150, 225, 300, 400, 500 ppm	C-1404B
0, 600, 1200, 2000, 3000, 4500, 6000, 8000, 10,000 ppm	
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Stabilizer Solution, Catalyzer Solution, Activator Solution, 25 mL sample cup, 3 mL syringe, dilutor snapper cup, sample cup top, micro test tube and instructions.	

## Instrumental Kits

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-7.00 ppm Method: Direct Nesslerization	
<b>Vacu-vials Kit</b> , Shelf life 2 months	<b>Cat#</b> <b>*K-1503<sup>2</sup></b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solution, 25 mL sample cup, ampoule blank, and instructions.	

Range: 0-10.00 ppm & 0-150 ppm Method: Direct Nesslerization (extended shelf life)	
<b>Vacu-vials Kit</b> , Shelf life 2 months	<b>Cat#</b> <b>*K-1513</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solution, 25 mL sample cup, 3-mL syringe, ampoule blank and instructions. Seawater analysis requires A-1503 Accessory Solution Pack (sold separately).	

Range: 0-14.0 ppm Method: Direct Nesslerization	
<b>Vacu-vials Kit</b> , Shelf life 2 months	<b>Cat#</b> <b>*K-1523<sup>2</sup></b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solution, 25 mL sample cup, ampoule blank, and instructions.	

Range: 0-3.00 & 0-60.0 ppm Method: Hydroxybenzyl Alcohol (HBA)	
<b>Vacu-vials Kit</b> , Shelf life 8 months	<b>Cat#</b> <b>K-1413</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Stabilizer Solution, Catalyzer Solution, Activator Solution, 25 mL sample cup, 3 mL syringe, ampoule blank and instructions.	

**Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.**

**⚠ WARNING!** The products employing the Direct Nesslerization method can expose you to chemicals including mercury, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack (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
** Sample Zeroing Accessory Pack	A-0025
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
** Sample Zeroing Accessory Pack	A-0503
** Sample Zeroing Accessory Pack	A-0504
Seawater Accessory Pack (4 bottles)	A-1503

## Bromine

### 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, 23<sup>rd</sup> ed., Method 4500-Cl G -2000.**

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>.



## Visual Kit

Range: 0-2.2 & 0-11 ppm MDL: 0.125 ppm / Method: DPD	
<b>CHEMetrics Kit</b>	<b>Cat#</b> <b>K-1605</b>
CHEMetrics Refill, 30 ampoules	R-1605
Activator Solution Pack, six 10 mL bottles	A-1600 <sup>1</sup>
Low Range Comparator 0, 0.25, 0.5, 0.7, 0.9, 1.4, 1.8, 2.2 ppm	C-1601
High Range Comparator 0, 2.2, 3.4, 4.5, 5.6, 6.8, 7.9, 9, 11 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 and instructions.	

Components and Accessories	
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 SDSs are posted on our website. If no shelf life is listed for a product, then the shelf life is at least 1 year.

\*Contains mercury. Dispose according to local, state or federal laws.  
\*\* For use when testing colored or turbid samples. See page 13 for details.  
<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.  
<sup>3</sup> The A-1410 Accessory Solution Pack supplies enough Ammonia Activator, Catalyzer, and Stabilizer Solutions to perform approximately 80 tests. An accessory solution contained in this pack has a shelf life of 8 months. (Test kits contain one bottle of each solution.)

Instructions and SDSs are posted on our website. If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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.

**WARNING!** This product can expose you to chemicals including chloroform, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Visual Kit

Range: 0-0.50 ppm MDL: 0.05 ppm / Method: PDTS	
CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-1805
Activator Solution Pack, six 10 mL bottles	A-1800
Comparator 0, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50 ppm	C-1805
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solution, 25 mL sample cup and instructions.	

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

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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, 23<sup>rd</sup> ed., Method 4500-CO<sub>2</sub> C-2004. 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. 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#
	K-1910
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 and instructions.	

Range: 100-1000 ppm MDL: 100 ppm / Method: Caustic Titrant with pH Indicator	
Titrets Kit	Cat#
	K-1920
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 and instructions.	

Range: 250-2500 ppm MDL: 250 ppm / Method: Caustic Titrant with pH Indicator	
Titrets Kit	Cat#
	K-1925
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 and instructions.	

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

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.



**WARNING!** These products can expose you to chemicals including phenolphthalein, which is known to the State of California to cause cancer, and methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



## The CHEMetrics COD System



### All Materials for COD Lab Setup are available from CHEMetrics

- ✓ COD Reagent Vials Kit (USEPA-accepted and Mercury-free)
- ✓ Photometer (single or multi-analyte)
- ✓ Calibration Standards (1000 and 10,000 ppm)
- ✓ COD Vial Rack (holds 40 vials)



### 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, 23<sup>rd</sup> ed., Method 5220 D-1997. 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.

USEPA-accepted

### The Dichromate Reactor Digestion Method

CHEMetrics offers two methods (USEPA-accepted and Mercury-free) for the determination of low-, mid-, and high-range COD levels in wastewater. The products using the USEPA-accepted method contain mercuric sulfate in the reagent to eliminate chloride interferences. The 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.

Results are obtained using any photometer or spectrophotometer that accepts a 16 mm cell including Hach instruments with factory-programmed calibrations<sup>1</sup>. A generic calibration equation is included for use with other spectrophotometers.

## Instrumental Kits

### Multi-Analyte Photometer V-2000

(See page 14 for instrumental features)

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

COD (USEPA-accepted) Vials Kit	Cat# *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.	

COD (USEPA-accepted) Vials Kit	Cat# *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.	

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

COD (Mercury-free) Vials Kit	Cat# 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.	

COD (Mercury-free) Vials Kit	Cat# 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.	

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

COD (USEPA-accepted) Vials Kit	Cat# *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.	

COD (USEPA-accepted) Vials Kit	Cat# *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.	

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

COD (Mercury-free) Vials Kit	Cat# 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.	

COD (Mercury-free) Vials Kit	Cat# 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.	

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

COD (Not USEPA-accepted) Vials Kit	Cat# *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.	

COD (Not USEPA-accepted) Vials Kit	Cat# *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.	

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

COD (Mercury-free) Vials Kit	Cat# 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.	

COD (Mercury-free) Vials Kit	Cat# 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.	

All COD Kits require the use of a Digester Block along with a CHEMetrics 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.

### Components and Accessories

Description	Cat#
Vial Rack (holds 40 vials)	A-0107
COD Zeroing Vial	A-0183
Digester Block <sup>2</sup> US (115 Volt, 12 cells), Warranty 1 year	A-0201
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.

<sup>2</sup> Digester not available from CHEMetrics

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

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

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

## 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, 23<sup>rd</sup> ed., Method 4500-Cl<sup>-</sup> C - 1997. 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, 23<sup>rd</sup> ed., Method 4500-Cl<sup>-</sup> E - 1997. 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 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

<b>Range: 20-200 ppm</b> MDL: 20 ppm / Method: Mercuric Nitrate	
<b>Titrets Kit</b> , Shelf life 20 months	<b>Cat#</b> *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 and instructions.	

<b>Range: 50-500 ppm</b> MDL: 50 ppm / Method: Mercuric Nitrate	
<b>Titrets Kit</b> , Shelf life 20 months	<b>Cat#</b> *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 and instructions.	

<b>Range: 250-2500 ppm</b> MDL: 250 ppm / Method: Mercuric Nitrate	
<b>Titrets Kit</b> , Shelf life 20 months	<b>Cat#</b> *K-2051
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 and instructions.	

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



<b>Range: 1000-10,000 ppm</b> MDL: 1000 ppm / Method: Mercuric Nitrate	
<b>Titrets Kit</b> , Shelf life 20 months	<b>Cat#</b> *K-2055
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 and instructions.	

<b>Range: 10,000-100,000 ppm</b> MDL: 10,000 ppm / Method: Mercuric Nitrate	
<b>Titrets Kit</b> , Shelf life 20 months	<b>Cat#</b> *K-2070
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 and instructions.	

## Instrumental Kit

### Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)

<b>Range: 0-40.0 ppm</b> Method: Ferric Thiocyanate	
<b>Vacu-vials Kit</b>	<b>Cat#</b> *K-2103 <sup>1</sup>
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 and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

<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.

Components and Accessories	
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
** Sample Zeroing Accessory Pack	A-0503

\*\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

⚠ WARNING! The products employing the Mercuric Nitrate method can expose you to chemicals including mercury, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

⚠ WARNING! The product employing the Ferric Thiocyanate method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



# Chlorine

## 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, 23<sup>rd</sup> ed., Method 4500-Cl G - 2000.



In the USEPA-accepted 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 DPD method is also applicable to the direct determination of hypochlorite concentrations in various cleaning preparations and disinfectants prior to their dilution. DPD reacts with hypochlorite ions to form a pink color. Results are expressed as percent (%) NaOCl.

### The DDPD™ Method

Reference: Developed by CHEMetrics.

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>.

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

**WARNING!** The product employing the DDPD method can expose you to chemicals including formaldehyde, which is known to the State of California to cause cancer, and methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Visual Kits

Range: 0-0.20 ppm MDL: 0.04 ppm / Method: DDPD	
<b>Chlorine (free &amp; total) ULR CHEMets Kit</b>	<b>Cat# K-2511</b>
ULR CHEMets Refill, 30 ampoules	R-2511
Activator Solution Pack, six 10 mL bottles	A-2500 <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, 25 mL sample cup and instructions.	

Range: 0-1 & 0-5 ppm MDL: 0.05 ppm / Method: DPD	
<b>Chlorine (free &amp; total) CHEMets Kit</b>	<b>Cat# 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 0, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 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, and instructions.	

Range: 0-25 & 0-125 ppm MDL: 2.5 ppm / Method: DPD	
<b>Chlorine (free &amp; total) CHEMets Kit</b>	<b>Cat# K-2504D</b>
CHEMets Refill, 30 ampoules	R-2504
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Low Range Comparator 0, 2.5, 5, 7.5, 10, 15, 20, 25 ppm	C-2504D
High Range Comparator 0, 25, 37.5, 50, 62.5, 75, 87.5, 100, 125 ppm	C-2506D
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, 25 mL sample cup, 3.0 mL syringe, and instructions.	

Range: 0-50 & 0-250 ppm MDL: 5 ppm / Method: DPD	
<b>Chlorine (free &amp; total) CHEMets Kit</b>	<b>Cat# K-2504A</b>
CHEMets Refill, 30 ampoules	R-2504
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Low Range Comparator 0, 5, 10, 15, 20, 30, 40, 50 ppm	C-2504A
High Range Comparator 0, 50, 75, 100, 125, 150, 175, 200, 250 ppm	C-2506A
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, 25 mL sample cup, 1.0 mL syringe and instructions.	

Range: 0-100 & 0-500 ppm MDL: 10 ppm / Method: DPD	
<b>Chlorine (free &amp; total) CHEMets Kit</b>	<b>Cat# K-2504B</b>
CHEMets Refill, 30 ampoules and 30 pipette tips	R-2509
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Low Range Comparator 0, 10, 20, 30, 40, 60, 80, 100 ppm	C-2504B
High Range Comparator 0, 100, 150, 200, 250, 300, 350, 400, 500 ppm	C-2506B
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, 25 mL sample cup, 200 uL MiniPet®, and instructions.	

Range: 0-400 & 0-2000 ppm MDL: 400 ppm / Method: DPD	
<b>Chlorine (free &amp; total) CHEMets Kit</b>	<b>Cat# K-2504C</b>
CHEMets Refill, 30 ampoules and 30 pipette tips	R-2509
Activator Solution Pack, six 10 mL bottles	A-2500 <sup>1</sup>
Low Range Comparator 0, 40, 80, 120, 160, 240, 320, 400 ppm	C-2504C
High Range Comparator 0, 400, 600, 800, 1000, 1200, 1400, 1600, 2000 ppm	C-2506C
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, 25 mL sample cup, 50 uL MiniPet®, and instructions.	

Range: 0-1.55% MDL: 0.3% / Method: DPD	
<b>Chlorine (hypochlorite) CHEMets Kit</b>	<b>Cat# K-5808</b>
CHEMets Refill, 30 ampoules and 30 pipette tips	R-5808
Comparator 0, 0.3, 0.47, 0.63, 0.78, 0.95, 1.1, 1.25, 1.55%	C-5808
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, sample prep cup, 3.0 mL syringe, 200 uL MiniPet®, and instructions.	

Range: 0-12.5% MDL: 2.5% / Method: DPD	
<b>Chlorine (hypochlorite) CHEMets Kit</b>	<b>Cat# K-5816</b>
CHEMets Refill, 30 ampoules and 30 pipette tips	R-5808
Comparator 0, 2.5, 3.8, 5, 6.3, 7.5, 8.8, 10, 12.5%	C-5816
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, sample prep cup, 3.0 mL syringe, 25 uL MiniPet®, and instructions.	

MiniPet® is a registered trademark of Tricontinent Scientific, Inc.

## Instrumental Kits

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-5.00 ppm Method: DPD	
<b>Chlorine (free) Vacu-vials Kit (USEPA-accepted)</b>	<b>Cat# K-2523</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

Range: 0-5.00 ppm Method: DPD	
<b>Chlorine (free &amp; total) Vacu-vials Kit (USEPA-accepted)</b>	<b>Cat# K-2513</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, and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

SAM Single Analyte Photometer (See page 16 for instrumental features)	
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Range: 0-5.00 ppm Method: DPD	
<b>Chlorine (free &amp; total) SAM Kit</b>	<b>Cat# I-2001</b>
Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	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.	

<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.

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
** Sample Zeroing Accessory Pack	A-0025
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
Pipette Tips Pack (30 ea)	A-0171
MiniPet®, 25 µL (1 ea)	A-0191
MiniPet®, 50 µL (1 ea)	A-0193
MiniPet®, 200 µL (1 ea)	A-0194
Sample Prep Cup Pack (6 ea)	A-0200

\*\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



# Chlorine Dioxide

## Method

Chlorine dioxide is used as an oxidizing microbiocide 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-1993 and 23<sup>rd</sup> ed., Method 4500-Cl G-2000.

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>.

## Visual Kit

Range: 0-2 & 0-10 ppm MDL: 0.1 ppm / Method: DPD	
<b>CHEMets Kit</b>	<b>Cat# K-2705</b>
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 0, 2, 3, 4, 5, 6, 7, 8, 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 and instructions.	

## Instrumental Kits

### Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)

Range: 0-11.0 ppm Method: DPD	
<b>Vacu-vials Kit</b> , Shelf life 8 months	<b>Cat# K-2703</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

### SAM Single Analyte Photometer (See page 16 for instrumental features)

Range: 0-11.0 ppm Method: DPD	
<b>SAM Kit</b>	<b>Cat# I-2005</b>
Vacu-vials Kit, 30 ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank and instructions. 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.	

Components and Accessories	
<b>Description</b>	<b>Cat#</b>
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0025

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

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

# Chromate (hexavalent)

## 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, 23<sup>rd</sup> ed., Method 3500-Cr B-2009. 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	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

## Instrumental Kit

### Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)

Range: 0-3.50 ppm Method: Diphenylcarbazide	
<b>Vacu-vials Kit</b>	<b>Cat# K-2803</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

Components and Accessories	
<b>Description</b>	<b>Cat#</b>
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0503

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



**WARNING!** This product can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Method

Conductivity (or Specific Conductance) is a measure of water's capability to pass electrical current and is directly related to the concentration of ionized dissolved solids in water. 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. Conductivity is also frequently tested for in environmental applications.

Total Dissolved Solids (TDS) and salinity concentrations of a water sample are often derived from the conductivity measurement. Although TDS is not considered a primary pollutant, for aesthetic considerations, the National Secondary Drinking Water Standard for TDS is 500 ppm. Water salinity influences the types of organisms that will thrive in a body of water as well as the plants that will grow on land fed by a particular water source.

## Method of Operation

The 3-in-1 CTSTestr™ combination meter measures Conductivity, TDS, and Salinity. To operate, switch the meter on, select measurement parameter, and immerse the probe in the sample. After the reading stabilizes, take the measurement. The CTSTestr™ can be used for a wide variety of applications including aquaculture, fresh water aquariums, swimming pools, industrial water treatment and wastewater treatment.



### FEATURES

- Replaceable electrode
- Waterproof, Dustproof
- Easy interface navigation for quick setup and calibration
- Automatic Temperature Compensation (ATC)
- Auto shut-off



## Instrument

<b>Ranges:</b>	
<b>Conductivity:</b> 0.0-200.0 µS, 200-2000 µS, 2.00-20.00 mS	
<b>TDS:</b> 0.0-100.0 ppm, 100-1000 ppm, 0.10-10.00 ppt	
<b>Salinity:</b> 0.00-10.00 ppt	
<b>CTSTestr™* (Conductivity, TDS and Salinity)</b>	<b>Cat#</b> I-1400
Meter comes in a plastic storage case and includes an electrode and sensor cap, four AAA batteries and instructions.	

Components and Accessories	
Description	Cat#
Conductivity/TDS Singles, 1413 µS, Shelf life 3 months	A-0178
Electrode for I-1400 CTSTestr™	A-0212
Sensor Cap for I-1400 CTSTestr™	A-0213

Instructions are posted on our website.

## Resolution:

Conductivity: 0.1 µS, 1 µS, 0.01 mS

TDS: 0.1 ppm, 1 ppm, 0.01 ppt

Salinity: 0.10 ppt

**Accuracy:** ±1% full scale

**Conductivity Calibration:** Automatic or Manual

**Ambient Operating Temperature:** 5 to 45°C (41 to 113°F).

**Power and battery life:** Four AAA 1.5 V alkaline batteries (supplied). >150 hours.

**Warranty:** 1 year

## 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, 23<sup>rd</sup> ed., Method 3500-Cu C-1999.

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

<b>Range: 0-1 &amp; 1-10 ppm</b>	
MDL: 0.05 ppm / Method: Bathocuproine	
<b>CHEMets Kit</b>	<b>Cat#</b> K-3510
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 and instructions.	



## Instrumental Kit

### Multi-Analyte Photometers

V-2000 / V-3000

(See page 14 for instrumental features)

**Range: 0-12.00 ppm / Spec: 0-7.00 ppm**  
Method: Bathocuproine

<b>Vacu-vials Kit</b>	<b>Cat#</b> K-3503
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, and instructions.	

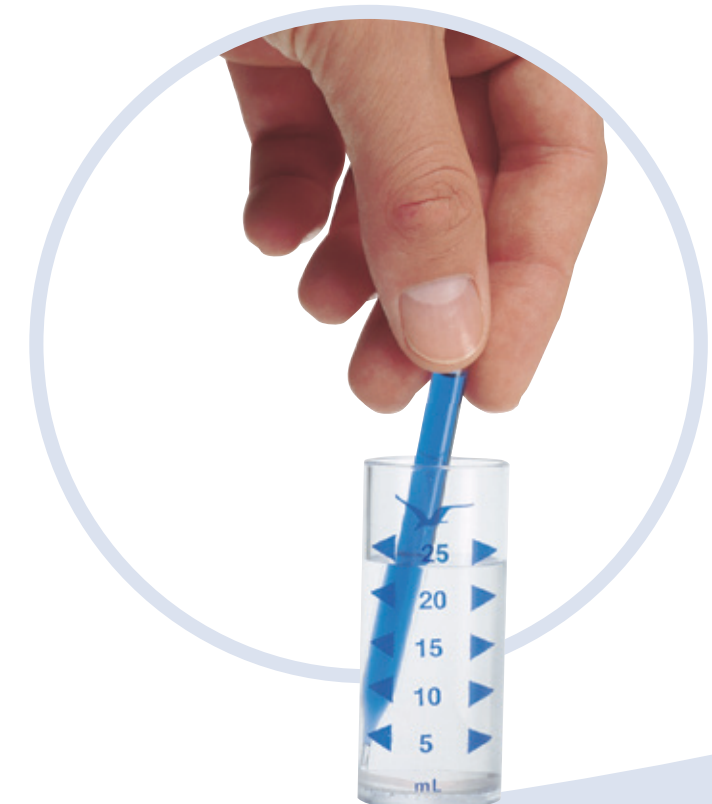
Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0503

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



## Method

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 CHEMetrics 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.



## Visual Kit

Range: 0-0.1 & 0.1-1 ppm MDL: 0.005 ppm / Method: Isonicotinic-Barbituric Acid	
<b>CHEMetrics Kit</b>	<b>Cat# K-3810</b>
CHEMetrics Refill, 30 ampoules	R-3810
Accessory Solution Pack, Shelf life 8 months: A-3801 Activator Solution, two 10 mL bottles A-3805 Neutralizer Solution, four 20 mL bottles	A-3810 <sup>1</sup>
Low Range Comparator, Shelf life 12 months 0, 0.01, 0.02, 0.03, 0.04, 0.06, 0.08, 0.1 ppm	C-3801
High Range Comparator, Shelf life 12 months 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, 25 mL sample cup, 1 mL syringe, and instructions.	



## Instrumental Kit

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-0.400 ppm Method: Isonicotinic-Barbituric Acid	
<b>Vacu-vials Kit</b> , Shelf life 8 months	<b>Cat# K-3803</b>
Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, Neutralizer Solution, Activator Solution, 25 mL sample cup, 3.0 mL syringe, ampoule blank and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

Components and Accessories	
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
* Sample Zeroing Accessory Pack	A-0503

<sup>1</sup> The A-3810 Accessory Solution Pack supplies enough Cyanide Activator and Neutralizer Solutions to perform approximately 60 tests.

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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.

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	
<b>CHEMetrics Kit</b>	<b>Cat# K-3902</b>
CHEMetrics Refill, 30 ampoules	R-3902
Activator Solution Pack, six 10 mL bottles	A-3900 <sup>1</sup>
Low Range Comparator, Shelf life 18 months 0, 50, 100, 150, 200, 250, 300, 400 ppb	C-3901
High Range Comparator, Shelf life 18 months 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 and instructions.	

Range: 25-250 ppm MDL: 25 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator	
<b>Titrets Kit</b>	<b>Cat# K-3925</b>
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 and instructions.	



## Instrumental Kit

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-2.00 ppm Method: PDTS	
<b>Vacu-vials Kit</b>	<b>Cat# K-3903</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, and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Titrettor Pack (1 ea)	A-0053
* Sample Zeroing Accessory Pack	A-0503

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

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

# Detergents (anionic surfactants, MBAS)

## 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, 23<sup>rd</sup> ed., Method 5540 C - 2000. 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 superior 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.

The shelf life of R-9400 is 5 months and R-9423 is 8 months. We recommend stocking quantities accordingly.



**WARNING!** These products can expose you to chemicals including chloroform, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Visual Kits

Range: 0-3 ppm MDL: 0.125 ppm / Method: Methylene Blue	
<b>CHEMets Kit</b>	<b>Cat# K-9400</b>
CHEMets Refill, 20 ampoule sets, Shelf life 5 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 and instructions.	

MiniPet® is a registered trademark of Tricontinent Scientific, Inc.

## Instrumental Kits

Range: 0-2.50 ppm Method: Methylene Blue	
<b>Detergents SAM Kit</b>	<b>Cat# I-2017</b>
Instrumental Refill, 20 double-tipped ampoules, 21 test tubes, dropper bottle with cap, tip-breaking tool and instructions. Shelf life 8 months.	R-9423
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.	

Components and Accessories	
Description	Cat#
Tip Breaking Tool Pack (2 ea)	A-0197
Reaction Tube w/Lid, Detergents (5 ea)	A-0087

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

# Filming Amine (aliphatic amine)

## 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 Diocetylaminines 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.

# Formaldehyde

## Method

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 Schiff's 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 4 months.

**WARNING!** This product can expose you to chemicals including chloroform, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Visual Kit

Range: 0-1 ppm MDL: 0.05 ppm / Method: Methyl Orange	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Components and Accessories	
Description	Cat#
Tip Breaking Tool Pack (2 ea)	A-0197
Reaction Tube w/Lid, Filming Amine (5 ea)	A-0087F

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

## Visual Kits

Range: 0-1 & 1-10 ppm MDL: 0.1 ppm / Method: Purpald	
<b>CHEMets Kit</b>	<b>Cat# 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, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-4610
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 and instructions.	

Components and Accessories	
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

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

<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 limited shelf life.

# Freshwater Monitoring

CHEMetrics is proud to partner with Canada-based Water Rangers to provide reliable water quality test kits for the citizen scientist. Its open data platform makes results available to other scientists and volunteers.

**The Freshwater Education Test Kit (K-0010)** is perfect for educators looking to create a full water testing program or simply a fun student activity. Not only does it provide educational materials to make you a water testing expert, it also gives young people hands-on experience. Lesson plans are available.

**The Freshwater Explorer Test Kit (K-0020)** is ideal for small organizations or individuals. It comes with instructions on how to perform all the tests and how to upload your data, and no prior user experience is required.

**The Freshwater Kit Restocking Pack (R-0010)** refill pack allows you to get back to testing if you've utilized the consumables from either of the two kits mentioned above.



# Glycol

## 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 airport deicing operations 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 results are expressed as ppm (mg/L) ethylene glycol. To convert results to ppm propylene glycol multiply by 2.

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

Shelf life: 5 months. We recommend stocking quantities that will be used within 4 months.

## Visual Kits

Range: 1-15 & 10-300 ppm as ethylene glycol (EG) (up to 30,000 ppm EG or 60,000 ppm propylene glycol with A-0188 accessory) MDL: 1 ppm / Method: Purpald-Periodate	
<b>CHEMets Kit</b>	<b>Cat# K-4815</b>
CHEMets Refill, 30 ampoules, Shelf life 5 months	R-4815
Activator Solution Pack, six 20 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	C-4815
1, 2, 3, 4, 5, 6, 8, 10, 15 ppm	
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, 3 mL syringe and instructions.	

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Syringe Pack 3 mL (6 ea)	A-0063
Pipettor Tips Pack (30 ea)	A-0171
Dilution Kit (10X, 25X, 125X, 250X, 500X, 1000X, 5000X)	A-0188

<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, the solution has a limited shelf life.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

**WARNING!** This product can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

# Hardness

## 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 zincin indicator. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

Shelf life: 8 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 7 months.

### The EDTA Method (total)

**References: APHA Standard Methods, 23<sup>rd</sup> ed., Method 2340 C-1997. 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# K-1705</b>
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 and instructions.	

Range: 2-20 ppm as CaCO <sub>3</sub> MDL: 2.0 ppm / Method: EDTA	
<b>Hardness (total) Titrets Kit</b>	<b>Cat# K-4502</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 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 and instructions.	

Range: 20-200 ppm as CaCO <sub>3</sub> MDL: 20 ppm / Method: EDTA	
<b>Hardness (total) Titrets Kit</b>	<b>Cat# K-4520</b>
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 and instructions.	

Range: 100-1000 ppm as CaCO <sub>3</sub> MDL: 100 ppm / Method: EDTA	
<b>Hardness (total) Titrets Kit</b>	<b>Cat# K-4585</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 and instructions.	

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

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

**WARNING!** These products can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

# Hydrazine

## 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 (µg/L) or ppm (mg/L) N<sub>2</sub>H<sub>4</sub>.

## Visual Kit

Range: 0-0.5 ppm MDL: 0.005 ppm / Method: PDMAB	
<b>CHEMetrics Kit</b>	<b>K-5005</b>
CHEMetrics 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 and instructions.	

Range: 0-12.5 ppm MDL: 0.25 ppm / Method: PDMAB	
<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 and instructions.	

**WARNING!** These products can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

# Hydrogen Peroxide

## 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 CHEMetrics 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, peracetic acid, and cupric copper will interfere.\* Results are expressed as ppm (mg/L) H<sub>2</sub>O<sub>2</sub>.

### The DPD Method

**References:** APHA Standard Methods Online, Method 4500-H<sub>2</sub>O<sub>2</sub> B-2020.

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.

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 test range can be modified by performing a sample dilution. Details are provided in the kit instructions for ranges of 0.01 - 0.1% through 2-20%.

**WARNING!** The product employing the Ferric Thiocyanate method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to [www.P65Warnings.gov](http://www.P65Warnings.gov).

Range: 0-25 ppm MDL: 0.5 ppm / Method: PDMAB	
<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 and instructions.	

Range: 0-50 ppm 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 and instructions.	

Range: 0-500 ppm 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 and instructions.	

Components and Accessories	
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

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

## Visual Kit

Range: 0-0.5 ppm MDL: 0.025 ppm / Method: DPD	
<b>CHEMetrics Kit</b>	<b>K-5502</b>
CHEMetrics 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, 0.30, 0.40, 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 and instructions.	

Range: 0-0.8 & 1-10 ppm MDL: 0.05 ppm / Method: Ferric Thiocyanate	
<b>CHEMetrics Kit</b>	<b>K-5510</b>
CHEMetrics Refill, 30 ampoules	R-5510
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.8 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 and instructions.	

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

\* Contact [technical@chemetrics.com](mailto:technical@chemetrics.com) for more information.



**Range: 0-25 & 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, 12.5, 15, 20, 25 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 and instructions.	

**Range: 0-100 & 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, 55, 70, 85, 100 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 and instructions.	

**Range: 0-50 & 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, 25, 35, 40, 50 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 and instructions.	

**Range: 0-1000 & 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, 550, 700, 850, 1000 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 and instructions.	

**Range: 0.1-1.0% (up to 20% with dilution)**  
MDL: 0.10% Method: Ceric Sulfate Titrant with Ferriin Indicator

	Cat#
<b>Titrets Kit</b>	<b>K-5530</b>
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 (except distilled water): thirty ampoules with valve assemblies, 1.0 mL syringe, 3.0 mL syringe, titrettor, 25 mL sample cup and instructions.	



## Instrumental Kits

**Multi-Analyte Photometers**  
V-2000 / V-3000  
(See page 14 for instrumental features)

**Range: 0-6.00 ppm**  
Method: Ferric Thiocyanate

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

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

**⚠ WARNING!** The product employing the Ferric Thiocyanate method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**SAM Single Analyte Photometer**  
(See page 16 for instrumental features)

**Range: 0-6.00 ppm**  
Method: Ferric Thiocyanate

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

### Components and Accessories

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
Syringe Pack, 3.0 mL (6 ea)	A-0063
* Sample Zeroing Accessory Pack	A-0503
Hydrogen Peroxide Standard (for 0.5 ppm standard)	A-5505

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



**⚠ WARNING!** The product employing the Ferric Thiocyanate method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## 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, 23<sup>rd</sup> ed., Method 3500-Fe B - 1997. ASTM D 1068-77, Iron in Water, Test Method A. J.A. Tetlow and A.L. Wilson, "The Absorptometric 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 Absorptometric 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 Method (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 Kit

Range: 0-1 & 1-10 ppm MDL: 0.05 ppm / Method: Phenanthroline	
<b>Iron (total &amp; ferrous) CHEMetrics Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-30 & 30-300 ppm MDL: 5 ppm / Method: Phenanthroline	
<b>Iron (total &amp; ferrous) VACUettes Kit</b>	<b>Cat# K-6210D</b>
VACUettes Refill, 30 ampoules	R-6201D
Activator Solution Pack, six 10 mL bottles	A-6000
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 tubes, and instructions.	

Range: 0-1 & 1-10 ppm MDL: 0.05 ppm / Method: Phenanthroline	
<b>Iron (total &amp; soluble) CHEMetrics Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-30 & 30-300 ppm MDL: 5 ppm / Method: Phenanthroline	
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>Cat# 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 tubes and instructions.	

Range: 0-60 & 60-600 ppm MDL: 10 ppm / Method: Phenanthroline	
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>Cat# 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 tubes and instructions.	

Range: 0-120 & 120-1200 ppm MDL: 20 ppm / Method: Phenanthroline	
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>Cat# 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 tubes and instructions.	

Range: 0-1200 & 1200-12,000 ppm MDL: 200 ppm / Method: Phenanthroline	
<b>Iron (total &amp; soluble) VACUettes Kit</b>	<b>Cat# 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 tubes and instructions.	

Range: 0-100 & 100-1000 mg/L MDL: 5 mg/L / Method: Ferric Thiocyanate	
<b>Iron in Brine CHEMetrics Kit</b>	<b>Cat# K-6002</b>
CHEMetrics Refill, 30 ampoules	R-6002
Acidifier Solution Pack, six 20 mL bottles	A-6001 <sup>2</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) and instructions.	

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

**WARNING!** The product employing the Ferric Thiocyanate method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).





### Instrumental Kits

#### Multi-Analyte Photometers V-2000 / V-3000

(See page 14 for instrumental features)

Range: 0-6.00 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 and instructions.

Range: 0-6.00 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 and instructions.

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

#### Components and Accessories

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack, small (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
Micro Test Tube Pack, 5 mL (5 ea)	A-0199
* Sample Zeroing Accessory Pack	A-0503

<sup>1</sup> The accessory pack supplies enough solution to perform at least 200 CHEMets tests, at least 200 Vacu-vial tests, or 42 VACUette tests. A-6000 Activator Solution is required for total iron analysis only.

<sup>2</sup> The accessory pack supplies enough solution for approximately 100 tests.

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



## Manganese

### 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.

Permanganate (MnO<sub>4</sub><sup>-</sup>) develops approximately 25% more color with this reagent than other forms of manganese, causing a high bias. If the sample is known to contain manganese in the form of permanganate only, multiplying test results by 0.8 will improve the accuracy of the results.

### Instrumental Kit

#### Multi-Analyte Photometers V-2000 / V-3000

(See page 14 for instrumental features)

Range: 0-30.0 ppm  
Method: Periodate

Vacu-vials Kit Cat#  
K-6503

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 and instructions.

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

#### Components and Accessories

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 Zeroing Accessory Pack	A-0503

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

\* For use when testing colored or turbid samples. See page 13 for details.

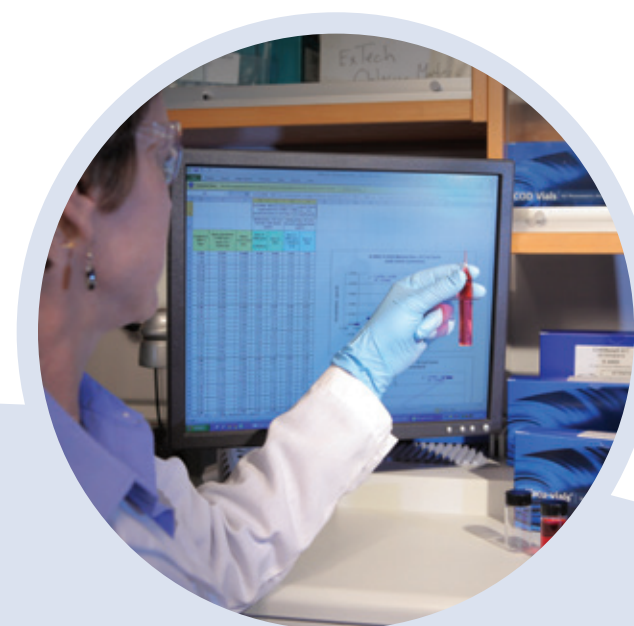
Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

### Visual Kits

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

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-6502
Activator Solution Pack, six 10 mL bottles	A-6502 <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, 25 mL sample cup and instructions.	



# Molybdate

## 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

	Cat#
<b>CHEMets Kit</b>	<b>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 and instructions.	

**Range: 2-24 ppm as Mo**  
MDL: 2 ppm / Method: Catechol

	Cat#
<b>CHEMets Kit</b>	<b>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 and instructions.	

**Range: 20-200 ppm as Mo**  
MDL: 20 ppm / Method: Catechol

	Cat#
<b>CHEMets Kit</b>	<b>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 and instructions.	

## Instrumental Kit

**Multi-Analyte Photometers**  
V-2000 / V-3000  
(See page 14 for instrumental features)

**Range: 0-25.0 ppm as Mo**  
Method: Catechol

	Cat#
<b>Vacu-vials Kit</b>	<b>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 and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

### Components and Accessories

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0503

\* For use when testing colored or turbid samples. See page 13 for details.

*Instructions and SDSs are posted on our website.*

*If no shelf life is listed for a product, then the shelf life is at least 1 year.*



# Monochloramine

## Visual Kit

**Range: 0-20 ppm as NH<sub>2</sub>Cl-Cl<sub>2</sub>**  
MDL: 0.625 ppm / Method: Hydroxybenzyl Alcohol (HBA)

	Cat#
<b>CHEMets Kit</b>	<b>K-6802</b>
CHEMets Refill, 30 ampoules	R-6802
Activator Solution, six 10 mL bottles	A-6802
Comparator 0, 1.25, 2.5, 3.75, 5.0, 7.5, 10, 15, 20 ppm	C-6802
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Stabilizer Solution, Catalyzer Solution, 25 mL sample cup, and instructions.	

## Instrumental Kit

**Multi-Analyte Photometers**  
V-2000 / V-3000  
(See page 14 for instrumental features)

**Range: V-2000: 0-15.0 ppm as NH<sub>2</sub>Cl-Cl<sub>2</sub>**  
**V-3000/Spec: 0-8.00 ppm as NH<sub>2</sub>Cl-Cl<sub>2</sub>**  
Method: Hydroxybenzyl Alcohol (HBA)

	Cat#
<b>Vacu-vials Kit</b>	<b>K-6803</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*



### Components and Accessories

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0025

*Instructions and SDSs are posted on our website.*

*If no shelf life is listed for a product, then the shelf life is at least 1 year.*

## 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, 23<sup>rd</sup> ed., Method 4500-NO<sub>3</sub><sup>-</sup> E - 2016. 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, 23<sup>rd</sup> ed., Method 4500-NO<sub>3</sub><sup>-</sup> E - 2016. 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.

MiniPet® is a registered trademark of Tricontinent Scientific, Inc.

**WARNING!** The product employing the Zinc Reduction method can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**WARNING!** The products employing the Cadmium Reduction method can expose you to chemicals including cadmium, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## Visual Kits

Range: 0-3.4 ppm as N MDL: 0.3 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, 0.3, 0.6, 0.9, 1.3, 1.7, 2.2, 2.8, 3.4 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 and instructions.	

Range: 0-4.5 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, 0.7, 1.0, 1.4, 1.8, 2.5, 3.5, 4.5 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 and instructions.	

Range: 0-45 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, 7, 10, 14, 18, 25, 35, 45 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 and instructions.	

Range: 0-225 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, 35, 50, 70, 90, 125, 175, 225 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 and instructions.	

Range: 0-675 ppm as N MDL: 60 ppm / Method: Cadmium Reduction	
<b>CHEMets Kit</b>	<b>Cat# K-6909B</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, 60, 105, 150, 210, 270, 375, 525, 675 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®, reaction tube with cap and instructions.	

Range: 0-2700 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, 420, 600, 840, 1080, 1500, 2100, 2700 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®, reaction tube with cap and instructions.	

## Instrumental Kits

### Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)

Range: 0-1.50 ppm as N Method: Zinc Reduction	
<b>Vacu-vials Kit</b> , Shelf life 12 months	<b>Cat# K-6913</b>
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 and instructions.	



**WARNING!** The product employing the Zinc Reduction method can expose you to chemicals including ethylene glycol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**WARNING!** The products employing the Cadmium Reduction method can expose you to chemicals including cadmium, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Range: 0-1.50 ppm as N Method: Cadmium Reduction	
<b>Vacu-vials Kit</b> , Shelf life 12 months	<b>Cat# K-6903</b>
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 and instructions.	

Range: 0-7.50 ppm as N Method: Cadmium Reduction	
<b>Vacu-vials Kit</b> , Shelf life 12 months	<b>Cat# K-6923</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 3 mL syringe, 25 mL sample cup, reaction tube with lid, ampoule blank and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

Range: 0-50.0 ppm as NO <sub>3</sub> Method: Cadmium Reduction	
<b>Vacu-vials Kit</b> , Shelf life 12 months	<b>Cat# K-6933</b>
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, and instructions.	

### Components and Accessories

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
*Sample Zeroing Accessory Pack	A-0025
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
MiniPet®, 100 uL (1 ea)	A-0170
Pipette Tips Pack (30 ea)	A-0171
Reaction Tube Pack, (6 ea)	A-0187
MiniPet®, 25 uL (1 ea)	A-0191

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

\*For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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, 23<sup>rd</sup> ed., Method 4500-NO<sub>2</sub><sup>-</sup> B-2000. 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.

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: 0-2.5 ppm as N MDL: 0.2 ppm / Method: Azo Dye Formation	
<b>CHEMetrics Kit</b>	<b>Cat# K-7004</b>
CHEMetrics Refill, 30 ampoules, Shelf life 12 months	R-7002
Comparator, Shelf life 12 months 0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0, 2.5 ppm	C-7004
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup and instructions.	

Range: 0-80 ppm as N MDL: 4 ppm / Method: Azo Dye Formation	
<b>VACUettes Kit</b>	<b>Cat# K-7004D</b>
VACUettes Refill, 30 ampoules, Shelf life 12 months	R-7002D
Comparator, Shelf life 12 months 0, 10, 15, 20, 30, 45, 55, 65, 80 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 and instructions.	

Range: 0-170 ppm as N MDL: 10 ppm / Method: Azo Dye Formation	
<b>VACUettes Kit</b>	<b>Cat# K-7004A</b>
VACUettes Refill, 30 ampoules, Shelf life 12 months	R-7002A
Comparator, Shelf life 12 months 0, 20, 30, 40, 60, 80, 110, 140, 170 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 and instructions.	

Range: 0-300 ppm as N MDL: 20 ppm / Method: Azo Dye Formation	
<b>VACUettes Kit</b>	<b>Cat# K-7004B</b>
VACUettes Refill, 30 ampoules, Shelf life 12 months	R-7002B
Comparator, Shelf life 12 months 0, 40, 60, 80, 120, 180, 220, 300 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 and instructions.	

Range: 0-3000 ppm as N MDL: 200 ppm / Method: Azo Dye Formation	
<b>VACUettes Kit</b>	<b>Cat# K-7004C</b>
VACUettes Refill, 30 ampoules, Shelf life 12 months	R-7002C
Comparator, Shelf life 12 months 0, 400, 600, 800, 1100, 1500, 1900, 2400, 3000 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 and instructions.	

Range: 0-0.1 & 0-1 ppm as N MDL: 0.005 ppm / Method: Azo Dye Formation (NED)	
<b>CHEMetrics Kit</b>	<b>Cat# K-7006</b>
CHEMetrics Refill, 30 ampoules, Shelf life 12 months	R-7006
Activator Solution Pack, six 10 mL bottles	A-7004 <sup>1</sup>
Low Range Comparator 0, 0.005, 0.01, 0.02, 0.04, 0.06, 0.08, 0.10 ppm	C-7006
High Range Comparator 0, 0.10, 0.15, 0.25, 0.35, 0.45, 0.60, 0.80, 1.0 ppm	C-7007
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, and instructions.	

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# K-7025</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, titrettor, 25 mL sample cup and instructions.	

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# K-7050</b>
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 and instructions.	

## Instrumental Kit

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-1.00 ppm as N Method: Azo Dye Formation	
<b>Vacu-vials Kit</b> , Shelf life 12 months	<b>Cat# K-7003</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

Range: 0-0.75 ppm as N Method: Azo Dye Formation (NED)	
<b>Vacu-vials Kit</b> , Shelf life 12 months	<b>Cat# K-7013</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank, and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

Components and Accessories	
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
* Sample Zeroing Accessory Pack	A-0025
Titrettor Pack (1 ea)	A-0053

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



## 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 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, Dissolved Oxygen in Water, 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.

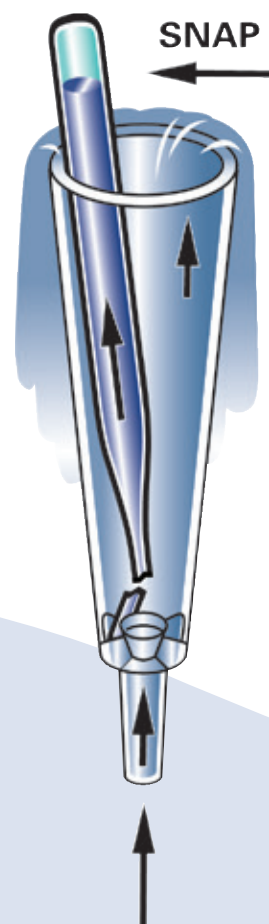
Test kits for environmental and drinking water applications (ppm range) employ the indigo carmine method. The reduced form of indigo carmine reacts with D.O. to form a blue product. The indigo carmine methodology is not subject to interferences from temperature, salinity, or dissolved gases such as sulfide, 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. ASTM Power Plant Manual, 1<sup>st</sup> ed. p. 169 (1984). ASTM D 5543-15, Low Level Dissolved Oxygen in Water. Department of the Navy, Final Report of NAVSECPHILADIV 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, 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. A video illustrating this sampling procedure is posted on the Dissolved Oxygen analyte page of our website.



## Visual Kits

Range: 0-20 ppb MDL: 2 ppb / Method: Rhodazine D	
<b>ULR CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-40 ppb MDL: 2.5 ppb / Method: Rhodazine D	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-100 ppb MDL: 5 ppb / Method: Rhodazine D	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Range: 5-180 ppb MDL: 5 ppb / Method: Rhodazine D	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-1 ppm MDL: 0.025 ppm / Method: Rhodazine D	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Range: 1-12 ppm MDL: 1 ppm / Method: Indigo Carmine	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.



**WARNING!** These products employing the Rhodazine D method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Instrumental Kits**

**Multi-Analyte Photometers**  
V-2000 / V-3000  
(See page 14 for instrumental features)

Range: 0-1.000 ppm  
Method: Rhodazine D

	Cat#
Vacu-vials Kit	K-7553
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 and instructions.	

Range: 0-15.0 ppm  
Method: Indigo Carmine

	Cat#
Vacu-vials Kit, Shelf life 18 months	K-7513
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

**SAM Single Analyte Photometers**  
(See page 16 for instrumental features)

Range: 0-15.0 ppm  
Method: Indigo Carmine

	Cat#
SAM Kit	I-2002
Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank and instructions, Shelf life 18 months	
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.	

**Components and Accessories**

Description	Cat#
Comparator Light Source (CLS)	A-0004
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
* Sample Zeroing Accessory Pack	A-0503

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

**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, 23rd ed., Method 4500-CI G - 2000.

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. Hoigné, Determination of Ozone in Water by the Indigo Method, Water Research Vol. 15, pp. 449-456, 1981. APHA Standard Methods, 23rd ed., Method 4500-O<sub>3</sub> B - 1997.

With the indigo method, indigo trisulfonate dye immediately reacts with ozone. The color of the blue dye decreases in intensity in proportion to the amount of ozone present in the sample. The test reagent is formulated with malonic acid to prevent interference from up to at least 10 ppm chlorine. Results are expressed as ppm (mg/L) O<sub>3</sub>.

The CHEMetrics Ozone (indigo) Vacu-vials Kit employs an innovative "self-zeroing" feature to eliminate the need to generate a reagent blank. Each Vacu-vials ampoule is measured before and after being snapped in sample. The change in color intensity, measured in absorbance, between reagent in the unsnapped and snapped ampoule is used to determine the ozone concentration of the sample.

**Visual Kit**

Range: 0-0.60 & 0.6-3.0 ppm  
MDL: 0.025 ppm / Method: DPD

	Cat#
CHEMetrics Kit	K-7404
CHEMetrics Refill, 30 ampoules	R-7404
Activator Solution Pack, six 10 mL bottles	A-7400 <sup>1</sup>
Low Range Comparator 0, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60 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 and instructions.

**Instrumental Kits**

**Multi-Analyte Photometers**  
V-2000 / V-3000  
(See page 14 for instrumental features)

Range: 0-5.00 ppm  
Method: DPD

	Cat#
Vacu-vials Kit	K-7423
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

**SAM Single Analyte Photometer**  
(See page 16 for instrumental features)

Range: 0-0.75 ppm  
Method: Indigo

	Cat#
SAM Kit	I-2022
Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank and instructions. Shelf life 12 months.	
K-7423	
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, certificate and instructions.	

Range: 0-5.00 ppm  
Method: DPD

	Cat#
SAM Kit	I-2019
Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	
K-7423	
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.	

**Components and Accessories**

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0025

\* For use when testing colored or turbid samples. See page 13 for details.

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

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

**WARNING!** The product employing the Rhodazine D method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).



## 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: APHA Standard Methods Online, Method 4500-PAA - 2019.

In the Peracetic Acid DPD test method, the sample is treated with an excess of potassium iodide. Peracetic acid oxidizes iodide to iodine. The iodine then 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, and cupric ions will produce high test results. Hydrogen peroxide does not interfere if present at levels comparable to the peracetic acid levels.



## Visual Kit

Range: 0-1 & 0-5 ppm MDL: 0.05 ppm / Method: DPD	
<b>CHEMets Kit</b>	<b>Cat# K-7904</b>
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 0, 1.0, 1.5, 2.0, 2.6, 3.2, 3.8, 4.4, 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 and instructions.	

Range: 0-30 & 0-150 ppm MDL: 3 ppm / Method: DPD	
<b>VACUettes Kit</b>	<b>Cat# K-7904D</b>
VACUettes Refill, 30 ampoules	R-7904D
Activator Solution Pack, six 10 mL bottles	A-7900
Low Range Comparator 0, 3, 6, 10, 15, 20, 25, 30 ppm	C-7902D
High Range Comparator 0, 30, 50, 70, 85, 100, 115, 130, 150 ppm	C-7904D
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, and instructions.	

Range: 0-70 & 0-300 ppm MDL: 7 ppm / Method: DPD	
<b>VACUettes Kit</b>	<b>Cat# K-7904A</b>
VACUettes Refill, 30 ampoules	R-7904A
Activator Solution Pack, six 10 mL bottles	A-7900
Low Range Comparator 0, 7, 15, 25, 35, 45, 55, 70 ppm	C-7902A
High Range Comparator 0, 70, 90, 130, 165, 200, 230, 265, 300 ppm	C-7904A
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, and instructions.	

Range: 0-130 & 0-600 ppm MDL: 15 ppm / Method: DPD	
<b>VACUettes Kit</b>	<b>Cat# K-7904B</b>
VACUettes Refill, 30 ampoules	R-7904B
Activator Solution Pack, six 10 mL bottles	A-7900
Low Range Comparator 0, 15, 30, 45, 65, 85, 105, 130 ppm	C-7902B
High Range Comparator 0, 130, 180, 250, 315, 380, 450, 515, 600 ppm	C-7904B
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, and instructions.	

Range: 0-1200 & 0-6000 ppm MDL: 120 ppm / Method: DPD	
<b>VACUettes Kit</b>	<b>Cat# K-7904C</b>
VACUettes Refill, 30 ampoules	R-7904C
Activator Solution Pack, six 10 mL bottles	A-7900
Low Range Comparator 0, 120, 240, 360, 540, 720, 960, 1200 ppm	C-7902C
High Range Comparator 0, 1200, 1800, 2400, 3100, 3800, 4400, 5200, 6000 ppm	C-7904C
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, and instructions.	

## Instrumental Kits

### Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)

Range: 0-5.00 ppm Method: DPD	
<b>Vacu-vials Kit</b>	<b>Cat# K-7913</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 and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

### SAM Single Analyte Photometer (See page 16 for instrumental features)

Range: 0-5.00 ppm Method: DPD	
<b>SAM Kit</b>	<b>Cat# I-2020</b>
Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	
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.	

### Components and Accessories

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
* Sample Zeroing Accessory Pack	A-0025
Peracetic Acid Standard (1 ppm)	A-7925

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

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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 ( $\text{Na}_2\text{S}_2\text{O}_8$ ).

*Note: For the analyst in need of an instrumental test, CHEMetrics hydrogen peroxide Vacu-vials® kit K-5543 can be used to measure sodium persulfate. Simply follow the K-5543 test procedure and multiply peroxide test results by 7 to convert to ppm sodium persulfate.*



## Visual Kit

<b>Range: 0-5.6 &amp; 7-70 ppm as <math>\text{Na}_2\text{S}_2\text{O}_8</math></b> MDL: 0.35 ppm / Method: Ferric Thiocyanate	
<b>CHEMetrics Kit</b>	<b>Cat# K-7870</b>
CHEMetrics Refill, 30 ampoules	R-7870
Low Range Comparator 0, 0.7, 1.4, 2.1, 2.8, 3.5, 4.2, 5.6 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 and instructions.	

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

**WARNING!** This product can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

## 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.

**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 (electrodes 6 months)

## Instrument

<b>Range: -1.00-15.00 pH Units</b>	
<b>pH Double Junction Meter</b>	<b>Cat# I-1000</b>
Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.	

Components and Accessories	
Description	Cat#
Electrode for pH Meter, Warranty 6 months	A-0174
pH Singles buffer solution assortment (5 ea), 4.0, 7.0, 10.0, and rinse, Shelf life 3 months	A-0175

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 shut-off
- For harsh applications

Instruments are manufactured and guaranteed by Oakton Instruments, Inc.



## 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, 23<sup>rd</sup> ed., Method 5530 D-2010. 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.

## Visual Kits

Range: 0-1 & 0-12 ppm MDL: 0.05 ppm / Method: 4-Aminoantipyrine	
<b>CHEMets Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-30 & 0-350 ppm MDL: 5 ppm / Method: 4-Aminoantipyrine	
<b>VACUettes Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-60 & 0-700 ppm MDL: 10 ppm / Method: 4-Aminoantipyrine	
<b>VACUettes Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-120 & 0-1400 ppm MDL: 20 ppm / Method: 4-Aminoantipyrine	
<b>VACUettes Kit</b>	<b>Cat# 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 and instructions.	

Range: 0-1000 & 0-13000 ppm MDL: 100 ppm / Method: 4-Aminoantipyrine	
<b>VACUettes Kit</b>	<b>Cat# 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 and instructions.	

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

## Instrumental Kits

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-8.00 ppm Method: 4-Aminoantipyrine	
<b>Vacu-vials Kit</b>	<b>Cat# K-8003</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

Range: 0-20.0 ppm Method: 4-Aminoantipyrine	
<b>Vacu-vials Kit</b>	<b>Cat# K-8023</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

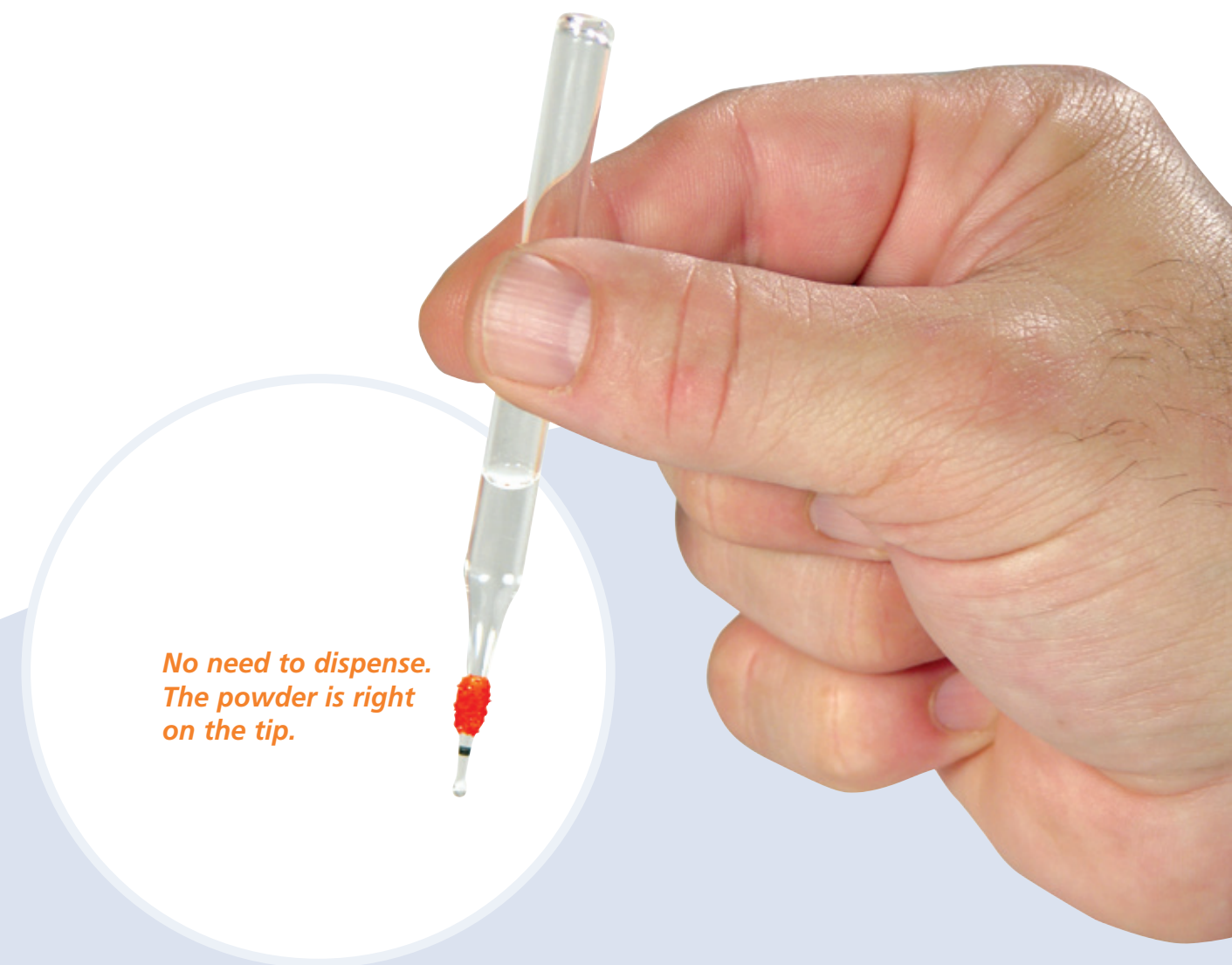
Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

Components and Accessories	
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
* Sample Zeroing Accessory Pack	A-0503
* Sample Zeroing Accessory Pack	A-0504

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



No need to dispense.  
The 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.

Accurate measurement of phosphate residuals in boilers and cooling towers is vital for monitoring corrosion inhibitor levels. 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, 23<sup>rd</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, 23<sup>rd</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	
<b>CHEMets Kit</b>	<b>Cat# K-8510</b>
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 and instructions.	

Range: 2-30 ppm MDL: 2 ppm / Method: Vanadomolybdophosphoric Acid	
<b>CHEMets Kit</b>	<b>Cat# K-8530</b>
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 and instructions.	

Range: 0-120 ppm MDL: 5 ppm / Method: Vanadomolybdophosphoric Acid	
<b>CHEMets Kit</b>	<b>Cat# K-8515</b>
CHEMets Refill, 30 ampoules	R-8515
Comparator 0, 10, 20, 30, 40, 60, 80, 100, 120 ppm	C-8515
Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup and instructions.	

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.

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 and instructions.	

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 and instructions.	

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 and instructions.	

<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 and instructions.	



## Instrumental Kits

### Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)

Range: V-2000: 0-8.00 ppm; V-3000/Spec: 0-5.00 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 and instructions.	

Range: 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 and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

### Components and Accessories

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
* Sample Zeroing Accessory Pack	A-0503

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.



## 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, 23<sup>rd</sup> ed., Method 4500-SiO<sub>2</sub> D - 1997. 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 18 months	R-9011
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 and instructions.	

<b>Range: 0-1 &amp; 1-10 ppm</b> MDL: 0.05 ppm / Method: Heteropoly Blue	
<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, Shelf life 18 months 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 and instructions.	

## Instrumental Kit

### Multi-Analyte Photometers V-2000 / V-3000

(See page 14 for instrumental features)

**Range: 0-10.00 ppm / Spec: 0-4.00 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 and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

### Components and Accessories

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
* Sample Zeroing Accessory Pack	A-0503

<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.

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

## 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 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 Kit

### Multi-Analyte Photometers V-2000 / V-3000

(See page 14 for instrumental features)

**Range: 0-100.0 ppm**  
Method: Turbidimetric

	Cat#
<b>Vacu-vials Kit</b>	<b>K-9203</b>
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 and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

### Components and Accessories

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

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



## 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, 23<sup>rd</sup> ed., Method 4500-S<sup>2</sup>-D-2000.**

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	
<b>CHEMetrics Kit</b>	<b>Cat# K-9510</b>
CHEMetrics 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 and instructions.	

Range: 0-30 & 30-300 ppm MDL: 2 ppm / Method: Methylene Blue	
<b>VACUettes Kit</b>	<b>Cat# 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, 2, 4, 6, 10, 15, 20, 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 and instructions.	

*Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.*

Range: 0-60 & 60-600 ppm MDL: 4 ppm / Method: Methylene Blue	
<b>VACUettes Kit</b>	<b>Cat# 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, 4, 8, 12, 20, 30, 40, 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 and instructions.	

Range: 0-120 & 120-1200 ppm MDL: 7.5 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, 7.5, 15, 25, 40, 60, 80, 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 and instructions.	

Range: 0-1200 & 1200-12,000 ppm MDL: 75 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, 75, 150, 250, 400, 600, 800, 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 and instructions.	

## Instrumental Kits

Multi-Analyte Photometers V-2000 / V-3000 (See page 14 for instrumental features)	
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Range: 0-3.00 ppm / Spec: 0-1.00 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 and instructions.	

Range: 0-6.00 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 and instructions.	

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

Components and Accessories	
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
* Sample Zeroing Accessory Pack	A-0503
* Sample Zeroing Accessory Pack	A-0504

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

\*For use when testing colored or turbid samples. See page 13 for details.

*Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.*



## 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, 23<sup>rd</sup> ed., Method 4500-SO<sub>3</sub><sup>2-</sup>-B-2000. 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. Sulfamic acid is added to the sample to prevent interference from nitrite. 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, 23<sup>rd</sup> ed., Method 4500-SO<sub>3</sub><sup>2-</sup>-B-2000. 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 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

<b>Range: 2-20 ppm as SO<sub>3</sub></b> MDL: 2.0 ppm / Method: Iodometric	
<b>Sulfite Titrets Kit</b>	<b>Cat# K-9602</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 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 and instructions.	

<b>Range: 5-50 ppm as SO<sub>3</sub></b> MDL: 5.0 ppm / Method: Iodometric	
<b>Sulfite Titrets Kit</b>	<b>Cat# K-9605</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, Neutralizer Solution, titrettor, 25 mL sample cup and instructions.	

<b>Range: 10-100 ppm as SO<sub>3</sub></b> MDL: 10 ppm / Method: Iodometric	
<b>Sulfite Titrets Kit</b>	<b>Cat# K-9610</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, Neutralizer Solution, titrettor, 25 mL sample cup and instructions.	

<b>Range: 50-500 ppm as SO<sub>3</sub></b> MDL: 50 ppm / Method: Iodometric	
<b>Sulfite Titrets Kit</b>	<b>Cat# K-9650</b>
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 and instructions.	

<b>Range: 10-100 ppm as SO<sub>2</sub></b> MDL: 10 ppm / Method: Ripper	
<b>Sulfite in Wine Titrets Kit</b>	<b>Cat# K-9610W</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 10 tests: ten ampoules, ten valve assemblies and instructions.	

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

Instructions and SDSs are posted on our website.  
If no shelf life is listed for a product, then the shelf life is at least 1 year.



### 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, 23<sup>rd</sup> ed., Method 3500-Zn B-1997. 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 8-month shelf life. We recommend stocking quantities that will be used within 7 months.



### Instrumental Kits

#### Multi-Analyte Photometers

V-2000 / V-3000

(See page 14 for instrumental features)

**Range: 0-3.00 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 up to 29 tests (except distilled water): thirty ampoules, Indicator Solution, 25 mL sample cup, ampoule blank and instructions.

**Range: 0-15.0 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 up to 29 tests (except distilled water): thirty ampoules, Indicator Solution, 25 mL sample cup, 10 mL syringe, ampoule blank and instructions.

*Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.*

#### Components and Accessories

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 10 mL (6 ea)	A-0104
* Sample Zeroing Accessory Pack	A-0503

\* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.



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**Patents** CHEMets, Titrets, ULR CHEMets, Vacu-vials, and VACUettes are covered by U.S. patents 3,634,038, 4,332,769, 4,537,747, and 4,596,780.

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