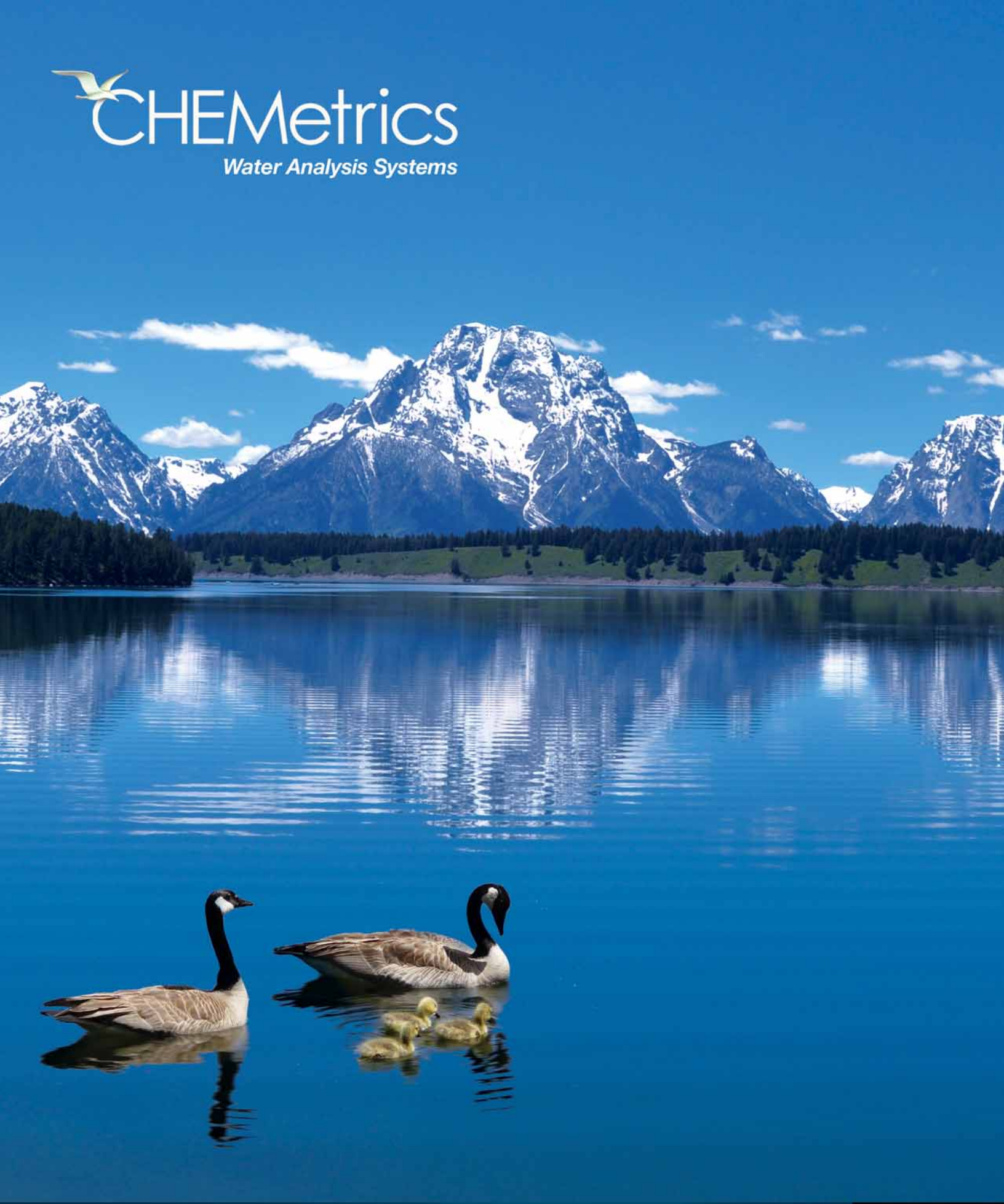
CHEMetrics

Water Analysis Systems



PRODUCT CATALOG

2014
2015

Contents

Analytical Methods

Cover: Jackson Lake in Grand Teton National Park. Photo by Gordon Rampy.

Company Introduction

No More Problems With Solutions.

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

No Mixing. No Measuring. No Mess.

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

Fewer Steps Means Fewer Errors.

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

Safer Testing.

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

Portable & Refillable.

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

Our Reputation Is Your Greatest Assurance.

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

Shelf-life.

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

Better Water Testing Is A Snap

Dear Analyst,

Since 1969 CHEMetrics has delivered faster, simpler, and safer solutions for professional water analysis. As we approach our 45th anniversary we remain dedicated to advancing that proud tradition.

Today our water testing systems undergo rigorous and meticulous scrutiny by our quality assurance staff. These careful measures are yielding even higher levels of product quality and dependability, which means you can expect accurate and reliable results each and every time. Yet the real beauty of our products is the simplicity and ease of use. So whether you are in the laboratory or the field—and whether you are testing a single sample or dozens—CHEMetrics will save you more time and make the process more convenient.

Our excellent customer service also makes your life easier. Our knowledgeable, courteous technical support staff is just a phone call or email away. Our professionals are eager to provide helpful answers and to solve your testing problems promptly. In fact, if one of our standard products does not meet your needs, our team will collaborate with you to develop a customized testing system that will work for you.

We realize that you have many options for your water testing needs. That is why we work so hard to be your supplier of choice. So put us to the test. Give us an opportunity to deliver the best combination of innovation and service. We believe that you, too, will become a long-term, satisfied customer.

In the end, you can count on CHEMetrics for simplicity, service, and satisfaction. Guaranteed. To explore a new solution for your company just call us at 1-800-356-3072 or email info@chemetrics.com.

Sincerely,

Gordon A. Rampy,
Chairman, CHEMetrics, Inc.

CHEMetrics Management

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

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

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

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

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

From Center:
Gordon A. Rampy *Chairman*
Teresa Neale *Vice President of Operations and Product Support*
Bruce H. Rampy *President*
Henry B. Castañeda *Vice President of Marketing and Technology*

Like Water, We Cover The Globe.

Our products are sold around the world by distributors under contract to CHEMetrics. Contact our International Business Manager, Shirley Ward, for more information on distribution in the following countries: Argentina, Austria, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Ecuador, 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, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom, Vietnam, West Indies.

Industries & Applications

POWER GENERATION

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

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

PETRO/CHEMICAL INDUSTRY

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

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

ENVIRONMENTAL/EDUCATION

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

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

Industries & Applications

WATER/WASTEWATER

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

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

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

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

PULP AND PAPER

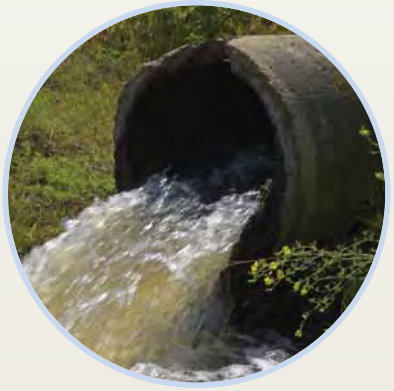
The primary applications for CHEMetrics products in pulp and paper plants are in boiler/cooling water and wastewater/effluent water treatment. Since water is used in nearly every mill operation, this industry also requires analytical products for processes including bleaching, cooking and washing, pulp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

Alkalinity
Ammonia
Chlorine
COD
DEHA
Dissolved Oxygen
Formaldehyde
Hydrogen Peroxide
Hydrazine
Nitrate
Nitrite
Phenols
Phosphate
Silica
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
Bromine
Chlorine
Chlorine Dioxide
COD
Dissolved Oxygen
Formaldehyde
Glycol
Hardness
Hydrogen Peroxide
Iron
Nitrate
Nitrite
Ozone
Peracetic Acid
Phenols
QAC's
Sulfate
Sulfite
Thiosulfate
Zinc



Visual Colorimetric Analysis

The CHEMets® Method

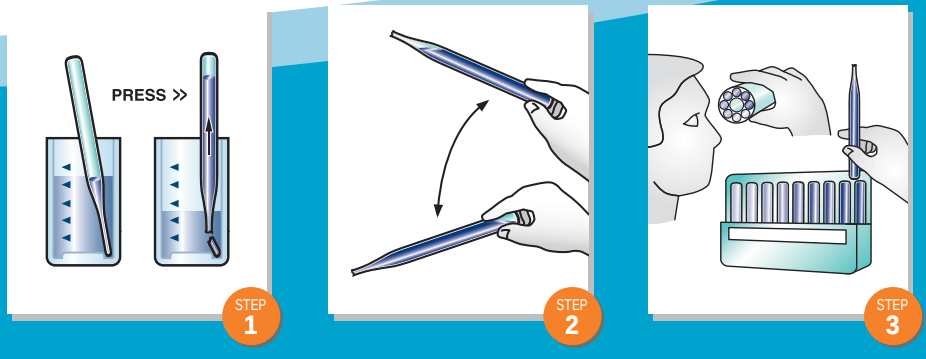
To perform a test, immerse the CHEMet™ ampoule into the sample and snap off the tip (Step 1)—the correct volume of sample is automatically drawn in, filling the ampoule; a small inert gas bubble remains in the ampoule. To facilitate mixing the sample and reagent, tilt the ampoule back and forth so the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

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

Most comparators have a 2-year shelf-life.

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

The CHEMets Test Procedure



Instrumental Colorimetric Analysis

The Vacu-vials® Method

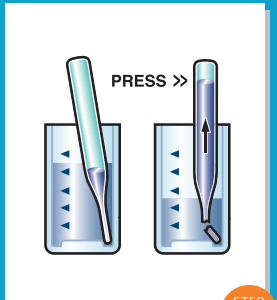
The sampling method is the same as the CHEMets method (Steps 1 & 2), but rather than comparing results visually, the user places the filled ampoule in the cell holder of an instrument set to a wavelength for optimal absorbance (Step 3). If you use a spectrophotometer that reads absorbance, the absorbance 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 webiste. Direct-reading instruments are available (pages 14-15,17).

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

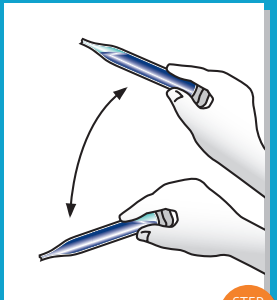
Designed with the same technology as the CHEMets ampoules, the Vacu-vials ampoules are 13 mm in diameter with a tapered, pre-scored tip; color forming reagents are vacuum-sealed inside.

View instructional videos on our website at www.chemetrics.com

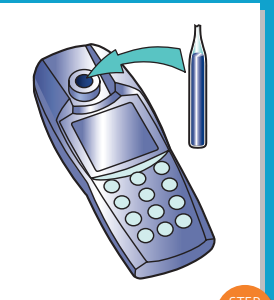
The Vacu-vials Test Procedure



STEP 1



STEP 2



STEP 3

High Range Visual Colorimetric Analysis

The VACUettes® Auto-Dilution Method

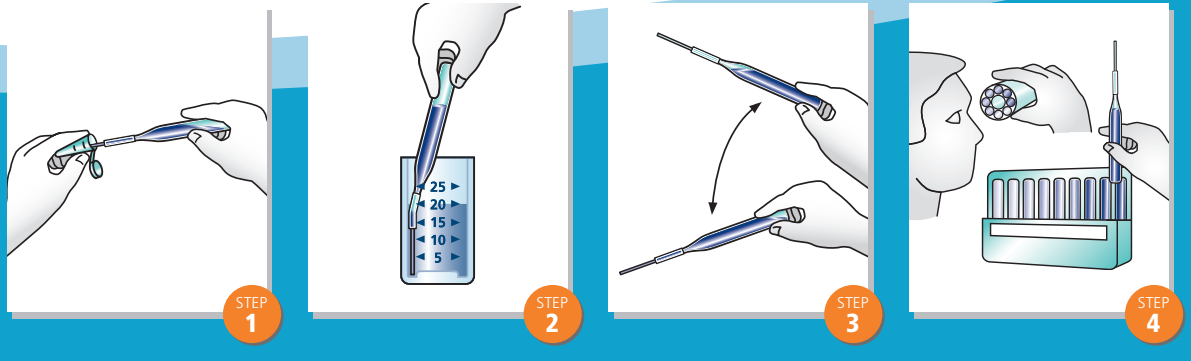
Hold the ampoule in a horizontal position while the capillary tip contacts the sample (Step 1). After the capillary fills, immerse it in a diluent (usually deionized water); snap the tip off the ampoule (Step 2). The sample and diluent are drawn into the ampoule where they mix with the reagent (Step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

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

Most comparators have a 2-year shelf-life.

VACUettes ampoules are designed for highly concentrated samples. They employ a patented auto-dilution feature that eliminates the need for a time-consuming and error-prone preliminary dilution. As a result, the entire test typically takes only 2 to 3 minutes, with a rate of accuracy comparable to a volumetric procedure. The basic design of these 7 mm ampoules is the same as CHEMets ampoules, however, a capillary tip is attached to the tip of each ampoule.

The VACUettes Test Procedure



Titrimetric Analysis

The Titrets® Method

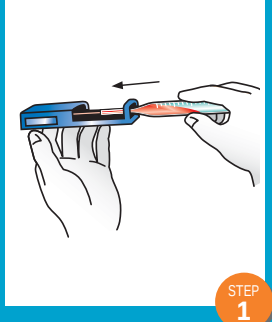
Titrets ampoules use *reverse titration* to quantify concentrations. After snapping the ampoule tip, the sample is drawn into the ampoule in small doses (with the Titrettor™ device included in each kit that precisely controls the sample) (Step 1), until a color change signals that the equivalence point has been reached (Step 2). The titration is stopped at the end point and the ampoule is held upright. The liquid level will correspond to a printed scale on the ampoule's outer surface (Step 3).

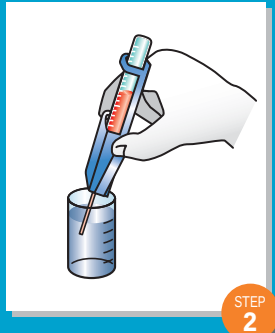
Kits include 30 ampoules with valve assemblies, a titrettor, accessory solution(s) (when necessary), a sample cup, and instructions.

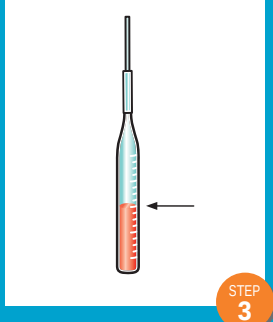
Each Titret™ ampoule is 13 mm in diameter and is designed for titrimetric analysis. The ampoule contains vacuum-sealed liquid titrant and has a flexible valve assembly attached.

View instructional videos on our website at www.chemetrics.com

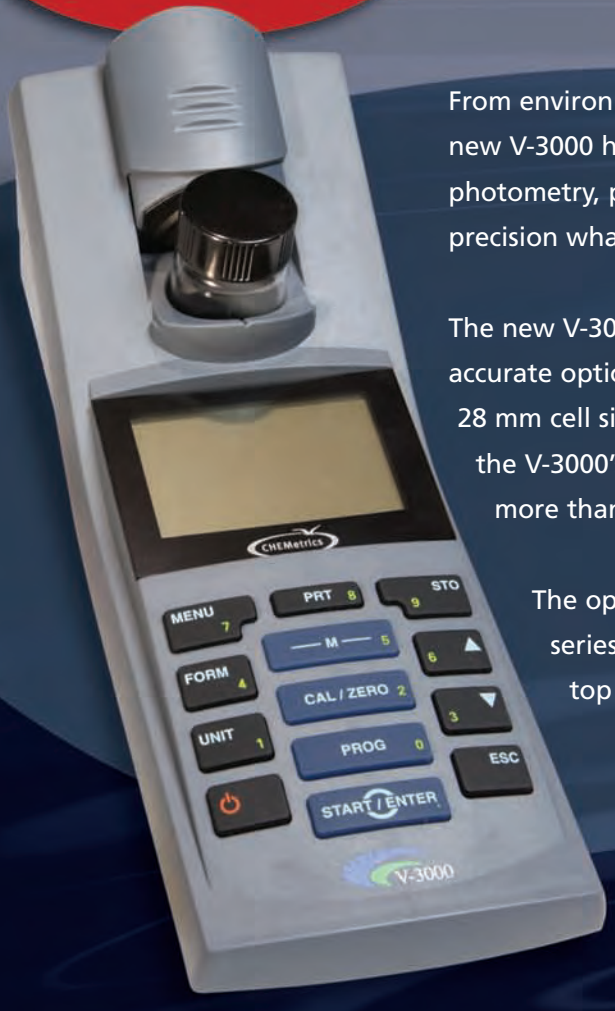
The Titrets Test Procedure







NEW! V-3000 Multi-Analyte Photometer Series



From environmental monitoring to routine water treatment, CHEMetrics' new V-3000 handheld photometer series offers the unique combination of photometry, pH and turbidity measurement for water analysis with utmost precision whatever the application.

The new V-3000, V-3000 Pro and V-3000 Turb photometers offer robust and accurate optics combining precision with universal flexibility (13 mm, 16 mm, 28 mm cell sizes). Equipped with six wavelengths and many other features, the V-3000's simple menu-driven operation allows the analyst to select from more than 50 pre-programmed tests. See page 14 for details.

The optional PowerLab Station takes the V-3000 series from an outdoor laboratory to a bench top solution all in one instrument.

Insert the 13 mm adapter and run Vacu-vials® methods for more than 50 water quality parameters.

Flip up the 16 mm adapter and run reagent vial methods such as COD, Total Phosphate and others.

Slide open the 28 mm sample compartment and run *MDL*+ methods such as Fluoride and others.

V-3000

Multi-Analyte Photometer

- 50+ factory calibrations
- Large easy to read LCD display
- Web-based methods update
- Data logging storage for 100 data sets
- Language selections: English, German, French, Spanish

V-3000 Turb

Multi-Analyte Photometer plus pH, ORP, and Turbidity

- 0-1100 NTU/FNU
- AMCO Clear® Calibration Standards
- Data logging storage for 1000 data sets
- Infrared light source

V-3000 Pro

Multi-Analyte Photometer plus pH and ORP

- Automatic temperature compensation
- Automatic buffer recognition
- Accepts up to three pH calibration points
- Data logging storage for 1000 data sets

NEW! Arsenic-free SPADNS Reagent Fluoride Kit for Drinking Water

New Instrumental Test Kit using MDL+ Ampoules

CHEMetrics' new Fluoride Test Kit (K-4009), range 0-3.00 ppm, utilizes our *MDL+* double-point reagent ampoules to offer the analyst measurement versatility. A truly platform independent system, the Fluoride *MDL+* Kit can be used with the new V-3000 Multi-Analyte Photometer, our Single Analyte Meter (SAM), or any instrument with a cell size up to 50 mm. See page 40 for details. Monitoring and maintaining optimum fluoride levels in drinking water is essential for assuring effectiveness and safety.

- ***Arsenic-free SPADNS method***
- ***Works with most instruments***
- ***Fast, easy and accurate***
- ***Obtain results in less than two minutes***

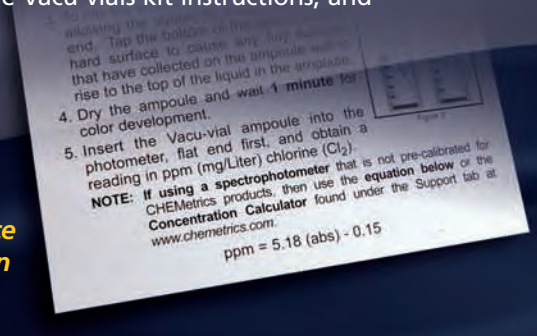
Snap tip to dispense liquid into sample cell.

Sample Dilution Kit

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

Use of Vacu-vials® Kits with Spectrophotometers

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.


4. Dry the ampoule and wait 1 minute for color development.
5. Insert the Vacu-vial ampoule into the photometer, flat end first, and obtain a reading in ppm (mg/Liter) chlorine (Cl_2).
NOTE: If using a spectrophotometer that is not pre-calibrated for CHEMetrics products, then use the **equation below** or the **Concentration Calculator** found under the Support tab at www.chemetrics.com.
ppm = 5.18 (abs) - 0.15

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.

CHEMetrics Products for Food & Beverage Industry

Aseptic Packaging

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

Custom Private Label and OEM Product Configurations also available.

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

V-3000 Photometer Series...the next generation

Multi-Analyte Photometers for Water Analysis

Introducing CHEMetrics' new handheld, portable V-3000 Photometer Series offering cutting edge technology for applications in the field and in the laboratory. Intuitive and easy to use, the menu guides the analyst through all measuring tasks, and allows a quick and easy selection of 50+ pre-programmed analytes employing CHEMetrics Vacu-vials® ampoules, COD Vials and new *MDL*+ test kits.

Additionally, the V-3000 Photometer Series offers the unique capability of full integration of pH, ORP and Turbidity making these instruments the perfect partner in the field. The optional PowerLab Station upgrades the portable V-3000 Series to a full laboratory solution all in one instrument.

Optional Accessories for V-3000 Series

A-0300	Turbidity Standards (for use with V-3000T)
A-0301	Data Management Software
A-0302	PowerLab Station
A-0303	pH Electrode (for use with V-3000P & V-3000T)
A-0304	ORP Electrode (for use with V-3000P & V-3000T)
A-0305	USB Cable Adapter (also for V-2000 use)

V-2000 Photometer

Packed with features, the field-portable V-2000 Photometer automatically tests 50+ pre-programmed analytes employing CHEMetrics Vacu-vials® ampoules and COD vials.

Specifications & Features

	V-2000 Photometer	V-3000 Photometer Series
Instrument Applicability	Portable	Portable / Benchtop
Display	LCD	Graphics / Backlit
Control Auto Shutoff	No	Yes
Power Supply Options	Battery	Battery Rechargeable Battery* Universal Cable / Plug*
Wavelengths (nm)	420, 520, 580, 610	436, 517, 557, 594, 610, 690
Data Interface Software	No	Yes
Cell Size	13 mm, 16 mm	13 mm, 16 mm, 28 mm
Language Selection	No	Yes: English, German, French, Spanish
New Methods Availability	No	Yes
Web-based Methods Update	Yes	Yes
pH/ORP Measurement	No	V-3000P and V-3000T only
Turbidity Measurement	No	V-3000T only
Waterproof	IP67	IP67
Operating Temperature	0 to 45° C	0 to 50° C
Data Logging	100 points	100 points (V-3000), 1000 points (V-3000P, V-3000T)
Warranty	2 years	2 years

*Requires purchase of PowerLab Station (A-0302)

Catalog No.		Catalog No.	
V-2000	Multi-Analyte Photometer	**V-3000P**	Multi-Analyte Photometer (+ pH and ORP)
V-3000	Multi-Analyte Photometer	**V-3000T**	Multi-Analyte Photometer (+ pH, ORP, and Turbidity)

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
V-3000P
V-3000T

Soft-and hard-sided cases are available for photometers and reagents.

See Application Guide for details.

		Range, ppm	
Analyte	**Cat. No.**	**V-2000**	**V-3000 Series**
Aluminum	K-0603	0-0.25	0-0.25
Ammonia	K-1403	0-30.0	0-30.0
*Ammonia	K-1503	0-7.00	0-7.00
*Ammonia	K-1523	0-14.0	0-14.0
Bromine	K-1613	0-12.00	0-12.00
Carbohydrazide	K-1803	0-2.50	0-2.50
*Chloride	K-2103	0-40.0	0-40.0
Chlorine, free & total ***USEPA Accepted***	K-2513	0-5.00	0-5.00
Chlorine, free ***USEPA Accepted***	K-2523	0-5.00	0-5.00
Chlorine Dioxide	K-2703	0-11.00	0-11.00
Chromate	K-2803	0-3.50	0-3.50
*COD LR, ***USEPA Accepted***	K-7350S, K-7355	0-150	0-150
COD LR, ***Mercury Free***	K-7351S, K-7356	0-150	0-150
*COD HR, ***USEPA Accepted***	K-7360S, K-7365	0-1500	0-1500
COD HR, ***Mercury Free***	K-7361S, K-7366	0-1500	0-1500
*COD HR+,	K-7370S, K-7375	0-15,000	0-15,000
COD HR+, ***Mercury Free***	K-7371S, K-7376	0-15,000	0-15,000
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
Detergents	R-9423	N/A	0-2.50
Fluoride	K-4009	N/A	0-3.00
Formaldehyde	K-4203	0-8.00	0-8.00
Glycol (as ethylene glycol)	K-4403	0-10.00	0-10.00
Glycol (as propylene glycol)	K-4403	0-20.00	0-20.00
Glycol (as propylene glycol)	K-4423	0-65.0	0-65.0
Glycol (as ethylene glycol)	K-4423	0-32.5	0-32.5
Hydrazine	K-5003	0-1.20	0-1.20
Peroxide	K-5513	0-3.00	0-3.00
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
Iron, total & soluble	K-6013	0-25.0	0-25.0
Manganese	K-6503	0-30.0	0-30.0
Molybdate (as Mo)	K-6703	0-25.0	0-25.0
Nitrate (as N)	K-6913	0-1.00	0-1.00
Nitrate (as N)	K-6903	0-1.50	0-1.50
Nitrate (as N)	K-6923	0-3.00	0-3.00
Nitrate (as NO_3)	K-6933	0-50.0	0-50.0
Nitrite (as N)	K-7003	0-0.800	0-0.800
Ozone	K-7423	0-5.00	0-5.00
Oxygen	K-7553	0-1.000	0-1.000
Oxygen	K-7503	0-2.00	0-2.00
Oxygen	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_4)	K-8513	0-8.00	0-5.00
Phosphate, ortho (as PO_4)	K-8503	0-80.0	0-80.0
Phosphate, Total (as P)	K-8540	0-2.30	0-2.30
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	0-6.00	0-6.00

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

Water Industry Application Guide

Create-A-Lab by purchasing a CHEMetrics handheld Multi-Analyte Photometer and any number of test kits. CHEMetrics gives you the freedom to tailor your lab with whatever you need for your application.

The V-2000 and the *New* V-3000 Series Photometers are field portable, lightweight, tough, and waterproof. Reading concentration, absorbance, or percent transmittance, these versatile instruments store up to 100 data points with date/time tags that can be downloaded to a computer. **See pages 14-15 for details.**

V-2000

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

Turbidity and pH features are available with the *New* V-3000 Series Photometers.

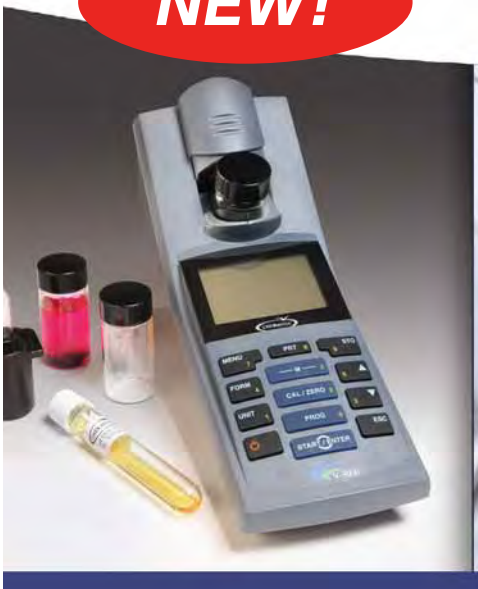
Dedicated meters are also available to measure pH, conductivity, total dissolved solids (TDS), and turbidity.

Simply purchase a V-2000 or V-3000 and use the guide attached to help you choose what test kits and/or dedicated instruments you need. For personalized service, call one of our expert Customer Service Representatives at 1-800-356-3072 to help you get started.

We also offer carrying cases (A-0182 and A-0190) to hold a CHEMetrics Photometer and test kits (order separately).

CHEMetrics
Water Analysis Systems

NEW!


V-3000


V-3000 Pro


V-3000 Turb

CHEMetrics Application Guide *[Create-A-Lab]*

Product	CHEMetrics Method	Range (mg/L = ppm)	CHEMetrics Catalog Number	Number of Tests	Drinking Water	Professional Water Treatment	Wastewater	Catalog Page
Multi-Analyte Photometers V-2000 / V-3000	**LED**	**Multiple (50+)**	**V-2000 / V-3000**	**N/A**	•	•	•	14
Carrying Cases for Photometers & Test Kits	**N/A**	**N/A**	**A-0182 A-0190**	**N/A**	•	•	•	N/A
Alkalinity	Acid Titrant with pH Indicator	10-100 mg/L (as $CaCO_3$)	K-9810	30	•	•		18
		50-500 mg/L (as $CaCO_3$)	K-9815	30	•	•		18
		100-1000 mg/L (as $CaCO_3$)	K-9820	30		•		18
Aluminum	Eriochrome Cyanine R (ECR)	0-0.25 mg/L	K-0603	30	•		•	19
Ammonia	Salicylate	0-30.0 mg/L	K-1403	30	•		•	21
	Nesslerization	0-7.00 mg/L	K-1503	30	•		•	21
Bromine	DPD	0-12.00 mg/L	K-1613	30		•		22
Carbohydrazide	PDTS	0-2.50 mg/L	K-1803	30		•		23
Chemical Oxygen Demand (COD)	Dichromate Reactor Digestion USEPA Accepted	0-150 mg/L	K-7350S	25			•	27
	Dichromate Reactor Digestion, Mercury Free	0-150 mg/L	K-7351S	25			•	27
	Dichromate Reactor Digestion, USEPA Accepted	0-150 mg/L	K-7355	150			•	27
	Dichromate Reactor Digestion, Mercury Free	0-150 mg/L	K-7356	150			•	27
	Dichromate Reactor Digestion, USEPA Accepted	0-1500 mg/L	K-7360S	25			•	27
	Dichromate Reactor Digestion, Mercury Free	0-1500 mg/L	K-7361S	25			•	27
	Dichromate Reactor Digestion, USEPA Accepted	0-1500 mg/L	K-7365	150			•	27
	Dichromate Reactor Digestion, Mercury Free	0-1500 mg/L	K-7366	150			•	27
	Dichromate Reactor Digestion, Not USEPA Accepted	0-15,000 mg/L	K-7370S	25			•	27
	Dichromate Reactor Digestion, Mercury Free	0-15,000 mg/L	K-7371S	25			•	27
	Dichromate Reactor Digestion, Not USEPA Accepted	0-15,000 mg/L	K-7375	98			•	27
	Dichromate Reactor Digestion, Mercury Free	0-15,000 mg/L	K-7376	98			•	27
Chloride	Mercuric Nitrate	20-200 mg/L	K-2020	30	•	•		28
		50-500 mg/L	K-2050	30	•	•		28
		250-2500 mg/L	K-2051	30		•		28
		1000-10,000 mg/L	K-2055	30		•		29
Chlorine, Free & Total	DPD, USEPA Accepted	0-5.00 mg/L	K-2513	30	•	•	•	31
Chlorine Dioxide	DPD	0-11.00 mg/L	K-2703	30	•	•	•	32
Chromium, Hexavalent	Diphenylcarbazide	0-3.50 mg/L	K-2803	30			•	33
Conductivity	Meter (electrode with ATC)	0-2000 μs and 0-20 mS	I-1200	N/A	•	•		34
	Conductivity/TDS Singles	1413 μs	A-0178	N/A	•	•		34
	Conductivity/TDS Singles	15,000 μs	A-0189	N/A	•	•		34
Copper, Soluble	Bathocuproine	0-12.00 mg/L	K-3503	30	•	•	•	35
DEHA	PDTS	0-2.00 mg/L	K-3903	30		•		37
Detergents	Methylene Blue	0-3 mg/L	K-9400	20			•	38
Fluoride *MDL*$^+$	SPADNS (arsenic-free)	V-3000: 0-3.00 mg/L	K-4009	28	•	•	•	40
Glycol	Purpald-Periodate	0-10.00 mg/L as ethylene glycol 0-20.00 mg/L as propylene glycol	K-4403	30		•		45
Hardness	EDTA	2-20 mg/L as $CaCO_3$	K-4502	30		•		46
		20-200 mg/L as $CaCO_3$	K-4520	30	•	•		46
		100-1000 mg/L as $CaCO_3$	K-4585	30	•	•		46
		250-2500 mg/L as $CaCO_3$	K-4530	30		•		46
Hydrazine	PDMAB	0-1.20 mg/L	K-5003	30		•		48
Iron, Total & Soluble	Phenanthroline	0-6.00 mg/L	K-6003	30	•	•	•	54
Manganese	Periodate	0-30.0 mg/L	K-6503	30	•	•	•	55
Molybdate	Catechol	0-25.0 mg/L as Mo	K-6703	30		•		57
Nitrate	Cadmium Reduction	0-1.50 mg/L as N	K-6903	30	•		•	59
		0-3.00 mg/L as N	K-6923	30			•	59
Nitrite	Azo Dye Formation	0-0.800 mg/L as N	K-7003	30	•		•	61
	Ceric Sulfate Titrant w/Ferroin Indicator	250-2500 mg/L as $NaNO_2$	K-7025	30		•		61
		500-5000 mg/L as $NaNO_2$	K-7050	30		•		61
Oxygen, Dissolved	Indigo Carmine	0-2.00 mg/L	K-7503	30		•		64
		0-15.0 mg/L	K-7513	30	•		•	64
pH	Double Junction Meter	-1.00-15.00 pH Units	I-1000	N/A	•	•	•	70
	pH Singles (calibration buffer assortment)	4.0, 7.0, 10.0	A-0175	N/A	•	•	•	70
Phosphate, ortho	Stannous Chloride	V-2000: 0-8.00 mg/L as PO_4	K-8513	30	•		•	74
		V-3000: 0-5.00 mg/L as PO_4	K-8513	30	•		•	74
	Vanadomolybdophosphoric Acid	0-80.0 mg/L as PO_4	K-8503	30		•	•	74
Phosphate, Total	Ascorbic Acid	0-2.30 mg/L as P / 0-7.00 as PO_4	K-8540	50			•	75
Silica	Heteropoly Blue	0-10.00 mg/L	K-9003	30		•		77
Sulfate	Turbidimetric	0-100.0 mg/L	K-9203	30	•			78
Sulfide	Methylene Blue	0-3.00 mg/L	K-9503	30	•		•	80
Sulfite	Iodometric	2-20 mg/L as SO_3	K-9602	30		•		81
		5-50 mg/L as SO_3	K-9605	30		•		81
		10-100 mg/L as SO_3	K-9610	30		•		81
Total Dissolved Solids (TDS)	Electrode with ATC	0-2000 mg/L and 0-10 ppt	I-1100	N/A	•	•		84
	Conductivity/TDS Singles	1413 μs	A-0178	N/A	•	•		84
Turbidity	Meter ISO-7027 (DIN EN 27027)	0-1000 NTU	I-1300	N/A	•	•	•	86
Zinc	Zincon	0-3.00 mg/L	K-9903	30		•	•	87

CHEMetrics optional carrying cases designed for maximum convenience and built to hold a CHEMetrics Photometer and test kits. Choose the CHEMetrics logo canvas carrying bag (A-0190) with detachable shoulder strap, or the durable, black polypropylene carrying case (A-0182).

SAM Single Analyte Meters

SAMs (Single Analyte Meters): Value and Convenience

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

Analyte	Cat. No.	Range (mg/L)	Replacement Kits
Chlorine	I-2001	0-5.00	K-2513
Chlorine Dioxide	I-2005	0-11.0	K-2703
COD Low Range	A-7320	0-150	*K-7350S, K-7351S, *K-7355, K-7356
COD High Range	A-7325	0-1500	*K-7360S, K-7361S, *K-7365, K-7366
COD High Range	A-7325	0-15,000	*K-7370S, K-7371S, *K-7375, K-7376
Detergents	I-2017	0-2.50	R-9423
Fluoride	I-2021	0-3.00	K-4009
Hydrogen Peroxide	I-2016	0-6.00	K-5543
Oxygen	I-2002	0-15.0	K-7513
Ozone	I-2019	0-5.00	K-7423
Peracetic Acid	I-2020	0-5.00	K-7913

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

SAM Specifications & Features

Light Source: Light-emitting diode / interference filter

Optical Paths: 13, 16 and 24 mm light path

Power Source: Battery operated.

Compliance: European CE Mark.

Waterproof: IP68

Warranty: 1 year

See Specific Analyte Pages for Contents of Individual Kits

Methods

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

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

Alkalinity (total)

References: ASTM D 1067-06, Acidity or Alkalinity of Water, Test Method B. APHA Standard Methods, 22nd 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) $CaCO_3$.

Alkalinity (hydrate)

Reference: APHA Standard Methods, 22nd ed., Method 2320 B-1997.

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

For hydrate alkalinity, CHEMetrics developed a titrimetric method that uses a hydrochloric acid titrant with a phenolphthalein indicator. The end point of the titration occurs at pH 8.3. Barium chloride is added to the sample to prevent interference from carbonate and bicarbonate alkalinity. Results are expressed as ppm (mg/L) NaOH.

Visual Kits

Range: 10-100 ppm as $CaCO_3$
MDL: 10 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (total) Titrets Kit	**K-9810**

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

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

Range: 50-500 ppm as $CaCO_3$
MDL: 50 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (total) Titrets Kit	**K-9815**

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

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

Range: 100-1000 ppm as $CaCO_3$
MDL: 100 ppm / Method: Acid Titrant with pH Indicator

	Cat#
Alkalinity (total) Titrets Kit	**K-9820**

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

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

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

	Cat#
Alkalinity (hydrate) Titrets Kit	**K-4710**

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

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

Kit Components common to Alkalinity

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

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

Method

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

The Eriochrome Cyanine R (ECR) Method

References: APHA Standard Methods, 22nd ed., Method 3500-Al B - 2001. Rapid Modified Eriochrome Cyanine R (ECR) Method for Determination of Aluminum in Water, Kenneth E. Shull and Gene R. Guthan, pp 1456-1468, *J. AWWA*, Nov. 1967.

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

Instrumental Kit

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

(See page 14 for instrumental features)

Range: 0-0.25 ppm
Method: Eriochrome Cyanine R (ECR)

	Cat#
Vacu-vials Kit	**K-0603**[1,2]

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

[1] 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.

[2] The Neutralizer Solution is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a limited shelf-life.

Kit Components common to Aluminum

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

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

Methods

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

The Direct Nesslerization Method

References: ASTM D 1426-08, Ammonia Nitrogen in Water, Test Method A. APHA Standard Methods, 18th ed., Method 4500-NH_3 C-1988.

The test kits employing the well-established Nessler reagent* to determine ammonia concentrations are applicable to drinking water, clean surface water, good-quality nitrified wastewater effluent, and seawater. In some waters, calcium and magnesium concentrations can cause cloudiness of the reagent. Adding a few drops of stabilizer solution (Rochelle Salt) will prevent this cloudiness. References recommend distilling samples prior to analysis. Results are expressed as ppm (mg/L) ammonia-nitrogen, NH_3-N.

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

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

The Salicylate Method

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

In the ammonia test method that employs the Salicylate chemistry, free ammonia reacts with hypochlorite to form monochloramine. Monochloramine reacts with salicylate, in the presence of sodium nitro-ferricyanide, to form 5-aminosalicylate, a green-colored complex. This test method measures free ammonia and monochloramine. Results are expressed in ppm (mg/L) ammonia nitrogen, NH_3-N.

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

Visual Kits

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

CHEMets Kit	Cat# *K-1510
CHEMets Refill, 30 ampoules, Shelf-life 5 months	*R-1501[2]
Stabilizer Solution Pack, six 10 mL bottles	A-1500[1]
Stabilizer Solution Pack, six 20 mL bottles	A-1501[1]
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-1501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-1510

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Stabilizer Solutions, 25 mL sample cup, 1.0 mL syringe, and instructions.

Range: 0-20 ppm (up to 10,000 ppm with A-0188 accessory)
MDL: 0.125 ppm / Method: Salicylate

CHEMets Kit	Cat# K-1410
CHEMets Refill, 30 ampoules	R-1401
Activator Solution Pack, six 20 mL bottles, Shelf-life 8 months	A-1400[1]
Catalyzer Solution Pack, six 20 mL bottles	A-1401[1]
Stabilizer Solution Pack, six 10 mL bottles	A-1402
Comparator 0, 0.25, 0.50, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0 ppm	C-1402

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solution, Catalyzer Solution, Stabilizer Solution, 25 mL sample cup, 3.0 mL syringe 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[2]
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.

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

Instrumental Kits

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[2]
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.

Range: 0-120 & 120-1200 ppm
MDL: 20 ppm / Method: Direct Nesslerization

VACUettes Kit	Cat# *K-1510B
VACUettes Refill, 30 ampoules, Shelf-life 5 months	*R-1501B[2]
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

VACUettes Kit	Cat# *K-1510C
VACUettes Refill, 30 ampoules, Shelf-life 5 months	*R-1501C[2]
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.

[1] **The accessory pack supplies enough solution to perform at least 200 tests. A-1501 accessory pack supplies enough solution to analyze approximately 100 seawater samples.**

[2] **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.**

[3] **Not included in kits. Must be purchased separately.**

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

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

Range: 0-7.00 ppm
Method: Direct Nesslerization

	Cat#
Vacu-vials Kit, Shelf-life 2 months	*K-1503[2]

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

Range: 0-14.0 ppm
Method: Direct Nesslerization

	Cat#
Vacu-vials Kit, Shelf-life 2 months	*K-1523[2]

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

Range: 0-30.0 ppm (up to 15,000 ppm with A-0188 accessory)
Method: Salicylate

	Cat#
Vacu-vials Kit, Shelf-life 8 months	K-1403

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

Kit Components common to Ammonia

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Micro Test Tube Pack (10 ea)	A-0015
Dilutor Snapper Cup Pack (6 ea)	A-0018
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
Pipettor Tips (30 ea)	A-0171
Dilution Kit (10X, 125X, 250X, 500X, 1000X, 5000X)	A-0188[3]

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

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, 22nd 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_2.

Visual Kit

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

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

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

Kit Components common to Bromine

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

Instrumental Kits

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

Range: 0-12.00 ppm
Method: DPD

	Cat#
Vacu-vials Kit	**K-1613**

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

Method

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

The PDTS Method

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

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

Visual Kit

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

CHEMets Kit	Cat# K-1805
CHEMets Refill, 30 ampoules	R-1805
Activator Solution Pack, six 10 mL bottles	A-1800
Low Range Comparator 0, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50 ppm	C-1805
High Range Comparator, Shelf-life 12 months 0.5, 0.75, 1.0, 1.25, 1.5, 2.0, 2.5, 3.0, 4.0 ppm	C-1810

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

Instrumental Kit

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

Range: 0-2.50 ppm
Method: PDTS

Vacu-vials Kit	Cat# K-1803

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 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.

Kit Components common to Carbohydrazide

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

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

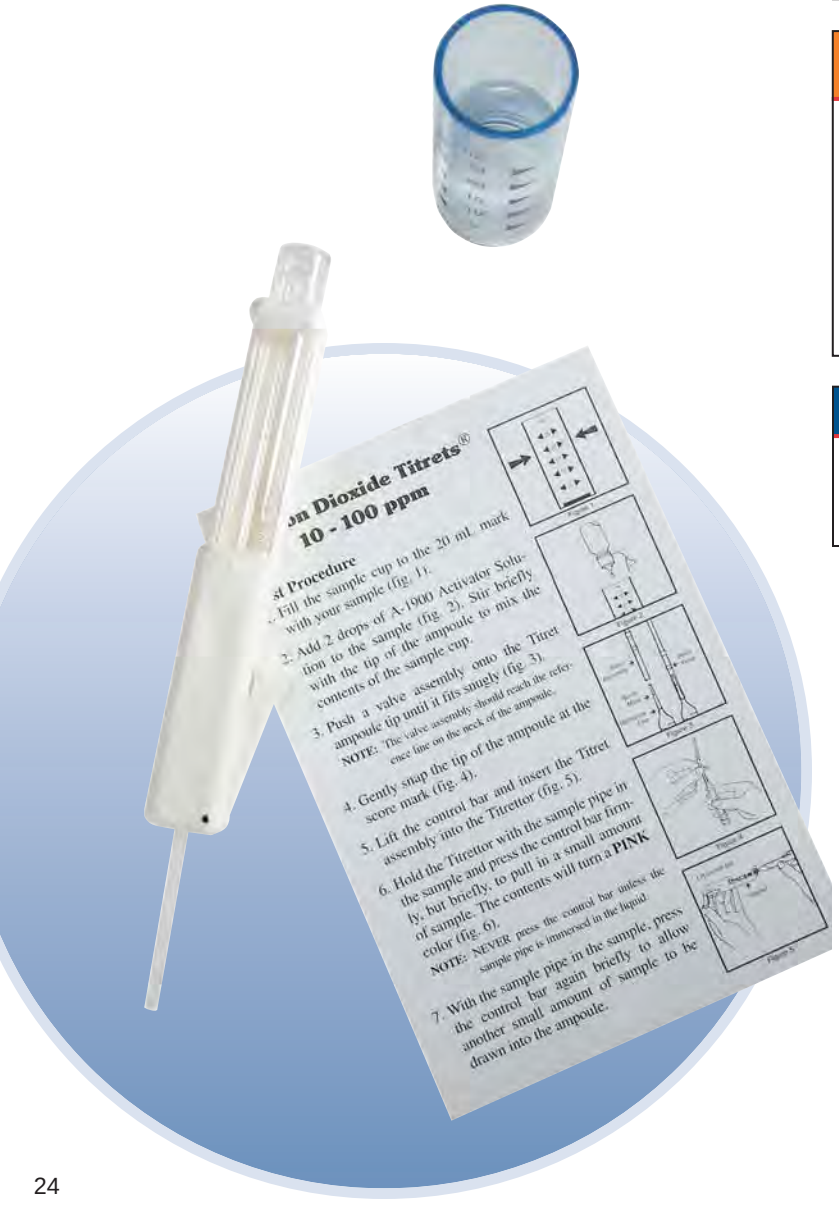
Method

Dissolved carbon dioxide (CO_2) 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_2, while ground waters, particularly if deep, may contain several hundred ppm (mg/L).

The Caustic Titrant with pH Indicator Method

References: APHA Standard Methods, 22nd ed., Method 4500-CO_2 C - 1997. 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_2.



Visual Kits

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

	Cat#
Titrets Kit	**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

	Cat#
Titrets Kit	**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

	Cat#
Titrets Kit	**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.

Kit Components common to Carbon Dioxide

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

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

Come full circle with
CHEMetrics COD

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

COD Reagent Vials*

CHEMetrics Part No.	No. of Tests	Range (ppm)	USEPA Accepted	Hach[1] 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

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

Mercury-free COD Reagent Vials

CHEMetrics Part No.	No. of Tests	Range (ppm)	USEPA Accepted	Hach[1] 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

[1] NOTE: No endorsement by Hach Company is implied or intended.

greenCOD™ Recycling Program

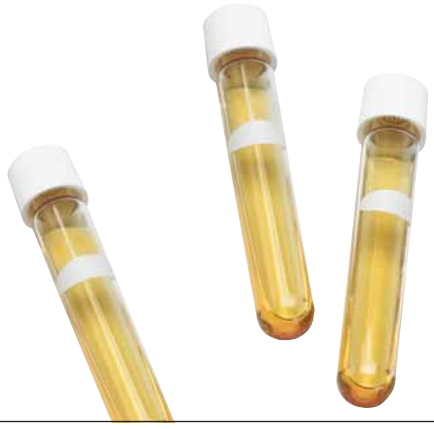
For disposal of CHEMetrics mercury-containing COD Vials. Through our new partnership with U.S. Waste Industries, a full service environmental company, CHEMetrics now offers an easy, economical method to dispose of CHEMetrics used COD Vials, using our new convenient 5-gallon mail-back program.

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

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

Easy 1-2-3 Ordering

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



Methods

USEPA Accepted

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, 22nd 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.

The Dichromate Reactor Digestion Method

CHEMetrics offers two dichromate reactor digestion methods for fast, easy, safe determinations of low-, mid-, and high-range COD levels in wastewater: the USEPA-accepted Method, and a mercury-free method. 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 premeasured 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 digestor block. Once digestion is completed, results are obtained using any photometer that accepts 16-mm diameter cells. CHEMetrics COD vials can be directly used in a CHEMetrics multi-analyte photometer, CHEMetrics' single analyte COD photometers, as well as in Hach[1] spectrophotometers. Built-in Hach COD methods and calibrations can be used without the need for a new calibration. A generic calibration equation is included within the CHEMetrics kit for use with other spectrophotometers.

[1] *NOTE: No endorsement by Hach Company is implied or intended.*

Instrumental Kit

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

	Cat#
COD *(Not USEPA Accepted)* Vials Kit	***K-7340S**

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

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

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

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

	Cat#
COD *(USEPA Accepted)* Vials Kit	***K-7350S**

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

COD *(USEPA Accepted)* Vials Kit	***K-7355**

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

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

	Cat#
COD *(Mercury Free)* Vials Kit	**K-7351S**

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

COD *(Mercury Free)* Vials Kit	**K-7356**

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

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

	Cat#
COD *(USEPA Accepted)* Vials Kit	***K-7360S**

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

COD *(USEPA Accepted)* Vials Kit	***K-7365**

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

See Product Price List for COD Quantity Discount Schedule.

Instructions and MSDS(s) are posted on website.

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

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

	Cat#
COD *(Mercury Free)* Vials Kit	**K-7361S**

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

COD *(Mercury Free)* Vials Kit	**K-7366**

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

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

	Cat#
COD *(Not USEPA Accepted)* Vials Kit	***K-7370S**

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

COD *(Not USEPA Accepted)* Vials Kit	***K-7375**

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

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

	Cat#
COD *(Mercury Free)* Vials Kit	**K-7371S**

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

COD *(Mercury Free)* Vials Kit	**K-7376**

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

All COD Kits require the use of a Digestor 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.

Accessories

Description	Cat#
Vial Rack (holds 40 vials)	A-0107
Digestor Block US (115 Volt, 12 cells), Warranty 1 year	A-0201
Digestor Block EURO (230 Volt, 12 cells), Warranty 1 year	A-0202
Digestor Block UK (230 Volt, 12 cells), Warranty 1 year	A-0203
Digestor Block AUS (230 Volt, 12 cells), Warranty 1 year	A-0204
Calibration Standard, 1000 ppm (200 mL), Shelf-life 8 months	A-7301[1]
Calibration Standard, 10,000 ppm (200 mL), Shelf-life 8 months	A-7310[1]
Low Range COD Photometer (0-150 ppm)	A-7320
High Range COD Photometer (0-1500 & 0-15,000 ppm)	A-7325

[1] ***This product must be refrigerated.***

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

Methods

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

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

The Mercuric Nitrate Method

References: APHA Standard Methods, 22nd ed., Method 4500-Cl^- 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^-.

The Ferric Thiocyanate Method

References: APHA Standard Methods, 22nd ed., Method 4500-Cl^- 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^-.

Visual Kits

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

	Cat#
Titrets Kit, Shelf-life 20 months	***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.

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

	Cat#
Titrets Kit, Shelf-life 20 months	***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.

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

	Cat#
Titrets Kit, Shelf-life 20 months	***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.

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

	Cat#
Titrets Kit, Shelf-life 20 months	***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.

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

	Cat#
Titrets Kit, Shelf-life 20 months	***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 Series
(See page 14 for instrumental features)

Range: 0-40.0 ppm
Method: Ferric Thiocyanate

	Cat#
Vacu-vials Kit	***K-2103**[1]

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.

Kit Components common to Chloride

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

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

[1]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.

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, 22nd 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_2.

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, Inc.

The DDPD™ method is derived from the DPD method. Test kits that employ this chemistry are well suited for use where biocides and chromate corrosion inhibitors are used simultaneously. DDPD reacts with free chlorine to form a purple product. When ammonia or amines are present in the sample, some of the chlorine may exist as *combined chlorine*. To determine total chlorine (the sum of free and combined), use the A-2500 Activator Solution (potassium iodide) that is supplied in the kit. Results are expressed as ppm (mg/L) Cl_2.

Visual Kits

Range: 0-0.20 ppm
MDL: 0.04 ppm / Method: DDPD

Chlorine (free & total) ULR CHEMets Kit	Cat# K-2511
ULR CHEMets Refill, 30 ampoules	R-2511
Activator Solution Pack, six 10 mL bottles	A-2500[1]
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

Chlorine (free & total) CHEMets Kit	Cat# K-2504
CHEMets Refill, 30 ampoules	R-2500
Activator Solution Pack, six 10 mL bottles	A-2500[1]
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

Chlorine (free & total) CHEMets Kit	Cat# K-2504D
CHEMets Refill, 30 ampoules	R-2504
Activator Solution Pack, six 10 mL bottles	A-2500[1]
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

Chlorine (free & total) CHEMets Kit	Cat# K-2504A
CHEMets Refill, 30 ampoules	R-2504
Activator Solution Pack, six 10 mL bottles	A-2500[1]
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.

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

Range: 0-100 & 0-500 ppm
MDL: 10 ppm / Method: DPD

	Cat#
Chlorine (free & total) CHEMets Kit	**K-2504B**
CHEMets Refill, 30 ampoules and 30 pipette tips	R-2509
Activator Solution Pack, six 10 mL bottles	A-2500[1]
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

	Cat#
Chlorine (free & total) CHEMets Kit	**K-2504C**
CHEMets Refill, 30 ampoules and 30 pipette tips	R-2509
Activator Solution Pack, six 10 mL bottles	A-2500[1]
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

	Cat#
Chlorine (hypochlorite) CHEMets Kit	**K-5808**
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

	Cat#
Chlorine (hypochlorite) CHEMets Kit	**K-5816**
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 Series
(See page 14 for instrumental features)

Range: 0-5.00 ppm
Method: DPD

	Cat#
Chlorine (free) Vacu-vials Kit *(USEPA Accepted)*	**K-2523**

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

	Cat#
Chlorine (free & total) Vacu-vials Kit *(USEPA Accepted)*	**K-2513**

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 17 for instrumental features)

Range: 0-5.00 ppm
Method: DPD

	Cat#
Chlorine (free & total) SAM Kit	**I-2001**
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.

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

Kit Components common to Chlorine

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
Syringe Pack, 1.0 mL (6 ea)	A-0027
Syringe Pack, 3.0 mL (6 ea)	A-0063
MiniPet®, 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

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

Method

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, 20th ed., Method 4500-ClO_2 D - 1993 and 22nd 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_2 is prevented (up to 6 ppm Cl_2) by the addition of glycine to the sample. Results are expressed as ppm (mg/L) ClO_2.

Visual Kit

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

CHEMets Kit	Cat# K-2705
CHEMets Refill, 30 ampoules	R-2705
Neutralizer Solution Pack, six 10 mL bottles, Shelf-life 8 months	A-2700[1]
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 Series
(See page 14 for instrumental features)

Range: 0-11.00 ppm
Method: DPD

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

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank 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 17 for instrumental features)

Range: 0-11.0 ppm
Method: DPD

SAM Kit	Cat# I-2005
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.

Kit Components common to Chlorine Dioxide

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

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, 22nd 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_4.

Visual Kits

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

CHEMets Kit	Cat# K-2810
CHEMets Refill, 30 ampoules	R-2810
Acidifier Solution Pack, six 10 mL bottles	A-2800[1]
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.

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

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

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

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

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

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

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

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

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

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

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

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

[1] The accessory pack supplies enough solution to perform at least 200 tests.

Instrumental Kit

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

Range: 0-3.50 ppm
Method: Diphenylcarbazide

Vacu-vials Kit	Cat# K-2803

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

Kit Components common to Chromate

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

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

Method

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

Method of Operation.

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

FEATURES

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

Instrument

Range: 0-2000 µS and 0-20 mS (0-20,000 µS)

	Cat#
Conductivity Meter	**I-1200**

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

Accessories

Description	Cat#
Electrode for TDS and Conductivity, Warranty 6 months	A-0176
Conductivity/TDS *Singles,* (20 ea) 1413 µS, Shelf-life 3 months	A-0178
Conductivity/TDS *Singles,* (20 ea) 15,000 µS, Shelf-life 3 months	A-0189
Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)	A-0179

Instructions are posted on our website.

FEATURES

Range: 0-2000 µS and 0-20 mS.

Resolution: 10 µS; 0.10 mS

Accuracy: ±1% full scale.

Calibration Type: Manual or Automatic with 1413 µS Conductivity Singles

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

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

Pocket-sized: 6.5" length x 1.5" diameter

Weight: 3.25 oz.(90 g)

Warranty: 1 year (electrodes 6 months)

Instruments are manufactured and guaranteed by Oakton Instruments, Inc.

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, 22nd 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

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

	Cat#
CHEMets Kit	**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 Series
(See page 14 for instrumental features)

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

	Cat#
Vacu-vials Kit	**K-3503**

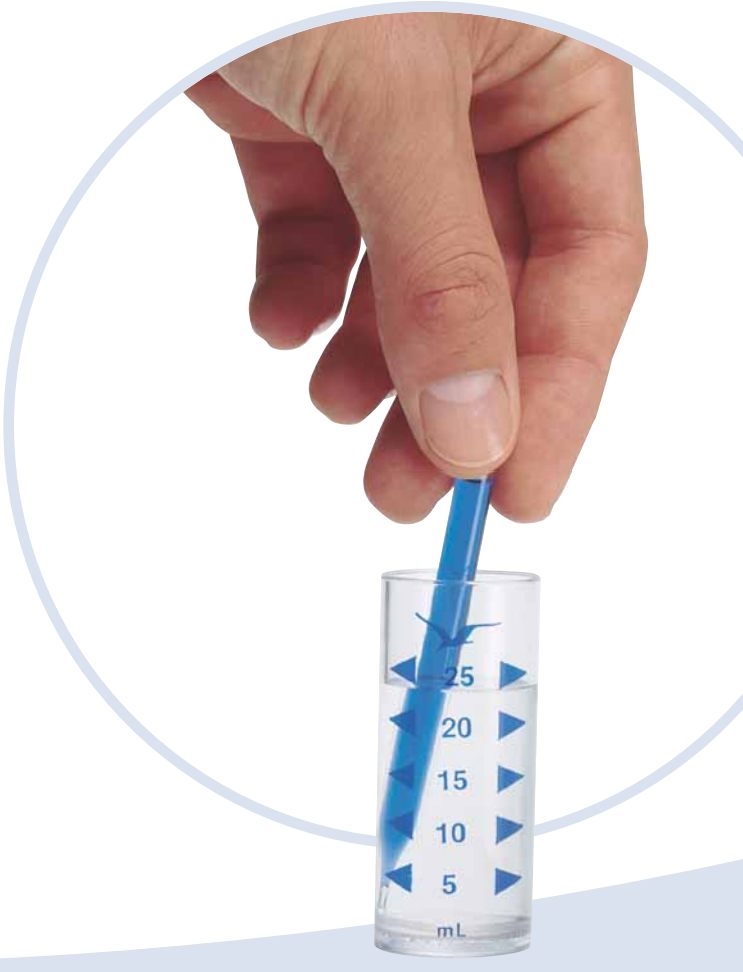
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, and instructions.

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.

Kit Components common to Copper

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

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



Methods

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

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

The Isonicotinic-Barbituric Acid Method

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

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

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

The Silver Nitrate Method

Reference: APHA Standard Methods, 22nd ed., Method 4500-CN⁻ D - 1999.

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

Visual Kits

Range: 0-0.1 & 0.1-1 ppm
MDL: 0.005 ppm / Method: Isonicotinic-Barbituric Acid

	Cat#
CHEMets Kit,	**K-3810**
CHEMets Refill, 30 ampoules	R-3810
Neutralizer Solution Pack, six 20 mL bottles	A-3800[1]
Activator Solution Pack, six 10 mL bottles, Shelf-life 8 months	A-3801[1]
Low Range Comparator 0, 0.01, 0.02, 0.03, 0.04, 0.06, 0.08, 0.1 ppm	C-3801
High Range Comparator 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 ppm	C-3810

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, Activator Solution, 5 mL sample cup & top, and instructions.

Range: 5-50 ppm
MDL: 5.0 ppm / Method: Silver Nitrate

	Cat#
Titrets Kit, Shelf-life 18 months	**K-3815**
Increments: 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm	

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

Instrumental Kit

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

Range: 0-0.400 ppm
Method: Isonicotinic-Barbituric Acid

	Cat#
Vacu-vials Kit, Shelf-life 8 months	**K-3803**

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.

Kit Components common to Cyanide

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

Methods

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

The PDTS Method

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

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

The Ceric Sulfate Titrimetric Method

Reference: Developed by CHEMetrics, Inc.

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

Visual Kits

Range: 0-400 & 400-3000 ppb
MDL: 15 ppb / Method: PDTS

	Cat#
CHEMets Kit	**K-3902**
CHEMets Refill, 30 ampoules	R-3902
Activator Solution Pack, six 10 mL bottles	A-3900[1]
Low Range Comparator 0, 30, 60, 100, 150, 200, 300, 400 ppb	C-3901
High Range Comparator 400, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000 ppb	C-3902

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

	Cat#
Titrets Kit	**K-3925**

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

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

Instrumental Kit

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

Range: 0-2.00 ppm
Method: PDTS

	Cat#
Vacu-vials Kit	**K-3903**

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

Kit Components common to DEHA

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

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

Method

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

The Methylene Blue Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983). APHA Standard Methods, 22nd 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 unique extraction/sampling technique that eliminates several steps required in other test procedures and provides increased sensitivity.

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

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

Visual Kits

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

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

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

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

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

Kit comes in a cardboard box and contains everything needed to perform 20 tests (except distilled water): Refill, Comparator, 25 uL MiniPet® [1], reaction tube with lid, tip breaking tool, and instructions.

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

Instrumental Kits

Multi-Analyte Photometers
V-3000 Series
(See page 14 for instrumental features)

Range: 0-2.50 ppm
Method: Methylene Blue

	Cat#
Detergents Instrumental Refill	**R-9423**

Instrumental Refill, comes in a cardboard box and contains everything needed to perform 20 test: 20 double-tipped ampoules, 21 test tubes, dropper bottle with cap, tip-breaking tool and instructions. Shelf-life 8 months.

SAM Single-Analyte Photometer
(See page 17 for instrumental features)

Range: 0-2.50 ppm
Method: Methylene Blue

	Cat#
Detergents SAM Kit	**I-2017**
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.

Kit Components common to Detergents

Description	Cat#
Tip Breaking Tool Pack (2 ea)	A-0197
Reaction Tube w/Lid, Detergents (5 ea)	A-0087
Pipette Tips Pack (30 ea)	A-0171
MiniPet®, 25 µL (1 ea)	A-0191

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

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 Dioctadecylamines in Water.

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

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

Visual Kit

Range: 0-1 ppm
MDL: 0.05 ppm / Method: Methyl Orange

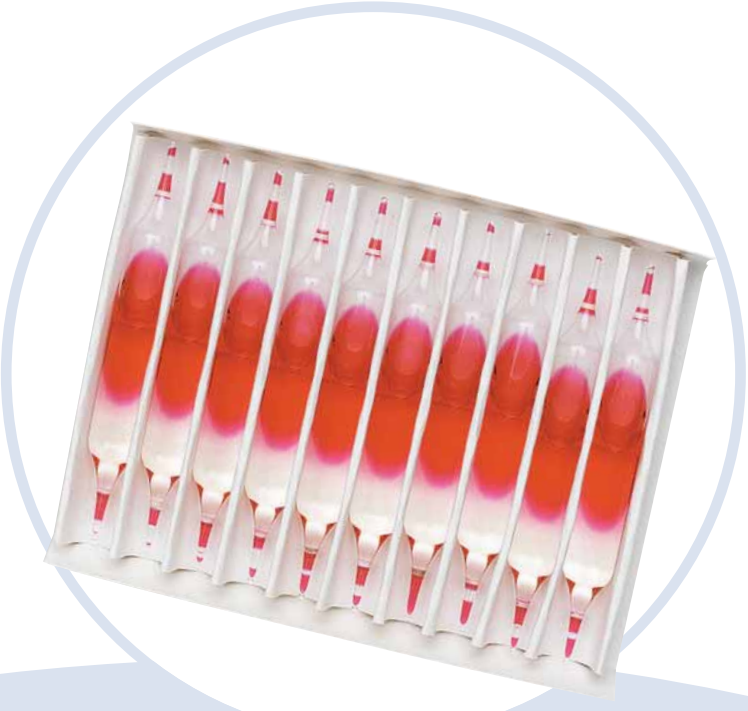
	Cat#
CHEMets Kit	**K-1001**
CHEMets Refill, 20 ampoule sets	R-1000
Comparator 0, 0.05, 0.10, 0.15, 0.25, 0.50, 0.75, 1.0 ppm	C-1001

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.

Kit Components common to Filming Amine

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

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



Method

Fluoride occurs naturally in most water supplies, and may be added to municipal water by injection of hydrofluorosilicic acid, sodium silicofluoride or sodium fluoride into the water stream as a public health measure. Fluoride compounds are also involved in the production of aluminum, steel, uranium, cement, enamel, and plastics.

The Centers for Disease Control and Prevention currently recommend a fluoride level for drinking water of 0.7 mg/L to reduce tooth decay. A maximum contaminant level of 4 mg/L has been established by the USEPA for fluoride in drinking water to protect against skeletal fluorosis. Monitoring and maintaining optimum fluoride levels is essential to maintain effectiveness and safety of the fluoridation process.

The SPADNS Method (Arsenic-free)

References: APHA Standard Methods, 22nd ed., Method 4500 F^- D - 1997. USEPA Methods for Chemical Analysis of Water and Wastes, Method 340.1 (1974, 1978). Bellack, E and P. J. Schoube, 1968, Rapid Photometric Determination of Fluoride with SPADNS - Zirconium Lake. *Anal. Chem.* 30:2032.

The Fluoride *MDL*$^+$ Kit is based on the reaction between fluoride and a red zirconium-dye lake that has been formed with SPADNS. The loss of color resulting from the reaction of fluoride with the dye lake is a function of the fluoride concentration. CHEMetrics' arsenic-free reagent is formulated with ascorbic acid to prevent chlorine interference. Results are expressed in ppm (mg/L) F^-.

Instrumental Kits

Multi-Analyte Photometers
V-3000 Series
(See page 14 for instrumental features)

Range: 0-3.00 ppm
Method: SPADNS (Arsenic-free)

	Cat#
Fluoride *MDL*$^+$ Kit, Shelf-life 18 months	**K-4009**

Kit comes in a cardboard box and contains everything needed to perform up to 27 tests (except distilled water): 28 double-tipped ampoules, Reducer Powder with scoop, sample cup with cap, tip breaking tool and instructions.

***MDL*$^+$ Kits require the use of a V-3000 Series Photometer or a spectrophotometer capable of accepting a 1" round vial.**

SAM Single-Analyte Photometer
(See page 17 for instrumental features)

Range: 0-3.00 ppm
Method: SPADNS (Arsenic-free)

	Cat#
Fluoride *MDL*$^+$ SAM Kit	**I-2021**
MDL$^+$ Kit, 28 double-tipped ampoules, Reducer Powder with scoop, sample cup with cap, tip breaking tool, and instructions. Shelf-life 18 months	**K-4009**

SAM Kit comes in a cardboard box and contains everything needed to perform up to 27 tests (except distilled water): *MDL*$^+$ Kit, SAM Photometer, 2 sample cells with lids, 4 AAA batteries, screwdriver, and instructions.

***MDL*$^+$ reagent ampoules for Fluoride determination may be used in photometers and spectrophotometers applying user-generated calibrations. Such calibrations should be produced by means of established methodology using NIST-traceable Fluoride standards covering the dynamic range of the analysis. CHEMetrics does not make any claims as to the accuracy of a user-generated calibration. The analyst must determine the suitability of a user-generated calibration subject to the operating conditions and specific instrument capabilities.**

Kit Components common to Fluoride

Description	Cat#
Tip Breaking Tool, (2 ea)	**A-0197**
Sample Cell, 24 mm, with Lid Pack (2 ea)	**A-0209**
Sample Cup with Cap Pack, MDL+ (3 ea)	**A-0211**

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

Methods

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

The Purpald Method

Reference: Purpald® developed by Aldrich Chemical Co.

Purpald® is subject to fewer interferences than Shiffs' reagent or chromotropic acid procedures. A purple-colored complex is formed when Purpald in alkaline solution reacts with formaldehyde. Results are expressed as ppm (mg/L) CH_2O.

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

Visual Kits

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

CHEMets Kit	Cat# K-4605
CHEMets Refill, 30 ampoules, Shelf-life 5 months	R-4605
Activator Solution Pack, six 20 mL bottles	A-4201[1, 2]
Activator Solution Pack, six 10 mL bottles	A-4202[1]
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-4601
High Range Comparator 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm	C-4605

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

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

VACUettes Kit	Cat# K-4605D
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605D
Activator Solution Pack, six 20 mL bottles	A-4201[1, 2]
Activator Solution Pack, six 10 mL bottles	A-4202[1]
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-4601D
High Range Comparator 30, 45, 60, 75, 87.5, 100, 112.5, 125, 150 ppm	C-4605D

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

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

VACUettes Kit	Cat# K-4605A
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605A
Activator Solution Pack, six 20 mL bottles	A-4201[1, 2]
Activator Solution Pack, six 10 mL bottles	A-4202[1]
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-4601A
High Range Comparator 60, 90, 120, 150, 175, 200, 225, 250, 300 ppm	C-4605A

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

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

VACUettes Kit	Cat# K-4605B
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605B
Activator Solution Pack, six 20 mL bottles	A-4201[1, 2]
Activator Solution Pack, six 10 mL bottles	A-4202[1]
Low Range Comparator, 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-4601B
High Range Comparator 120, 180, 240, 300, 350, 400, 450, 500, 600 ppm	C-4605B

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

[1] The accessory pack supplies enough solution to perform at least 200 tests.

[2] The Activator Solution, A-4201, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a limited shelf-life.

Visual Kits

Range: 0-1200 & 1200-6000 ppm
MDL: 200 ppm / Method: Purpald

	Cat#
VACUettes Kit	**K-4605C**
VACUettes Refill, 30 ampoules, Shelf-life 5 months	R-4605C
Activator Solution Pack, six 20 mL bottles	A-4201[1, 2]
Activator Solution Pack, six 10 mL bottles	A-4202[1]
Low Range Comparator 0,200, 300, 400, 600, 800, 1000, 1200 ppm	C-4601C
High Range Comparator 1200. 1800, 2400, 3000, 3500, 4000, 4500, 5000, 6000 ppm	C-4605C

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

Instrumental Kit

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

Range: 0-8.00 ppm
Method: Purpald

	Cat#
Vacu-vials Kit, Shelf-life 5 months	**K-4203[2]**

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

Kit Components common to Formaldehyde

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

[1] The accessory pack supplies enough solution to perform at least 200 tests.

[2] The Activator Solution, A-4201, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a limited shelf-life.

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

Glutaraldehyde

Method

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

The Acid Titrant with Phenolphthalein Indicator Method

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

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

Visual Kit

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

	Cat#
Titrets Kit	**K-4302**
Increments: 0.10, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.18, 0.20, 0.25, 0.30, 0.35, 0.40, 0.50, 0.70, 1.0%	
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup and instructions.	

Kit Components common to Glutaraldehyde

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

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

Method

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

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

The Purpald-Periodate Method

Reference: Purpald® developed by Aldrich Chemical Company. Fritz, James S. and Schenk, George H., Quantitative Analytical Chemistry, 4th 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 may be expressed in either ppm (mg/L) ethylene or propylene glycol. Correction factors are supplied with all kits to convert to the alternate glycol form.

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

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

Visual Kits

Range: 1-15 ppm as ethylene glycol; 2-30 ppm as propylene glycol
MDL: 1 ppm / Method: Purpald-Periodate

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

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

Range: 1000-15,000 ppm as ethylene glycol; 2000-30,000 ppm as propylene glycol
MDL: 1000 ppm / Method: Purpald-Periodate

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

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

Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-10.00 ppm as ethylene glycol; 0-20.00 ppm as propylene glycol

Method: Purpald-Periodate

	Cat#
Vacu-vials Kit, Shelf-life 5 months	**K-4403**[2]

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

Range: 0-65.0 ppm as propylene glycol; 0-32.5 ppm as ethylene glycol

Method: Purpald-Periodate

	Cat#
Vacu-vials Kit, Shelf-life 5 months	**K-4423**[2]

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

Kit Components common to Glycol

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

[1]The accessory pack supplies enough solution to perform at least 200 tests.

[2]The Activator Solutions, A-4401 and A-4406 are supplied as a dry chemical with NO expiration date. Once reconstituted, they have a limited shelf-life.

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

Methods

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

The EGTA Method (calcium)

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

The EGTA method is specific for calcium hardness. The EGTA titrant in alkaline solution is employed with a zincon indicator. Results are expressed as ppm (mg/L) $CaCO_3$.

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

The EDTA Method (total)

References: APHA Standard Methods, 22nd 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) $CaCO_3$.

Visual Kits

Range: 50-500 ppm as $CaCO_3$
MDL: 50 ppm / Method: EGTA

	Cat#
Hardness (calcium) Titrets Kit, Shelf-life 8 months	**K-1705**

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: 100-1000 ppm as $CaCO_3$
MDL: 100 ppm / Method: EGTA

	Cat#
Hardness (calcium) Titrets Kit , Shelf-life 8 months	**K-1710**

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

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

Range: 2-20 ppm as $CaCO_3$
MDL: 2.0 ppm / Method: EDTA

	Cat#
Hardness (total) Titrets Kit	**K-4502**

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 $CaCO_3$
MDL: 20 ppm / Method: EDTA

	Cat#
Hardness (total) Titrets Kit	**K-4520**

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 $CaCO_3$
MDL: 100 ppm / Method: EDTA

	Cat#
Hardness (total) Titrets Kit	**K-4585**

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.

Range: 250-2500 ppm as $CaCO_3$
MDL: 250 ppm / Method: EDTA

	Cat#
Hardness (total) Titrets Kit	**K-4530**

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.

Kit Components common to Hardness

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

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

Method

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

The PDMAB Method

References: ASTM D 1385-07, Hydrazine in Water. L. C. Thomas and G. J. Chamberlin, Colorimetric Chemical Analytical Methods, 8th 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_2H_4.

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

VACUettes Kit	Cat# K-5005D
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.

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

VACUettes Kit	Cat# K-5005A
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.

Visual Kits

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

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

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

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

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

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

Range: 0-50 ppm
MDL: 1 ppm / Method: PDMAB

	Cat#
VACUettes Kit	**K-5005B**
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

	Cat#
VACUettes Kit	**K-5005C**
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.

Instrumental Kit

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

Range: 0-1.20 ppm / Spec: 0-0.700 ppm
Method: PDMAB

	Cat#
Vacu-vials Kit	**K-5003**

Kit comes in a cardboard box and contains everything needed to perform up to 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.

Kit Components common to Hydrazine

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

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

Methods

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

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

The Ferric Thiocyanate Method

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

The ferric thiocyanate method consists of ammonium thiocyanate and ferrous iron in acid solution. Hydrogen peroxide oxidizes ferrous iron to the ferric state, resulting in the formation of a red thiocyanate complex. Chlorine will not interfere with this method. Ferric iron will interfere. Results are expressed as ppm (mg/L) H_2O_2.

The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 22nd ed., Method 4500-Cl G - 2000. D.F. Boltz and J.A. Howell, eds., Colorimetric Determination of Nonmetals 2nd ed., Vol. 8, p. 303 (1978).

With the DPD Method, hydrogen peroxide reacts with DPD (N, N-diethyl-p-phenylenediamine) in the presence of potassium iodide and ammonium molybdate to form a pink product. Results are expressed as ppm (mg/L) H_2O_2.

The Ceric Sulfate Titrimetric Method

Reference: Developed by CHEMetrics, Inc.

CHEMetrics developed a titrimetric method using ceric sulfate as the titrant and ferroin as the end point indicator. A color change from green to orange signals the end of the titration. Results are expressed as percent (%) H_2O_2.

The Ceric Sulfate Go-No-Go Method

Reference: Developed by CHEMetrics, Inc.

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

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

Visual Kits

Range: 0-0.5 ppm
MDL: 0.025 ppm / Method: DPD

CHEMets Kit	Cat# K-5502
CHEMets Refill, 30 ampoules	R-5502
Activator Solution Pack, six 10 mL bottles	A-5500[1]
Activator Solution Pack, six 10 mL bottles	A-5501[1]
Comparator 0, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.50 ppm	C-5502

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

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

CHEMets Kit	Cat# K-5510
CHEMets Refill, 30 ampoules	R-5510
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-5501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-5510

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Go-No-Go Kit

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

Go-No-Go Kit	Cat# K-5500C

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

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

Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-3.00 ppm
Method: DPD

	Cat#
Vacu-vials Kit	**K-5513**

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

Range: 0-6.00 ppm
Method: Ferric Thiocyanate

	Cat#
Vacu-vials Kit	**K-5543**

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 Photometer

(See page 17 for instrumental features)

Range: 0-6.00 ppm
Method: Ferric Thiocyanate

	Cat#
Hydrogen Peroxide SAM Kit	**I-2016**
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.

Kit Components common to Hydrogen Peroxide

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

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

Methods

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

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

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

References: APHA Standard Methods, 22nd ed., Method 3500-Fe B - 1997. ASTM D 1068-77, Iron in Water, Test Method A. J.A. Tetlow and A.L. Wilson, "The Absorptiometric Determination of Iron in Boiler Feed-water", *Analyst.* Vol. 89, p. 442 (1964).

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

The PDTS Method (total)

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

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

The Ferric Thiocyanate Method (Iron in Brine)

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

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

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

Visual Kits

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

Iron (total & ferrous) CHEMets Kit	Cat# K-6210
CHEMets Refill, 30 ampoules	R-6201
Activator Solution Pack, six 10 mL bottles	A-6000[1]
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: 0-1 &1-10 ppm
MDL: 0.05 ppm / Method: Phenanthroline

Iron (total & soluble) CHEMets Kit	Cat# K-6010
CHEMets Refill, 30 ampoules	R-6001
Activator Solution Pack, six 10 mL bottles	A-6000[1]
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

Iron (total & soluble) VACUettes Kit	Cat# K-6010D
VACUettes Refill, 30 ampoules	R-6001D
Activator Solution Pack, six 10 mL bottles	A-6000[1]
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

Iron (total & soluble) VACUettes Kit	Cat# K-6010A
VACUettes Refill, 30 ampoules	R-6001A
Activator Solution Pack, six 10 mL bottles	A-6000[1]
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

Iron (total & soluble) VACUettes Kit	Cat# K-6010B
VACUettes Refill, 30 ampoules	R-6001B
Activator Solution Pack, six 10 mL bottles	A-6000[1]
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

Iron (total & soluble) VACUettes Kit	Cat# K-6010C
VACUettes Refill, 30 ampoules	R-6001C
Activator Solution Pack, six 10 mL bottles	A-6000[1]
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

Iron in Brine CHEMets Kit	Cat# K-6002
CHEMets Refill, 30 ampoules	R-6002
Acidifier Solution Pack, six 20 mL bottles	A-6001[1]
Activator Solution Pack, six 20 mL bottles	A-6002[1]
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 MSDS(s) are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-2.50 ppm
Method: PDTS

	Cat#
Iron (total) Vacu-vials Kit	**K-6023**

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

Range: 0-6.00 ppm
Method: Phenanthroline

	Cat#
Iron (total & ferrous) Vacu-vials Kit	**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

	Cat#
Iron (total & soluble) Vacu-vials Kit	**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.

Range: 0-25.0 ppm
Method: Phenanthroline

	Cat#
Iron (total & soluble) Vacu-vials Kit	**K-6013**

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

Kit Components common to Iron

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

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

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

Method

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

The Periodate Method

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

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

Visual Kits

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

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

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

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

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

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

Instrumental Kit

Multi-Analyte Photometers
V-2000 / V-3000 Series
(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.

Kit Components common to Manganese

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

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

Method

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

The Permanganate Method

Reference: Developed by CHEMetrics, Inc.

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

Visual Kit

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

	Cat#
Titrets Kit	**K-6810**

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

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

Kit Components common to MBT

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

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

Method

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

The Catechol Method

References: G. P. Haight and V. Paragamian, Analytical Chemistry, pp. 32, 642 (1960). H. Onishi and E. B. Sandell, Photometric Determination of Trace Metals, 4th 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

CHEMets Kit	Cat# K-6701
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

CHEMets Kit	Cat# K-6702
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

CHEMets Kit	Cat# K-6720
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 Series
(See page 14 for instrumental features)

Range: 0-25.0 ppm as Mo
Method: Catechol

Vacu-vials Kit	Cat# K-6703

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.

Kit Components common to Molybdate

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

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

Methods

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

The Cadmium Reduction Method

References: ASTM D 3867-09, Nitrate-Nitrite in Water, Test Method B. APHA Standard Methods, 22nd ed., Method 4500-NO_3^- E - 2000. 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_3-N or NO_3.

The Zinc Reduction Method

References: ASTM D 3867-09, Nitrate-Nitrite in Water, Test Method B. APHA Standard Methods, 22nd ed., Method 4500-NO_3^- E - 2000. 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_3-N.

Visual Kits

Range: 0-3 ppm as N
MDL: 0.25 ppm / Method: Zinc Reduction

CHEMets Kit	Cat# K-6905
CHEMets Refill, 30 ampoules and 30 zinc foil packs, Shelf-life 12 months	R-6905
Acidifier Solution Pack, six 20 mL bottles	A-6901[1]
Comparator, Shelf-life 12 months 0, 0.25, 0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0 ppm	C-6906

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

Range: 0-3 ppm as N
MDL: 0.4 ppm / Method: Cadmium Reduction

CHEMets Kit	Cat# K-6904
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, Shelf-life 12 months	R-6902
Comparator, Shelf-life 12 months 0, 0.4, 0.6, 0.8, 1.0, 1.2, 1.5, 2.0, 3.0 ppm	C-6904

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

Range: 0-30 ppm as N
MDL: 4 ppm / Method: Cadmium Reduction

CHEMets Kit	Cat# K-6909D
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, Shelf-life 12 months	R-6904
Comparator, Shelf-life 12 months 0, 4, 6, 8, 10, 12, 15, 20, 30 ppm	C-6909D

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 3.0 mL syringe, reaction tube with cap and instructions.

Range: 0-150 ppm as N
MDL: 20 ppm / Method: Cadmium Reduction

CHEMets Kit	Cat# K-6909A
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, Shelf-life 12 months	R-6904
Comparator, Shelf-life 12 months 0, 20, 30, 40, 50, 60, 75, 100, 150 ppm	C-6909A

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

Range: 0-450 ppm as N
MDL: 60 ppm / Method: Cadmium Reduction

CHEMets Kit	Cat# K-6909B
CHEMets Refill, 30 ampoules and 30 cadmium foil packs, and 30 pipette tips, Shelf-life 12 months	R-6909
Comparator, Shelf-life 12 months 0, 60, 90, 120, 150, 180, 225, 300, 450 ppm	C-6909B

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 100 uL MiniPet®, reaction tube with cap and instructions.

Range: 0-1800 ppm as N
MDL: 240 ppm / Method: Cadmium Reduction

CHEMets Kit	Cat# K-6909C
CHEMets Refill, 30 ampoules, 30 cadmium foil packs, and 30 pipette tips, Shelf-life 12 months	R-6909
Comparator, Shelf-life 12 months 0, 240, 360, 480, 600, 720, 900, 1200, 1800 ppm	C-6909C

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 25 uL MiniPet®, reaction tube with cap and instructions.

Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-1.00 ppm as N
Method: Zinc Reduction

	Cat#
Vacu-vials Kit, Shelf-life 12 months	**K-6913**

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

Range: 0-1.50 ppm as N
Method: Cadmium Reduction

	Cat#
Vacu-vials Kit, Shelf-life 12 months	**K-6903**

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

Range: 0-3.00 ppm as N
Method: Cadmium Reduction

	Cat#
Vacu-vials Kit, Shelf-life 12 months	**K-6923**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, reaction tube with lid, ampoule blank 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_3
Method: Cadmium Reduction

	Cat#
Vacu-vials Kit, Shelf-life 12 months	**K-6933**

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

Kit Components common to Nitrate

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

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

Methods

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

Azo Dye Formation Method

References: APHA Standard Methods, 22nd. ed., Method 4500-NO_2^- 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_2-N.

The Ceric Sulfate Titrimetric Method

Reference: Developed by CHEMetrics, Inc.

Ceric sulfate is the titrant and ferroin is the end point indicator. The method is free from glycol interference in samples that contain up to 75% glycol, making it particularly applicable to systems that contain nitrite corrosion inhibitors. Results are expressed as ppm (mg/L) $NaNO_2$.

Visual Kits

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

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

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

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

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

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

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

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

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

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

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

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

Instrumental Kit

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

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

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

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

Range: 250-2500 ppm as $NaNO_2$
MDL: 250 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

	Cat#
Titrets Kit	**K-7025**
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 $NaNO_2$
MDL: 500 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

	Cat#
Titrets Kit	**K-7050**
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.

Range: 0-0.800 ppm as N
Method: Azo Dye Formation

	Cat#
Vacu-vials Kit, Shelf-life 12 months	**K-7003**

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.

Kit Components common to Nitrite

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

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

Methods

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

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

The Indigo Carmine Method

References: ASTM D 888-87, 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.

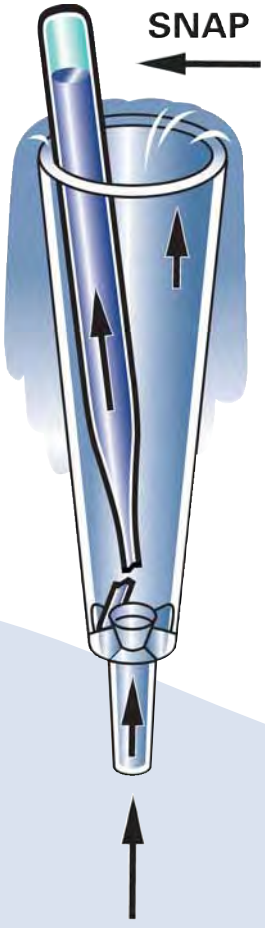
Test kits for environmental and drinking water applications (ppm range) employ the indigo carmine method. The reduced form of indigo carmine reacts with D.O. to form a blue product. The indigo carmine methodology is not subject to interferences from temperature, salinity, or dissolved gases such as sulfide, which plague users of D.O. meters. Results are expressed as ppm (mg/L) O_2.

The Rhodazine D™ Method

References: Developed by CHEMetrics, Inc. ASTM Power Plant Manual, 1st. ed. p. 169 (1984). ASTM D 5543-09, 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, Inc., and approved by ASTM as the reference method for ppb D.O. determination, the Rhodazine D compound in reduced form reacts with dissolved oxygen to form a bright pink reaction product. The method is not subject to salinity or dissolved gas interferences. Oxidizing agents, including benzoquinone, can cause high results. Reducing agents such as hydrazine and sulfite do not interfere. Results are expressed as ppm (mg/L) or ppb (µg/L) O_2.

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: 1 ppb / Method: Rhodazine D

ULR CHEMets Kit	Cat# K-7511
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

CHEMets Kit	Cat# K-7540
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

CHEMets Kit	Cat# K-7599
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

CHEMets Kit	Cat# K-7518
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

CHEMets Kit	Cat# K-7501
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

CHEMets Kit	Cat# K-7512
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 MSDS(s) are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

Instrumental Kits

Multi-Analyte Photometers
V-2000 / V-3000 Series
(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 instruction.

Range: 0-2.00 ppm
Method: Indigo Carmine

	Cat#
Vacu-vials Kit	**K-7503**

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

Range: 0-15.0 ppm
Method: Indigo Carmine

	Cat#
Vacu-vials Kit	**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 17 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.	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.

Kit Components common to Oxygen

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

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

Methods

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

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

The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 22nd ed., Method 4500-Cl 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_3.

Visual Kit

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

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

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

Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(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 page17 for instrumental features)

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.

Kit Components common to Ozone

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

[1]**The accessory pack supplies enough solution to perform at least 200 tests.**

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

Method

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

The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983) APHA Standard Methods, 22nd ed., Method 4500-Cl G - 2000.

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, ferric ions, and cupric ions will produce high test results. Hydrogen peroxide does not interfere if present at levels comparable to the peracetic acid levels.

Visual Kit

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

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

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

Instrumental Kits

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

Range: 0-5.00 ppm
Method: DPD

Vacu-vials Kit	Cat# K-7913

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank 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 17 for instrumental features)

Range: 0-5.00 ppm
Method: DPD

SAM Kit	Cat# I-2020
Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	K-7913

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

Kit Components common to Peracetic Acid

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

Method

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

The Ferrous Ammonium Sulfate Method

Reference: Developed by CHEMetrics, Inc.

The CHEMetrics' permanganate test kit is applicable to monitoring the concentration of permanganate in feed solutions used to treat potable water and wastewaters. The test method employs a titrimetric chemistry in which ferrous ammonium sulfate is the titrant. No additional indicator is required. A color change from colorless to pink signals the end of the test. Results are expressed as percent (%) $KMnO_4$.

Visual Kit

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

	Cat#
Titrets Kit	**K-7630**

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

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

Kit Components common to Permanganate

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

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

Method

Persulfate is a strong oxidizer that is commonly used for clarifying swimming pools and spas and for the destruction of a broad range of soil and groundwater contaminants. Sodium persulfate is frequently used for environmental applications.

The Ferric Thiocyanate Method

Reference: D.F. Boltz and J.A. Howell, eds. Colorimetric Determination of Nonmetals, 2nd 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 ($Na_2S_2O_8$).

Visual Kit

Range: 0-7 & 7-70 ppm as $Na_2S_2O_8$
MDL: 0.35 ppm / Method: Ferric Thiocyanate

CHEMets Kit	Cat# K-7870
CHEMets Refill, 30 ampoules	R-7870
Low Range Comparator 0, 0.7, 1.4, 2.1, 2.8, 4.2, 5.6, 7.0 ppm	C-7807
High Range Comparator 7, 14, 21, 28, 35, 42, 49, 56, 70 ppm	C-7870

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

Kit Components common to Persulfate

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

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

Method

The measurement of pH is one of the most frequently performed water quality determinations. Water softening, precipitation, disinfection, and corrosion control are some of the many operations that depend on the careful measurement and control of pH. CHEMetrics' pH meter is applicable to the monitoring of drinking water, natural water supplies, boiler waters, make-up waters, condensate returns, swimming pools, aquariums, wastewaters, and similar samples.

CHEMetrics' double-junction pH meter was specifically developed for water conditioning and purification applications.

Method of Operation.

Turn the meter on. Remove the protective cap from the tip of the probe. Dip the probe into the sample and stir the sample gently with the probe until the display stabilizes.

Calibration should be done regularly, typically everyday that the meter is used.

FEATURES

Range: -1.00 to 15.00 pH

Resolution: 0.01 pH

Accuracy: ±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

Range: -1.00-15.00 pH Units

	Cat#
pH Double Junction Meter	**I-1000**

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

Accessories

Description	Cat#
Electrode for pH Meter, 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
Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)	A-0179

Instructions are posted on our website.

FEATURES

- Accuracy with push-button three-point calibration
- Temperature readout & compensation
- Replaceable electrode
- Waterproof, dustproof
- Error messages; Hold function
- Auto-shutoff
- For harsh applications!

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, 14th ed., Method 510 C (1975). ASTM D 1783-01, Phenolic Compounds in Water, Test Method B. USEPA Methods for Chemical Analysis of Water and Wastes, Method 420.1 (1983).

CHEMetrics' phenols kits employ the well-established 4-aminoantipyrine (4-AAP) method. Phenolic compounds react with 4-AAP in alkaline solution in the presence of ferricyanide to produce a red reaction product. Phenol, meta-, and ortho-substituted phenols, and some para-substituted phenols, under proper pH conditions, are detected with this method. The method is applicable to the monitoring of phenolic compounds in wastewater. Results are expressed as ppm (mg/L) phenol.

Visual Kits

Range: 0-1 & 0-12 ppm
MDL: 0.05 ppm / Method: 4-Aminoantipyrine

CHEMets Kit	Cat# K-8012
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

VACUettes Kit	Cat# K-8012D
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

VACUettes Kit	Cat# K-8012A
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

VACUettes Kit	Cat# K-8012B
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

VACUettes Kit	Cat# K-8012C
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 MSDS(s) are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

Instrumental Kits

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

Range: 0-8.00 ppm
Method: 4-Aminoantipyrine

	Cat#
Vacu-vials Kit	**K-8003**

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

	Cat#
Vacu-vials Kit	**K-8023**

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.

Kit Components common to Phenols

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

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

No need to dispense. The ferricyanide powder is right on the tip.

Methods

Phosphorus occurs naturally in rock formations in the earth's crust, usually as phosphate. High phosphate concentrations in surface waters may indicate fertilizer runoff, domestic waste discharge, or the presence of industrial effluents or detergents. Although phosphates from these sources are usually poly-phosphates or organically bound, all will degrade to *ortho* or reactive phosphates with time.

Phosphate measurement is used to control scale and corrosion inhibitor levels in boilers and cooling towers. Both methods described below measure reactive phosphate, which will give a positive reaction prior to hydrolysis, and is usually termed *ortho-phosphate*.

The Vanadomolybdophosphoric Acid Method

References: ASTM D 515-82, Phosphorous in Water, Test Method C. APHA Standard Methods, 22nd ed., Method 4500-P C - 1999.

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_4.

The Stannous Chloride Method

Reference: APHA Standard Methods, 22nd ed., Method 4500-P D - 1999.

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_4.

Visual Kits

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

CHEMets Kit	Cat# K-8510
CHEMets Refill, 30 ampoules	R-8510
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500[1]
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

CHEMets Kit	Cat# K-8530
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: 10-150 ppm
MDL: 10 ppm / Method: Vanadomolybdophosphoric Acid

CHEMets Kit	Cat# K-8515
CHEMets Refill, 30 ampoules	R-8515
Comparator 10, 20, 30, 40, 60, 80, 100, 120, 150 ppm	C-8515

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

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

Range: 0-30 & 30-300 ppm
MDL: 5 ppm / Method: Stannous Chloride

VACUettes Kit	Cat# K-8510D
VACUettes Refill, 30 ampoules	R-8510D
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500[1]
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

VACUettes Kit	Cat# K-8510A
VACUettes Refill, 30 ampoules	R-8510A
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500[1]
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

VACUettes Kit	Cat# K-8510B
VACUettes Refill, 30 ampoules	R-8510B
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500[1]
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.

[1]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

VACUettes Kit	Cat# K-8510C
VACUettes Refill, 30 ampoules	R-8510C
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500[1]
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 Series
(See page 14 for instrumental features)

Range: V-2000: 0-8.00 ppm; V-3000/Spec: 0-5.00 ppm
Method: Stannous Chloride

	Cat# K-8513
Vacu-vials Kit, Shelf-life 20 months	

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

Vacu-vials Kit	Cat# K-8503

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.

Kit Components common to Phosphate

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

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

Method

Phosphorous occurs in natural waters and wastewaters mainly as phosphates and is widely distributed in the environment as orthophosphates, condensed phosphates (pyro-, meta- and other polyphosphates), and organically-bound phosphates. Sources of phosphate include surface-applied fertilizers, commercial cleaning preparations, boiler water conditioners, and drinking water treatment chemicals. Phosphorous is an essential nutrient for the growth of organisms. However, discharge of wastewater containing high levels of phosphate may cause excessive algae growth which causes taste and odor problems in drinking water supplies and oxygen depletion and death of aquatic organisms in surface water. Therefore, control and monitoring of phosphate concentrations in wastewater are critical.

The Persulfate Digestion-Ascorbic Acid Method

References: APHA Standard Methods, 22nd ed. Method 4500-P B.5 & E - 1999. USEPA Methods for Chemical Analysis of Water and Wastes, Methods 365.2 and 365.4 (1983). Murphy, J., and Riley, J.P., "A Modified Single Solution Method for the Determination of Phosphate in Natural Waters", Anal. Chim. Acta., Vol. 27 pp 31-36 (1962).

The Total Phosphate Vials measure those forms of phosphate that are converted to orthophosphate during an acid oxidation digestion. This includes many organically bound and condensed phosphates. Once converted to orthophosphate, the reaction with molybdate in acidic solution produces phosphomolybdic acid, which is reduced by ascorbic acid to a blue complex. Results are expressed as ppm (mg/L) P or PO_4.

Instrumental Kit

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

(See page 14 for instrumental features)

Range: 0-2.30 ppm as P / 0-7.00 ppm as PO_4
Method: Ascorbic Acid

	Cat#
Total Phosphate Vials Kit, Shelf-life: 18 months	**K-8540**

Kit comes in a cardboard box and contains everything needed to perform 50 tests: 50 ampoules sets, Oxidizer Powder, Neutralizer Solution, Stabilizer Solution, Reducer Powder with scoop, Oxidizer Powder Dispenser Cap, 3 mL syringe with tip, tip breaking tool, funnel and instructions.

Total Phosphate vials kits require the use of a Digestor Block along with a CHEMetrics Photometer, or a spectrophotometer capable of accepting a 16 mm round cell. Instruments sold separately.

Kit Components common to Total Phosphate

Description	Cat#
Tip Breaking Tool Pack (2 ea)	A-0197
Digestor Block US (115 Volt, 12 Cells)	A-0201
Digestor Block EURO (230 Volt, 12 Cells)	A-0202
Digestor Block UK (230 Volt, 12 Cells)	A-0203
Digestor Block AUS (230 Volt, 12 Cells)	A-0204
Phosphate Standard, 250 ppm as P (125 mL), Shelf-life 8 months	A-8577

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

Method

QACs are known for their bactericidal and disinfecting qualities. They are used extensively throughout the healthcare and food processing industries to sanitize, deodorize, and disinfect surfaces and equipment. QACs are also routinely formulated with various water treatments to inhibit algal growth in cooling towers, humidifiers, and swimming pools.

The Polyvinyl Sulfate Method

References: Wang, L. K., Shuster, W. W., "Polyelectrolyte Determination at Low Concentration," *Ind. Eng. Chem., Prod. Res. Dev.*, **Vol. 14, No. 4, 1975, pp. 312-314. Parazak, D. P., Burkhardt, C. W., McCarthy, K. J., "Determination of Low Levels of Cationic Polyelectrolytes in Water,"** *Analytical Chemistry*, **Vol. 59, No. 10, May 15, 1987, pp. 1444-1445.**

These tests are applicable to the monitoring of QACs in cleaning solutions and cooling waters. CHEMetrics employs a titrimetric chemistry in which stabilized polyvinyl sulfate is the titrant and toluidene blue is the end point indicator.

A color change from pink to blue signals the end of the titration. Results are expressed as ppm (mg/L) QAC.

Visual Kits

Range: 100-1000 ppm
MDL: 100 ppm / Method: Polyvinyl Sulfate

	Cat#
Titrets Kit, Shelf-life 18 months	**K-8810**

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.

Range: 2000-20,000 ppm
MDL: 2000 ppm / Method: Polyvinyl Sulfate

	Cat#
Titrets Kit, Shelf-life 18 months	**K-8820**

Increments:
2000, 2200, 2400, 2600, 2800, 3000, 3200, 3600, 4000, 5000, 6000, 7000, 8000, 10,000, 14,000, 20,000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, 1.0 mL syringe and instructions.

Kit Components common to QACs

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

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

Method

Silica (SiO_2) 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, 22nd ed., Method 4500-SiO_2 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_2.

Visual Kits

Range: 0-0.20 ppm
MDL: 0.02 ppm / Method: Heteropoly Blue

ULR CHEMets Kit	Cat# K-9011
ULR CHEMets Refill, 30 ampoules, Shelf-life 12 months	R-9011
Neutralizer Solution Pack, six 10 mL bottles	A-9000[1]
Activator Solution Pack, six 20 mL bottles	A-9001[1]
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.

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

CHEMets Kit	Cat# K-9010
CHEMets Refill, 30 ampoules, Shelf-life 11 months	R-9010[2]
Neutralizer Solution Pack, six 10 mL bottles	A-9000[1]
Activator Solution Pack, six 20 mL bottles	A-9001[1]
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 Kits

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

Range: 0-10.00 ppm / Spec: 0-4.00 ppm
Method: Heteropoly Blue

Vacu-vials Kit	Cat# K-9003

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.

Kit Components common to Silica

Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Sample Cup Top Pack for 25 mL Cup (6 ea)	A-0014
Ampoule Blank Pack (5 ea)	A-0023

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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

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

Method

Sulfate is present at widely varying concentrations in natural waters. The USEPA has established a Secondary Drinking Water Standard of 250 mg/L for sulfate in potable water, as higher concentrations affect odor and taste. Sulfate levels are also measured in the beverage industry due to its effect on odor and taste. Sulfate levels must be monitored in cooling water and ion exchange systems in order to prevent calcium sulfate scale formation.

The Turbidimetric Method

References: APHA Standard Methods, 15th 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_4.

Instrumental Kit

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

Range: 0-100.0 ppm
Method: Turbidimetric

	Cat#
Vacu-vials Kit	**K-9203**

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

Kit Component common to Sulfate

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

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

Method

Sulfides are naturally present in ground waters as a result of leaching from sulfur-containing mineral deposits. Surface waters do not usually contain high sulfide concentrations. Sulfides result from the decomposition of organic matter, from bacterial sulfate reduction under anaerobic conditions and from various chemical processes.

The Methylene Blue Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 376.2 (1983). APHA Standard Methods, 22nd ed., Method 4500-S^{2-} 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

CHEMets Kit	Cat# K-9510
CHEMets Refill, 30 ampoules	R-9510
Activator Solution Pack, six 10 mL bottles	A-9500[1]
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: 5 ppm / Method: Methylene Blue

VACUettes Kit	Cat# K-9510D
VACUettes Refill, 30 ampoules	R-9510D
Activator Solution Pack, six 10 mL bottles	A-9500[1]
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-9501D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-9510D

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

Range: 0-60 & 60-600 ppm
MDL: 10 ppm / Method: Methylene Blue

VACUettes Kit	Cat# K-9510A
VACUettes Refill, 30 ampoules	R-9510A
Activator Solution Pack, six 10 mL bottles	A-9500[1]
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-9501A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-9510A

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

Range: 0-120 & 120-1200 ppm
MDL: 20 ppm / Method: Methylene Blue

VACUettes Kit	Cat# K-9510B
VACUettes Refill, 30 ampoules	R-9510B
Activator Solution Pack, six 10 mL bottles	A-9500[1]
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-9501B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-9510B

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

Range: 0-1200 & 1200-12,000 ppm
MDL: 200 ppm / Method: Methylene Blue

VACUettes Kit	Cat# K-9510C
VACUettes Refill, 30 ampoules	R-9510C
Activator Solution Pack, six 10 mL bottles	A-9500[1]
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-9501C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-9510C

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

Instrumental Kits

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

(See page 14 for instrumental features)

Range: 0-3.00 ppm / Spec: 0-1.00 ppm
Method: Methylene Blue

Vacu-vials Kit	Cat# K-9503

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

Vacu-vials Kit	Cat# K-9523

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.

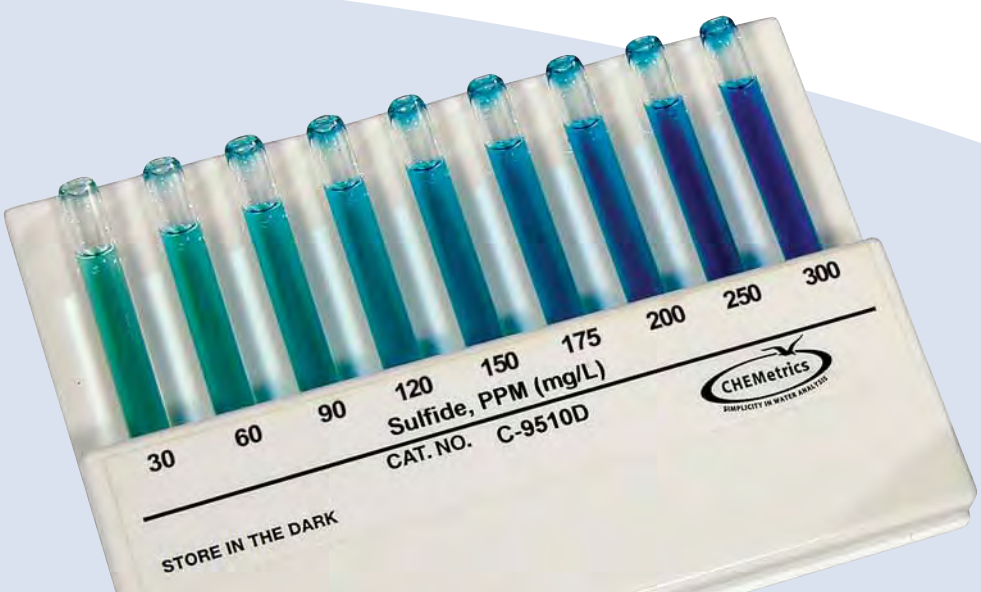
Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

Kit Components common to Sulfide

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

[1] **The accessory pack supplies enough solution to perform at least 200 tests.**

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



Methods

Sulfite is not usually present in surface waters. If sulfite is discharged in effluents or from domestic wastewaters, it readily oxidizes to form sulfate. Sodium sulfite is the most common form of sulfite and is an excellent reducing agent with applications as an oxygen scavenger. Sulfite concentrations in boiler and process waters must be monitored routinely to avoid overtreatment. Waste treatment plants that use sulfur dioxide to remove excess chlorine must monitor their effluents for sulfite.

Sulfites have been used for centuries to sanitize and preserve foods. They are used worldwide in the wine industry as antioxidant and antimicrobial agents. However, sulfites have been identified as causative agents in certain allergic reactions suffered by asthmatics. As a result, the FDA and the Bureau of Alcohol,Tobacco, and Firearms have mandated that sulfites in foods and beverages, at levels of 10 ppm or higher, be identified on the label.

The Iodometric Method (Sulfite)

References: ASTM D 1339-84, Sulfite Ion in Water, Test Method C. APHA Standard Methods, 22nd ed., Method 4500-SO_3^{2-} 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. Results are expressed as ppm (mg/L) SO_3.

The Ripper Method (Sulfite in Wine)

References: ASTM D 1339-84, Sulfite Ion in Water, Test Method C. APHA Standard Methods, 22nd ed., Method 4500-SO_3^{2-} 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_2.

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

Range: 2-20 ppm as SO_3
MDL: 2.0 ppm / Method: Iodometric

	Cat#
Sulfite Titrets Kit	K-9602

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

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

Range: 5-50 ppm as SO_3
MDL: 5.0 ppm / Method: Iodometric

	Cat#
Sulfite Titrets Kit	K-9605

Increments:
5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm

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

Range: 10-100 ppm as SO_3
MDL: 10 ppm / Method: Iodometric

	Cat#
Sulfite Titrets Kit	K-9610

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

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

Range: 50-500 ppm as SO_3
MDL: 50 ppm / Method: Iodometric

	Cat#
Sulfite Titrets Kit	K-9650

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

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

Range: 10-100 ppm as SO_2
MDL: 10 ppm / Method: Ripper

	Cat#
Sulfite in Wine Titrets Kit	**K-9610W**

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

Kit comes in a cardboard box and contains everything needed to perform 10 tests: ten ampoules, ten valve assemblies and instructions.

Kit Components common to Sulfite

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

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

Method

Thiosulfate is an excellent reducing agent. It is used primarily as an *antichlor* or chlorine-removing agent in various chemical processes, including the bleaching of pulp, paper, and textiles.

The Iodometric Method

Reference: APHA Standard Methods, 22nd ed., Method 4500-SO_3^{2-} B - 2000.

CHEMetrics' method employs the iodometric chemistry. Although sulfite usually titrates as thiosulfate, the reagent has been formulated to inhibit high-level sulfite interferences. Thiosulfate is titrated with iodide-iodate titrant in acid solution using a starch indicator. Results are expressed as ppm (mg/L) S_2O_3.

Visual Kit

Range: 5-50 ppm
MDL: 5.0 ppm / Method: Iodometric

	Cat#
Titrets Kit	**K-9705**

Increments:
5.0,. 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm

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

Kit Components common to Thiosulfate

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

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

Method

In industrial water systems, it is important to accurately measure and control the amount of dissolved solids present, as they can form deposits on the system components and decrease overall system efficiency. The National Secondary Drinking Water Standard for TDS is 500 mg/L.

Method of Operation.

To operate the CHEMetrics Total Dissolved Solids (TDS) Meter (Cat. No. I-1100), switch unit on, remove the electrode cap, immerse the probe into the sample, making sure that the sensor is fully covered. Wait for the readings to stabilize (Automatic Temperature compensation corrects for temperature changes). Take measurement. To clean the probe, simply rinse it in tap water. Tester is factory calibrated. However, to ensure accuracy, calibrate the TDS meter on a regular basis.

Instrument

Range: 0-2000 ppm and 0-10 ppt

	Cat#
Total Dissolved Solids (TDS) Meter	**I-1100**

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

Accessories

Description	Cat#
Electrode for TDS and Conductivity, Warranty 6 months	A-0176
Conductivity/TDS *Singles* (20 ea), 1413 µS, Shelf-life 3 months	A-0178
Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)	A-0179

Instructions are posted on our website.

FEATURES

Range: 0 - 2000 ppm and 0-10 ppt.

Resolution: 10 ppm; 0.10 ppt.

Accuracy: ± 1% full scale.

Calibration Type: Manual

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

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

Pocket-sized: 6.5" length x 1.5" diameter

Weight: 3.25 oz.(90 g)

Warranty: 1 year (electrode: 6 months)

FEATURES

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

Instruments are manufactured and guaranteed by Oakton Instruments, Inc.

Method

Detection of total petroleum hydrocarbons (TPH) in soil can indicate contamination from leaking underground storage tanks (USTs), petroleum refineries, or other fuel sources.

The Friedel Crafts Method

References: U.S. Patent #5,834,655. U.S. Patent #4,992,379. EPO Application #94 302 944. Roberts, R. M. and Khalaf, A. A., Friedel Crafts Alkylation Chemistry: A Century of Discovery, Marcel Dekker, Inc., NY, (1984). Schmid, George H., Organic Chemistry, Mosby-Yearbook, Inc., QD251.2S354, p. 935 (1996).

The RemediAid™ Total Petroleum Hydrocarbon Test is a rapid, simple field test for measuring aromatic petroleum hydrocarbon contamination in soil. The patented test is based upon the Friedel-Crafts Reaction with one fundamental difference—the intermediate that is formed in the solvent is the colored species that is measured.

The RemediAid Test determines TPH across a wide range of soil types and petroleum products. RemediAid allows the user to analyze for specific fractions, including: BTEX, PAH, diesel fuel, leaded and unleaded gasoline, brent crude, and lubricating oil.

In the test method, a pre-measured sample of soil is added to a reaction tube that contains anhydrous sodium sulfate, a drying agent. A pre-measured volume of dichloromethane is then added to the reaction tube. This organic solvent extracts the petroleum hydrocarbons from the soil sample. In order to remove polar hydrocarbons and color interferences, the soil extract is treated with Florisil. Finally, a vacuum-sealed ampoule, containing aluminum chloride, draws in a predetermined volume of the hydrocarbon-containing solvent. The hydrocarbons in the solvent react with the aluminum chloride to produce a soluble colored product directly proportional to the petroleum hydrocarbon concentration in the sample. The absorbance of the sample is measured in a portable, battery-powered, LED-based colorimeter and converted to mg/kg hydrocarbon in the soil by use of a formula.

Instrumental Kit

Ranges[1]:
Unleaded Gasoline: 80-600 mg/kg
Diesel: 60-400 mg/kg
Brent Crude: 40-400 mg/kg
Lube Oil: 120-1000 mg/kg
BTEX: 16-140 mg/kg
Leaded Gasoline: 80-520 mg/kg
PAH (16 component mixture): 8-60 mg/kg
Method: Friedel Crafts

	Cat#
RemediAid (TPH) Starter Kit (No Consumables)	**I-9312**
RemediAid (TPH) Starter Kit comes in a plastic case and contains TPH Photometer, pocket scale, 3-channel timer, TPH reaction tube plug/snapper, tip-breaking tool, 4 AAA batteries, screwdriver, and instruction booklet.	
RemediAid (TPH) Refill (for use with I-9312)	**R-9310**
Refill comes in a cardboard box and contains 16 tests, two 30 g bottles of sodium sulfate and reagent blank ampoule.	

NOTE: R-9310 TPH Refill must be purchased separately from I-9312.

Kit Components common to TPH

Description	Cat#
Tip Breaking Tool (2 ea)	A-0197
Reagent Blank Ampoule Pack (2 ea)	A-0161
Sodium Sulfate, two 30 g bottles	A-0162[2]
TPH Reaction Tube Plug/Snapper (1 ea)	A-0168

[1] **Expected dynamic range of the test in soil sample matrix (The instructions include dilution procedures, if an extended range is required.).**

[2] **Consumption of this accessory is solely dependent on the moisture content of the soil being tested. If the soil being tested has a moisture content above 10%, the bottle of sodium sulfate will be depleted after approximately 8 tests.**

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

Method

Designed for portability and durability, the waterproof CHEMetrics Turbidity Meter is ideal for monitoring turbidity of water in chemical, food, and industrial applications. The microprocessor-based turbidity meter uses an infrared LED light source and delivers unprecedented repeatability and accuracy while offering resolution as low as 0.01 NTU. This light-weight meter is a valuable analytical tool for field-testing and quality control.

Method of Operation.

The turbidity meter is equipped with an infrared LED as its source of light and meets all testing requirements of ISO-7027 (DIN EN 27027) method (Nephelometric Turbidity Units). The wavelength peaks at 850 nm, which provides the required intensity of diffused light even in samples with low turbidity values and also reduces interference from any colors.

The meter determines the sample turbidity level and automatically adjusts to the appropriate measurement range (0-1000 NTU), eliminating guesswork. Pressing the CAL button initiates the quick and simple calibration procedure. The instrument automatically prompts the user for the next calibration standard. The meter comes with four primary calibration standards (0.02, 20.0, 100, and 800 NTU). The meter also comes with three borosilicate sample cuvettes with light-shield caps.

FEATURES

Measurement Range: 0 to 1000 NTU.

Automatic Range Selection: 0.01-19.99 NTU, 20.0-99.9 NTU, 100-1000 NTU.

Resolution: 0.01 NTU (0-19.99 NTU), 0.1 NTU (20.0-99.9 NTU), 1 NTU (100-1000 NTU).

Accuracy: ±2% of measurement ± 1 LSD for 0 to 500 NTU, ±3% of measurement ± 1 LSD for 501 to 1000 NTU.

Light Source: Infrared-emitting diode (850 nm wavelength).

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

Power Supply: Four AAA Alkaline batteries (>1200 measurements).

Dimensions: 2.7" width x 6.1" length x 1.8" height (6.8 x 15.5 x 4.6 cm)

Weight: 7 oz. (200 g)

Warranty: 1 year

Instrument

Range: 0-1000 NTU

	Cat#
Turbidity Meter	**I-1300**

Instrument comes in carrying case with calibration standards, cuvettes, four AAA alkaline batteries, and instructions.

Accessories

Description	Cat#
Turbidity Calibration Set, Shelf-life 8 months Increments: 0.02, 20.0, 100, and 800 NTU	A-0198
Turbidity Cuvettes Pack (3 ea)	A-0181

Instructions are posted on our website.

FEATURES

- **Waterproof**
- **Auto-Ranging**
- **Push-button calibration**
- **Advanced power-supply management**
- **Auto-shutoff**

Instruments are manufactured and guaranteed by Oakton Instruments, Inc.

Method

Zinc deposits are present in much of the earth's crust. The metal provides an effective protective coating for steel (galvanized coatings) and is useful as an alloying agent. Zinc salts are useful as corrosion inhibitors in cooling water treatment formulations. The USEPA has established a Maximum Secondary Drinking Water Standard of 5 mg/L for zinc.

The Zincon Method

References: APHA Standard Methods, 22nd 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 eight-month shelf-life. We recommend stocking quantities that will be used within seven months.

Instrumental Kits

Multi-Analyte Photometers
V-2000 / V-3000 Series
(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 30 tests: thirty ampoules, Indicator Solution, 25 mL sample cup, ampoule blank and instructions.

Range: 0-6.00 ppm
Method: Zincon

	Cat#
Vacu-vials Kit, Shelf-life 8 months	**K-9923**

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

Kit Components common to Zinc

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

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

To Place an Order

Write: CHEMetrics, Inc.
4295 Catlett Road
Midland, VA 22728
Call: 1-800-356-3072
1-540-788-9026
Fax: 1-540-788-4856
E-Mail: orders@chemetrics.com
Web: www.chemetrics.com

E-Mail

Technical Support: technical@chemetrics.com
Marketing & Sales: marketing@chemetrics.com
Ordering: orders@chemetrics.com
Custom Products: tneale@chemetrics.com

Prompt Order Processing
orders@chemetrics.com

Hours

8:00 AM to 4:30 PM Eastern Time, Monday through Friday, except holidays.

Terms

Net 30 days from date of shipment, with approved credit. Ex Works Midland, VA. VISA, MasterCard, and American Express accepted.

Quantity Discounts

Quantity discounts off list price are as follows for identical items:

Test Kits, Refills, and Components

Quantity	Discount
50-99	10%
100-199	15%
200 or more	20%

CHEMetrics photometric kits:

Quantity	Discount
5-9	5%
10-19	10%
20 or more	15%

Quantity discounts are not available for the following products: Digestors, I-1000 pH Tester, I-1100 Total Dissolved Solids Tester, I-1200 Conductivity Tester, I-1300 Turbidity Meter, Total Petroleum Hydrocarbons (TPH), and ULR CHEMets® products.
Substantially higher discounts are available for large quantity orders. Contact the Marketing Department for details. See Product Price List or Website for Quantity Discount Schedule for COD kits.

Shipping

In the absence of instructions from the customer, merchandise will be shipped via UPS whenever possible. Freight cost plus $4.00 handling will be added to the invoice. Claims for transportation damage must be submitted to the common carrier.

Returns of Merchandise

CHEMetrics generally accepts returns of resellable merchandise for credit when such merchandise is returned within 60 days. Products with a shelf-life of less than 1 year may need to be returned within 30 days to be considered "resellable" and receive credit. Customers who wish to return merchandise should call CHEMetrics in advance to obtain authorization. Restocking fees of 20% may be imposed except on instruments returned within 30 days of purchase. Additional fees may be imposed for special handling.

Warranty

CHEMetrics generally warrants its products to be free from defects in materials and workmanship for two years from manufacture, except as follows. Those reagent products that we identify as having shelf-lives shorter than two years are warranted through the expiration dates printed on the merchandise. Instrument products, other than their expendable components, are warranted for one year from receipt by the customer. This warranty does not apply to merchandise improperly stored or handled by a party other than CHEMetrics. Our V-2000 and V-3000 Series Photometers offer a two-year warranty.

THIS WARRANTY SHALL BE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

CHEMetrics, Inc. will repair, replace or refund the purchase price for products it manufactures which are defective. This is the exclusive remedy for damages of any nature, including incidental and consequential, resulting from such products. CHEMetrics reserves the right to change or discontinue any product without notice. Customers may find the most current and accurate product information at our website, www.chemetrics.com.

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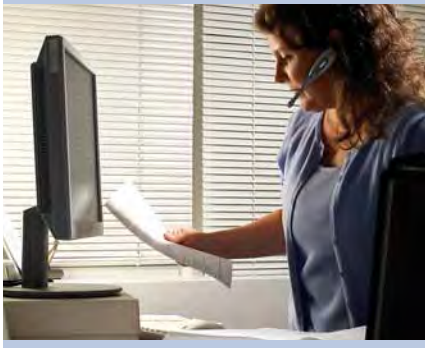

Technical Services
technical@chemetrics.com

Custom Products
tneale@chemetrics.com

CHEMetrics, Inc.

4295 Catlett Road | Midland, VA 22728

P: 800-356-3072 | F: 540-788-4856

www.chemetrics.com