



CHEMetrics
for good measure

PRODUCT CATALOG 2016 | 2017

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

| | | | | | |
|----------------------------------|----|-----------------------------|----|--------------------------------------|----|
| Alkalinity | 18 | Fluoride | 40 | pH | 67 |
| Aluminum | 19 | Formaldehyde | 41 | Phenols | 68 |
| Ammonia | 20 | Glycol | 43 | Phosphate, ortho | 70 |
| Bromine | 22 | Hardness | 44 | Quaternary Ammonium Compounds (QACs) | 72 |
| Calcium (see Hardness) | 44 | Hydrazine | 45 | Silica | 73 |
| Carbohydrazide | 23 | Hydrogen Peroxide | 47 | Sulfate | 74 |
| Carbon Dioxide | 24 | Hypochlorite (see chlorine) | 31 | Sulfide | 75 |
| Chemical Oxygen Demand (COD) | 26 | Iron | 50 | Sulfite | 77 |
| Chloride | 28 | Iron in Brine | 51 | Sulfite in Wine | 78 |
| Chlorine | 30 | Manganese | 53 | Thiosulfate | 79 |
| Chlorine Dioxide | 32 | Mercaptobenzothiazole (MBT) | 54 | Total Dissolved Solids (TDS) | 80 |
| Chromate | 33 | Molybdate | 55 | Total Petroleum Hydrocarbons (TPH) | 81 |
| Conductivity | 34 | Nitrate | 56 | Zinc | 82 |
| Copper | 35 | Nitrite | 58 | | |
| Cyanide | 36 | Oxygen, dissolved | 60 | | |
| DEHA | 37 | Ozone | 63 | | |
| Detergents (anionic surfactants) | 38 | Peracetic Acid | 65 | | |
| Filming Amine (aliphatic amine) | 39 | Persulfate | 66 | | |

Why CHEMetrics

Innovation Starts Here

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 47th 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 Left:

Joanne Carpenter *Director of Research and Development*

Gordon A. Rampy *Chairman*

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

Bruce H. Rampy *President*

Teresa Neale *Vice President of Operations and Product Support*



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

PETRO/CHEMICAL INDUSTRY

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

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

ENVIRONMENTAL/EDUCATION

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

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



Industries & Applications

WATER/WASTEWATER

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

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

WATER TREATMENT

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

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

MINING AND MANUFACTURING

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

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



LAB/CLINIC/MEDICAL

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

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

PULP AND PAPER

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

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

FOOD AND BEVERAGE

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

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



Visual Colorimetric Analysis

The CHEMets® Method

To perform a test, immerse the CHEMets™ 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.

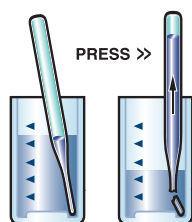


Kits include 30 ampoules, comparator(s), accessory solution(s) (when necessary), a sample cup, and instructions. Refill packs of 30 ampoules and accessory solutions are available separately.

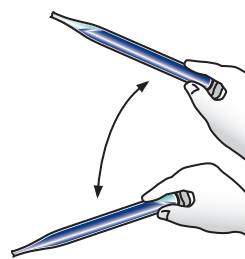
Most comparators have a 2-year shelf-life.

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.

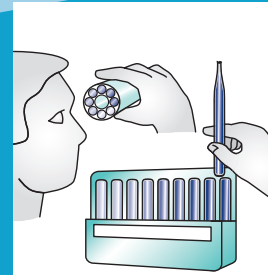
The CHEMets Test Procedure



STEP 1



STEP 2



STEP 3

Instrumental Colorimetric Analysis

The Vacu-vials® Method

The sampling method is the same as the CHEMets method (Steps 1 & 2), but rather than comparing results visually, the user places the filled ampoule in the cell holder of an instrument set to a wavelength for

optimal absorbance (Step 3). If you use a spectro-

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

is posted under the "Support" tab on our website. Direct-reading instruments are available (pages 14-15,17).

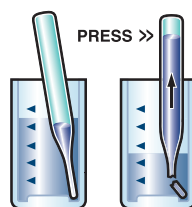
Vacu-vials® Kits include 30 ampoules, a zeroing ampoule, accessory solution(s) (when necessary), a sample cup, and instructions.



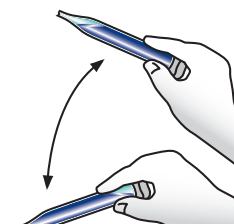
View instructional videos
on our website at
www.chemetrics.com

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.

The Vacu-vials Test Procedure



STEP
1



STEP
2



STEP
3

High Range Visual Colorimetric Analysis

The VACUettes® Auto-Dilution Method

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

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

Most comparators have a 2-year shelf-life.

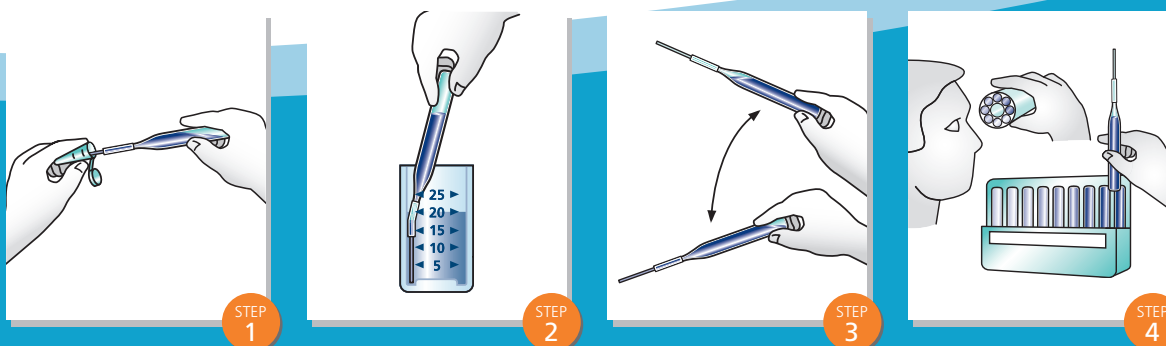


VACUettes ampoules are designed for highly concentrated samples. They employ a patented auto-dilution feature that eliminates the need for a time-consuming and error-prone preliminary dilution. As a result, the entire test typically takes

only 2 to 3 minutes, with a rate of accuracy compar-

able 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.

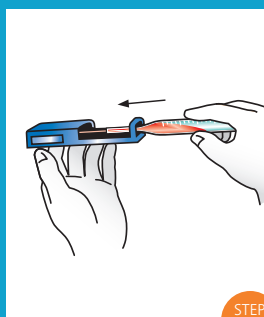


Each Titret™ ampoule is 13 mm in diameter and is designed for titrimetric analysis. The ampoule contains vacuum-sealed liquid titrant and has a flexible valve assembly attached.

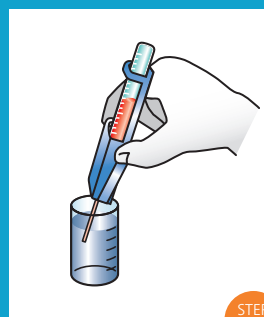


View instructional videos
on our website at
www.chemetrics.com

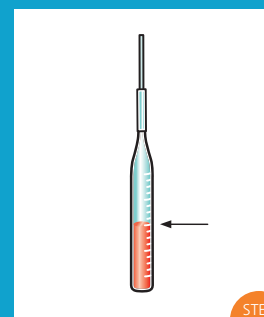
The Titrets Test Procedure



STEP
1



STEP
2



STEP
3

PRODUCT SPOTLIGHT

Hydrogen Peroxide for Food & Beverage Industry ▶

CHEMetrics® Hydrogen Peroxide products are used to monitor the sterilization solution residuals in Extended Shelf Life (ESL) and Aseptic Packaging applications. The product cartons are sprayed with hydrogen peroxide to pre-sterilize them, then heated to remove the hydrogen peroxide. CHEMetrics® Hydrogen Peroxide Kits meet critical residual concentration limits of 0.5 ppm. **See page 47. Other products of interest include our Peracetic Acid and Ozone kits.**

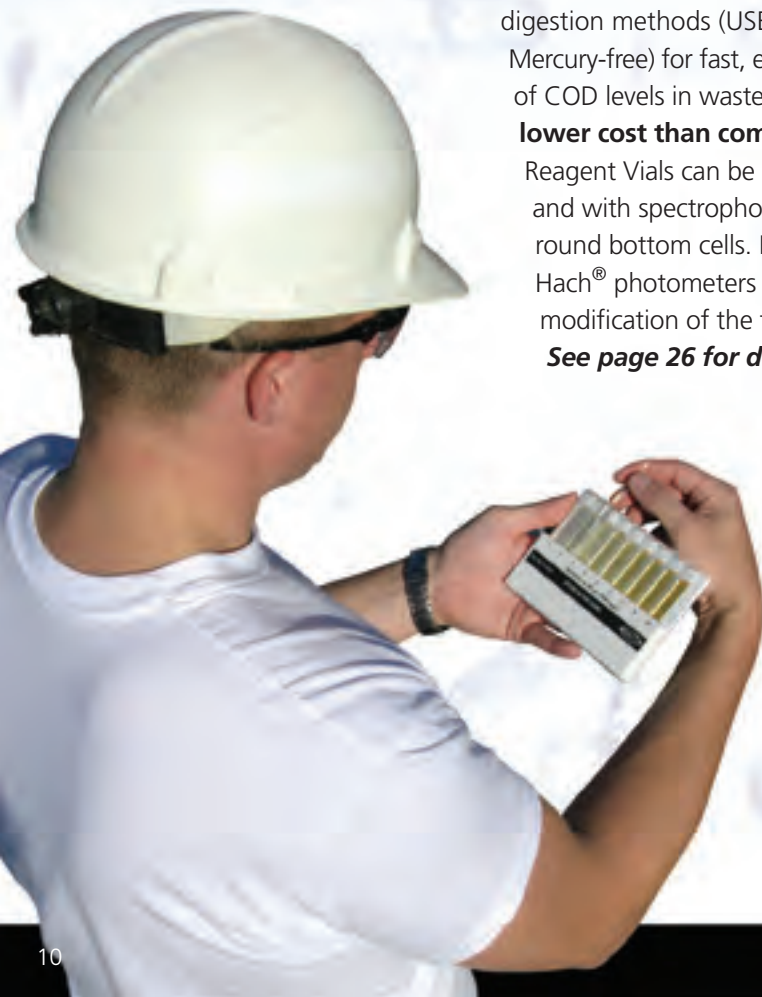


◀ PPB Dissolved Oxygen for Monitoring Boiler Water

CHEMetrics® ppb (parts per billion) Dissolved Oxygen CHEMetrics® ampoules employ the only method approved by the ASTM for detecting trace concentrations of dissolved oxygen in boiler applications. With sensitivity down to 2 ppb, Dissolved Oxygen CHEMetrics® ampoules provide power plant operators with a rapid, reliable means to determine ppb levels of Dissolved Oxygen. **See page 60 for more information.**

COD for Municipal and Industrial Labs ▶

CHEMetrics offers two dichromate reactor digestion methods (USEPA-accepted and Mercury-free) for fast, easy, safe determinations of COD levels in wastewater—at about **30% lower cost than competitive vials!** Our COD Reagent Vials can be used with CHEMetrics® photometers and with spectrophotometers that accept 16 mm diameter round bottom cells. Furthermore they may be used with Hach® photometers and spectrophotometers without modification of the factory calibrations¹. **See page 26 for details.**



◀ Ammonia Test Kits for Wastewater and Environment

Ammonia concentrations are routinely measured in wastewater effluent, drinking water, surface water and seawater. CHEMetrics offers test kits employing the well-known Nessler reagent to deliver sensitivity and accuracy within **two minutes or less**, as well as kits employing the salicylate method which offers similar sensitivity without generating any mercury-containing waste. **Information on our Ammonia kits can be found on page 20.**

¹Note: No endorsement by Hach Company is implied or intended.

NEW!



Ozone Testing For Bottled Water

New Instrumental Test Kit featuring Unique Self-zeroing Method

CHEMetrics® new Ozone Vacu-vials® Test Kit (K-7433), employs the broadly accepted indigo method and is designed to enable bottled water producers to quickly and accurately measure ozone residuals between 0 and 0.75 ppm.

The innovative self-zeroing feature eliminates the need to generate a reagent blank every time a test is performed—only one ampoule per test.

The Ozone (indigo) Kit can be used with our new I-2022 Ozone Single Analyte Meter (SAM), the V-3000 Multi-Analyte Photometer, or a spectrophotometer that accepts a 13 mm diameter round cell. **See page 63 for details.**



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

Simple Test Procedure



Set Instrument to Zero
using the zero ampoule



Set Reagent Blank Value
using unsnapped ampoule



Snap the Ampoule
by placing the tip at the
bottom of the sample cup



Obtain Test Results
by inserting the snapped
ampoule in the instrument's
sample cell



Verification Kits for CHEMetrics® Photometers To Validate Photometer Performance

Features

- Easy to use. No preparation is required.
- Uses NIST traceable standards.
- Ideal for instrument verification in the lab and in the field.
- Saves time. No need to return the photometer to CHEMetrics for verification.

CHEMetrics® Verification Kits allow you to quickly and routinely check the performance of your CHEMetrics photometers. Introducing our 530 nm SAM Verification Kit, Cat. No. I-0003 for use with CHEMetrics® I-2001 Chlorine, I-2002 Dissolved Oxygen, I-2005 Chlorine Dioxide, I-2019 Ozone (DPD) and I-2020 Peracetic Acid SAM Photometers. Coming soon will be Verification Kits for our Ozone (indigo) SAM and V-2000 Photometers.

Packaged in a compact, durable polypropylene carrying case, each kit includes a set of ampoules containing various dye solutions specific to the wavelength(s) for the particular photometer. The absorbance of each dye ampoule is individually confirmed using a spectrophotometer that is certified using optical standards traceable to NIST.

A Certificate of Analysis will be supplied with each kit that reports the permissible test value for each standard in the kit. Contact technical@chemetrics.com for details.



Flexibility and Convenience! Use Vacu-vials® Kits with Other Instruments

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

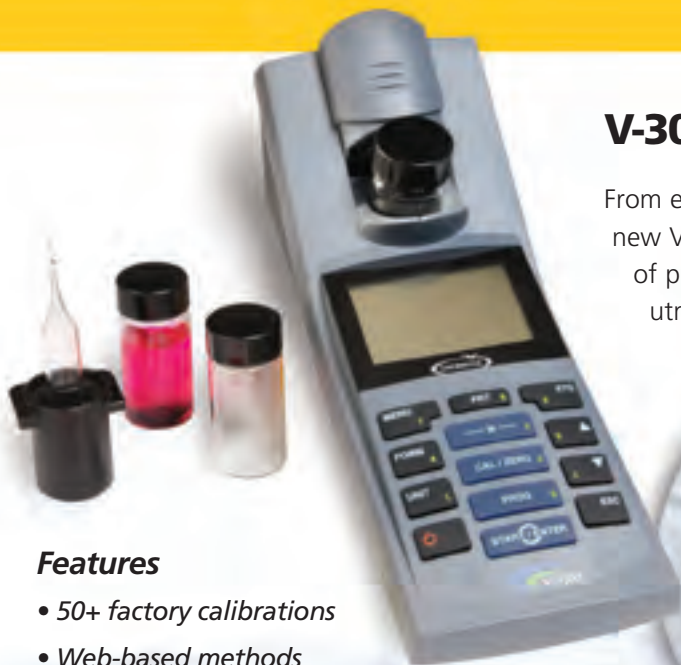


To convert from absorbance to concentration in ppm...

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

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. **See page 14 for details.**



Features

- 50+ factory calibrations
- 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



V-3000 Pro
Multi-Analyte Photometer
plus pH and ORP

Detergents Testing for the Pharmaceutical Industry

Cleaning validation is a requirement in industries such as pharmaceutical manufacturing which adhere to Good Manufacturing Practice (GMP) and Quality Systems Regulations (QSR), and is specific to the cleaning method and cleaner employed.

A cleaning validation involves testing for acceptable residue on pharmaceutical manufacturing or medical device surfaces. CHEMetrics® Detergents Test Kit, Cat. No. K-9400, featuring a superior extraction/sampling technique, is routinely used by

pharmaceutical companies to measure detergents (anionic surfactants) to ensure that no excessive residual surfactant remains.

For more information, see page 38.



Arsenic-free SPADNS Reagent Fluoride Kit for Drinking Water

CHEMetrics® 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 Kit can be used with the new V-3000 Photometer, our Single Analyte Photometer (SAM), or any instrument with a cell size up to 50 mm.

See page 40 for details.



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 and 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 Power LabStation 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 Power LabStation
- 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)
- A-0306 28 mm cell with lid

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 (flat bottom vials only) |
| 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 Power LabStation (A-0302)

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.

Catalog No.

V-2000
V-3000

Multi-Analyte Photometer
Multi-Analyte Photometer

Catalog No.

V-3000P
V-3000T

Multi-Analyte Photometer (+ pH and ORP)
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.

| Analyte | Cat. No. | Range, ppm | |
|--|-----------------|------------|---------------|
| | | 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 | 0-12.0 | 0-12.0 |
| *Chloride | K-2103 | 0-40.0 | 0-40.0 |
| Chlorine, free & total <i>USEPA-accepted</i> | K-2513 | 0-5.00 | 0-5.00 |
| Chlorine, free <i>USEPA-accepted</i> | K-2523 | 0-5.00 | 0-5.00 |
| Chlorine Dioxide | K-2703 | 0-11.0 | 0-11.0 |
| Chromate | K-2803 | 0-3.50 | 0-3.50 |
| *COD LR, <i>USEPA-accepted</i> | K-7350S, K-7355 | 0-150 | N/A |
| COD LR, <i>Mercury-free</i> | K-7351S, K-7356 | 0-150 | N/A |
| *COD HR, <i>USEPA-accepted</i> | K-7360S, K-7365 | 0-1500 | N/A |
| COD HR, <i>Mercury-free</i> | K-7361S, K-7366 | 0-1500 | N/A |
| *COD HR+, | K-7370S, K-7375 | 0-15,000 | N/A |
| COD HR+, <i>Mercury-free</i> | K-7371S, K-7376 | 0-15,000 | N/A |
| Copper | K-3503 | 0-12.00 | 0-12.00 |
| Cyanide | K-3803 | 0-0.400 | 0-0.400 |
| DEHA | K-3903 | 0-2.00 | 0-2.00 |
| Fluoride, <i>USEPA-compliant</i> | K-4009 | N/A | 0-3.00 |
| Formaldehyde | K-4203 | 0-8.00 | 0-8.00 |
| Glycol (as ethylene glycol) | K-4403 | 0-10.0 | 0-10.0 |
| Glycol (as propylene glycol) | K-4403 | 0-20.0 | 0-20.0 |
| Glycol (as propylene glycol) | K-4423 | 0-200 | 0-200 |
| Glycol (as ethylene glycol) | K-4423 | 0-100 | 0-100 |
| Hydrazine | K-5003 | 0-1.20 | 0-1.20 |
| Hydrogen Peroxide | K-5513 | 0-3.00 | 0-3.00 |
| Hydrogen Peroxide | K-5543 | 0-6.00 | 0-6.00 |
| Iron, total | K-6023 | 0-2.50 | 0-2.50 |
| Iron, total & ferrous | K-6203 | 0-6.00 | 0-6.00 |
| Iron, total & soluble | K-6003 | 0-6.00 | 0-6.00 |
| 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 | 0-1.50 | 0-1.50 |
| Nitrate (as N) | K-6903 | 0-1.50 | 0-1.50 |
| Nitrate (as N) | K-6923 | 0-7.50 | 0-7.50 |
| Nitrate (as NO ₃) | K-6933 | 0-50.0 | 0-50.0 |
| Nitrite (as N) | K-7003 | 0-1.00 | 0-1.00 |
| Ozone (DPD) | K-7423 | 0-5.00 | 0-5.00 |
| Ozone (indigo) | K-7433 | N/A | 0-0.75 |
| Oxygen, dissolved | K-7553 | 0-1.000 | 0-1.000 |
| Oxygen, dissolved | K-7503 | 0-2.00 | 0-2.00 |
| Oxygen, dissolved | K-7513 | 0-15.0 | 0-15.0 |
| Peracetic Acid | K-7913 | 0-5.00 | 0-5.00 |
| Phenols | K-8003 | 0-8.00 | 0-8.00 |
| Phenols | K-8023 | 0-20.0 | 0-20.0 |
| Phosphate, ortho (as P) | K-8513 | 0-2.64 | 0-1.63 |
| Phosphate, ortho (as PO ₄) | K-8513 | 0-8.00 | 0-5.00 |
| Phosphate, ortho (as PO ₄) | K-8503 | 0-80.0 | 0-80.0 |
| Silica | K-9003 | 0-10.00 | 0-10.00 |
| Sulfate | K-9203 | 0-100.0 | 0-100.0 |
| Sulfide | K-9503 | 0-3.00 | 0-3.00 |
| Sulfide | K-9523 | 0-6.00 | 0-6.00 |
| Zinc | K-9903 | 0-3.00 | 0-3.00 |
| Zinc | K-9923 | 0-15.0 | 0-15.0 |

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



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, dissolved | I-2002 | 0-15.0 | K-7513 |
| Ozone (Indigo) | I-2022 | 0-0.75 | K-7433 |
| Ozone (DPD) | 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) CaCO₃.

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 CaCO₃
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 CaCO₃
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 CaCO₃
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 SDSs 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-AI 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 SDSs 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-NH₃ 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, NH₃-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, NH₃-N.

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

Visual Kits

| Range: 0-1 & 1-10 ppm MDL: 0.05 ppm / Method: Direct Nesslerization | |
|---|----------------------|
| | Cat# |
| CHEMets Kit | *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: 0-30 ppm (up to 15,000 ppm with A-0188 accessory) MDL: 0.125 ppm / Method: Salicylate | |
|--|---------------------|
| | Cat# |
| CHEMets Kit | 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, 2.0, 3.0 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 | |
|---|-----------------------|
| | Cat# |
| VACUettes Kit | *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, diluter snapper cup, micro test tube and instructions. | |

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

 Instrumental Kits

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-1503² |

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-1523² |

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, Catalyst 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 |
| Pipette Tips Pack (30 ea) | A-0171 |
| Dilution Kit (10X, 25X, 125X, 250X, 500X, 1000X, 5000X) | A-0188 ³ |

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

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

| |
|----------------------|
| Cat# |
| VACUettes Kit |
| *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

| |
|----------------------|
| Cat# |
| VACUettes Kit |
| *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

| |
|----------------------|
| Cat# |
| VACUettes Kit |
| *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.

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

²Shelf-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.

³Not included in kits. Must be purchased separately.

Instructions and SDSs are posted on our website.

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



Method

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

The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 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 Br₂.



Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-12.0 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.

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

Instructions and SDSs are posted on our website.

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



Visual Kit

Range: 0-2.2 & 0-11 ppm
MDL: 0.125 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, 0.25, 0.5, 0.7, 0.9, 1.4, 1.8, 2.2 ppm | C-1601 |
| High Range Comparator 0, 2.2, 3.4, 4.5, 5.6, 6.8, 7.9, 9, 11 ppm | C-1605 |

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

Kit Components common to Bromine

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



Method

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

The PDTS Method

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

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

Visual Kit

Range: 0-0.50 ppm
MDL: 0.05 ppm / Method: PDTS

| | Cat# |
|---|---------------|
| CHEMets Kit | K-1805 |
| CHEMets Refill, 30 ampoules | R-1805 |
| Activator Solution Pack, six 10 mL bottles | A-1800 |
| Comparator 0, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50 ppm | C-1805 |

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

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 SDSs 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 (CO₂) 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 CO₂, 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-CO₂ 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) CO₂.

Visual Kits

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

| Titrets Kit | Cat# |
|-------------|---------------|
| | K-1910 |

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

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

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

| Titrets Kit | Cat# |
|-------------|---------------|
| | K-1920 |

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

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

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

| Titrets Kit | Cat# |
|-------------|---------------|
| | K-1925 |

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

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

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 SDSs are posted on our website.

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



Save up to 30% with CHEMetrics® COD Vials



No Difference—CHEMetrics® COD Vials can be used directly with any Hach® factory-programmed instrument calibrations, at savings of up to 30%! Request the Performance Data Report showing CHEMetrics COD Vial performance in Hach instrumentation.

- ✓ USEPA-accepted for wastewater analysis
- ✓ Lower cost per test—save up to 30%
- ✓ Mercury-free method available
- ✓ Compact and eco-friendly packaging
- ✓ No need to modify existing equipment or procedures
- ✓ Product support with a personal touch

Cross Reference to Hach® COD Products

COD Reagent Vials*

| CHEMetrics Cat. No. | No. of Tests | Range (ppm) | USEPA-accepted | Hach 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 |

Mercury-free COD Reagent Vials

| CHEMetrics Cat. 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 |

*USEPA-accepted COD Vials can be used for NPDES reporting.

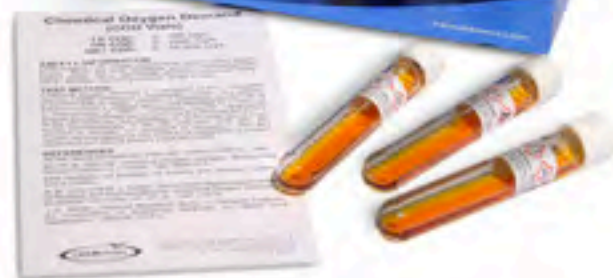
¹ NOTE: No endorsement by Hach Company is implied or intended.

The CHEMetrics COD System



All Materials for COD Lab Setup are available from CHEMetrics

- ✓ COD Reagent Vials Kit (USEPA-accepted and Mercury-free)
- ✓ Digester Block (holds 12 vials)
- ✓ Photometer (single or multi-analyte)
- ✓ Calibration Standards (1000 and 10,000 ppm)
- ✓ COD Vial Rack (holds 40 vials)



Methods

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

References: USEPA Methods of Analysis of Water and Wastes, Method 410.4 (1983). APHA Standard Methods, 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.

USEPA-accepted

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 pre-measured solutions of sulfuric acid and potassium dichromate. To perform the COD determination, the analyst simply removes the Teflon-lined screw cap from the vial, adds sample to the vial, and replaces the cap. The vial is then heated for two hours at 150°C in a standard digester block.

Results are obtained using any photometer or spectrophotometer that accepts a 16 mm cell including Hach instruments with factory-programmed calibrations¹. A generic calibration equation is included for use with other spectrophotometers.

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

Multi-Analyte Photometer

V-2000

(See page 14 for instrumental features)

Range: 0-150 ppm (LR)

Method: Dichromate Reactor Digestion

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

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

| | |
|---------------------------------------|----------------|
| COD (USEPA-accepted) Vials Kit | *K-7355 |
|---------------------------------------|----------------|

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

Range: 0-150 ppm (LR)

Method: Dichromate Reactor Digestion

| | |
|-------------------------------------|-------------------------------|
| COD (Mercury-free) Vials Kit | Cat# K-7351S |
|-------------------------------------|-------------------------------|

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

| | |
|-------------------------------------|---------------|
| COD (Mercury-free) Vials Kit | K-7356 |
|-------------------------------------|---------------|

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

Range: 0-1500 ppm (HR)

Method: Dichromate Reactor Digestion

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

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

| | |
|---------------------------------------|----------------|
| COD (USEPA-accepted) Vials Kit | *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 SDSs 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

| | |
|-------------------------------------|-------------------------------|
| COD (Mercury-free) Vials Kit | Cat# K-7361S |
|-------------------------------------|-------------------------------|

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

| | |
|-------------------------------------|---------------|
| COD (Mercury-free) Vials Kit | K-7366 |
|-------------------------------------|---------------|

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

Range: 0-15,000 ppm (HR+)

Method: Dichromate Reactor Digestion

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

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

| | |
|---|----------------|
| COD (Not USEPA-accepted) Vials Kit | *K-7375 |
|---|----------------|

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

Range: 0-15,000 ppm (HR+)

Method: Dichromate Reactor Digestion

| | |
|-------------------------------------|-------------------------------|
| COD (Mercury-free) Vials Kit | Cat# K-7371S |
|-------------------------------------|-------------------------------|

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

| | |
|-------------------------------------|---------------|
| COD (Mercury-free) Vials Kit | K-7376 |
|-------------------------------------|---------------|

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

All COD Kits require the use of a Digester Block along with a CHEMetrics Photometer, a COD Photometer, or a spectrophotometer capable of accepting a 16 mm round cell. Instruments sold separately.

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

Accessories

| Description | Cat# |
|--|---------------------|
| Vial Rack (holds 40 vials) | A-0107 |
| COD Zeroing Vial | A-0183 |
| Digester Block US (115 Volt, 12 cells), Warranty 1 year | A-0201 |
| Digester Block EURO (230 Volt, 12 cells), Warranty 1 year | A-0202 |
| Digester Block UK (230 Volt, 12 cells), Warranty 1 year | A-0203 |
| Digester 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

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

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

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

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

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

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

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

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

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

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 SDSs are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

 **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-2103¹ | |

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.

¹Although 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.





Visual Kits

Methods

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

The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983).
 APHA Standard Methods, 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) Cl₂.

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) Cl₂.

| Range: 0-0.20 ppm MDL: 0.04 ppm / Method: DDPD | |
|---|---------------------|
| | Cat# |
| Chlorine (free & total) ULR CHEMets Kit | 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 | |
|---|---------------------|
| | Cat# |
| Chlorine (free & total) CHEMets Kit | 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 | |
|--|---------------------|
| | Cat# |
| Chlorine (free & total) CHEMets Kit | 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 | |
|---|---------------------|
| | Cat# |
| Chlorine (free & total) CHEMets Kit | 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.



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.

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.

¹The 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 |
| Pipette Tips Pack (30 ea) | A-0171 |
| MiniPet®, 25 µL (1 ea) | A-0191 |
| MiniPet®, 50 µL (1 ea) | A-0193 |
| MiniPet®, 200 µL (1 ea) | A-0194 |
| Sample Prep Cup Pack (6 ea) | A-0200 |

Instructions and SDSs are posted on our website.

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

Range: 0-100 & 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-2500¹

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 µL 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-2500¹

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 µL 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 µL 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 µL MiniPet®, and instructions.

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

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-ClO₂ 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 Cl₂ is prevented (up to 6 ppm Cl₂) by the addition of glycine to the sample. Results are expressed as ppm (mg/L) ClO₂.

Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-11.0 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

| | Cat# |
|---------|--------|
| SAM Kit | I-2005 |

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

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 |

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

Instructions and SDSs are posted on our website.

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

Visual Kit

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

| | Cat# |
|---|---------------------|
| CHEMets Kit | K-2705 |
| CHEMets Refill, 30 ampoules | R-2705 |
| Neutralizer Solution Pack, six 10 mL bottles, Shelf-life 8 months | A-2700 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.



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) CrO₄.



Visual Kits

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

| | Cat# |
|--|---------------------|
| CHEMets Kit | 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

| | Cat# |
|---|---------------------|
| VACUettes Kit | 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

| | Cat# |
|---|---------------------|
| VACUettes Kit | 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

| | Cat# |
|--|---------------------|
| VACUettes Kit | 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

| | Cat# |
|---|---------------------|
| VACUettes Kit | 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.

¹The 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

| | Cat# |
|-----------------------|---------------|
| Vacu-vials Kit | K-2803 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank 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 SDSs 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 μ S and 0-20 mS (0-20,000 μ S)

| Conductivity Meter | Cat# I-1200 |
|--------------------|----------------|
|--------------------|----------------|

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

Accessories

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

Instructions are posted on our website.

FEATURES

Range: 0-2000 μ S and 0-20 mS.

Resolution: 10 μ S; 0.10 mS

Accuracy: \pm 1% full scale.

Calibration Type: Manual or Automatic with 1413 μ S Conductivity Singles

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

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

Pocket-sized: 6.5" length x 1.5" diameter

Weight: 3.25 oz. (90 g)

Warranty: 1 year (electrodes: 6 months)

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# |
|--|---------------|
| CHEMetrics Kit | K-3510 |
| CHEMetrics 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 SDSs are posted on our website.

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



Method

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

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

The Isonicotinic-Barbituric Acid Method

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

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

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

Visual Kit

Range: 0-0.1 & 0.1-1 ppm

MDL: 0.005 ppm / Method: Isonicotinic-Barbituric Acid

| | Cat# |
|--|---------------------|
| CHEMetrics Kit | K-3810 |
| CHEMetrics 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, Shelf-life 12 months 0, 0.01, 0.02, 0.03, 0.04, 0.06, 0.08, 0.1 ppm | C-3801 |
| High Range Comparator, Shelf-life 12 months 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 ppm | C-3810 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, Activator Solution, 5 mL sample cup & top, 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 |
| Syringe Pack, 3.0 mL (6 ea) | A-0063 |
| Sample Cup & Top Pack, 5 mL (6 ea) | A-0105 |

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

Instructions and SDSs are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 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 ($\mu\text{g/L}$) 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, Shelf-life 18 months 0, 30, 60, 100, 150, 200, 300, 400 ppb | C-3901 |
| High Range Comparator, Shelf-life 18 months 400, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000 ppb | C-3902 |

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

¹The 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 SDSs 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 superior extraction/sampling technique that eliminates several steps required in other test procedures and provides increased sensitivity.

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

The shelf-life of R-9400 is five months and of R-9404 and R-9423 is eight months. We recommend stocking quantities accordingly.



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 5 months | R-9400 |
| Comparator 0, 0.25, 0.50, 0.75, 1.0, 1.5, 2.0, 3.0 ppm | C-9400 |

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

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®, reaction tube with lid, tip breaking tool, and instructions.

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

Instrumental Kits

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 uL (1 ea) | A-0191 |

Instructions and SDSs are posted on our website.

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

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 |

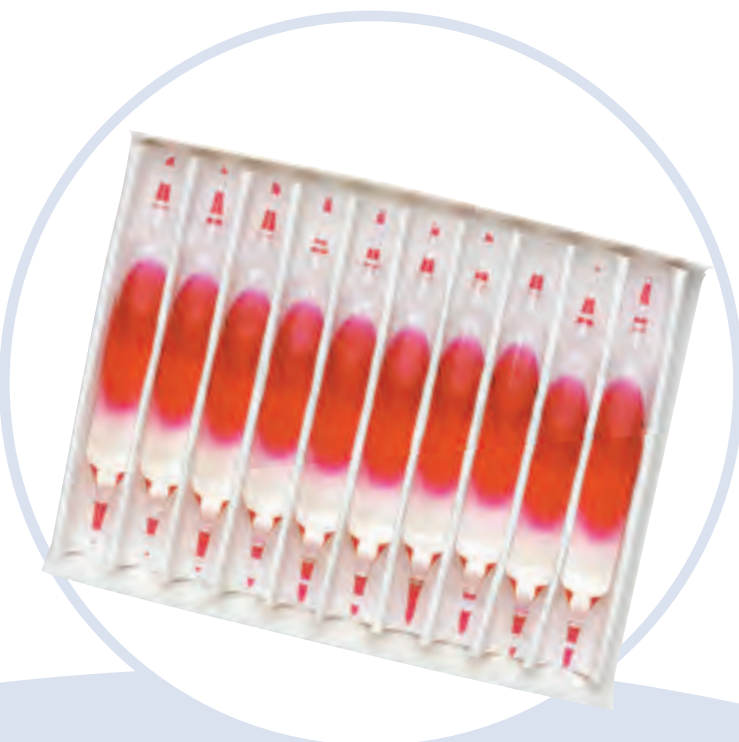
Kit comes in a cardboard box and contains everything needed to perform 20 tests: Refill, Comparator, reaction tube with lid, tip breaking tool and instructions.

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 SDSs 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, 1958, 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 Photometer

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 SDSs are posted on our website.

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

**Equivalent to the USEPA-approved Hach SPADNS 2 Arsenic free Fluoride Method 10225 in the range 0.40 to 3.00 ppm. A data package demonstrating equivalency to Method 10225 is available on request.*



Method

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

The Purpald Method

Reference: Purpald® developed by Aldrich Chemical Co.

Purpald® is subject to fewer interferences than Schiff's reagent or chromotropic acid procedures. A purple-colored complex is formed when Purpald in alkaline solution reacts with formaldehyde. Results are expressed as ppm (mg/L) CH₂O.

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

Visual Kits

Range: 0-1 & 1-10 ppm
MDL: 0.1 ppm / Method: Purpald

| | Cat# |
|--|-----------------------|
| CHEMets Kit | 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, 2, 3, 4, 5, 6, 7, 8, 10 ppm | C-4610 |

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

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

| | Cat# |
|---|-----------------------|
| VACUettes Kit | 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, 60, 90, 120, 150, 180, 210, 240, 300 ppm | C-4610D |

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 & 60-600 ppm
MDL: 10 ppm / Method: Purpald

| | Cat# |
|---|-----------------------|
| VACUettes Kit | 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, 120, 180, 240, 300, 360, 420, 480, 600 ppm | C-4610A |

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 & 120-1200 ppm
MDL: 20 ppm / Method: Purpald

| | Cat# |
|---|-----------------------|
| VACUettes Kit | 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, 240, 360, 480, 600, 720, 840, 960, 1200 ppm | C-4610B |

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 & 1200-12,000 ppm MDL: 200 ppm / Method: Purpald | |
|--|-------------------------|
| VACUettes Kit | Cat# 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, 2400, 3600, 4800, 6000, 7200, 8400, 9600, 12,000 ppm | C-4610C |
| 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. | |

| 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 |

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

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

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

 Instrumental Kit

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

| Range: 0-8.00 ppm Method: Purpald | |
|---|------------------------------------|
| Vacu-vials Kit , Shelf-life 5 months | Cat# K-4203² |
| 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.



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 Kit

Range: 1-15 & 10-300 ppm as ethylene glycol (EG)

(up to 30,000 ppm EG or 60,000 ppm propylene glycol with A-0188 accessory)

MDL: 1 ppm / Method: Purpald-Periodate

| | Cat# |
|--|-----------------------|
| CHEMets Kit | 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, 3 mL syringe and instructions.

Instrumental Kit

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-10.0 ppm as ethylene glycol; 0-20.0 ppm as propylene glycol

Method: Purpald-Periodate

| | Cat# |
|---|---------------------------|
| Vacu-vials Kit , Shelf-life 5 months | K-4403² |

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

Range: 0-200 ppm as propylene glycol; 0-100 ppm as ethylene glycol

Method: Purpald-Periodate

| | Cat# |
|---|---------------------------|
| Vacu-vials Kit , Shelf-life 5 months | K-4423² |

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, 3 mL syringe, ampoule blank and instructions.

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

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 3 mL (6 ea) | A-0063 |
| Pipettor Tips Pack (30 ea) | A-0171 |
| Dilution Kit (10X, 25X, 125X, 250X, 500X, 1000X, 5000X) | A-0188 |

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

²The Activator Solution, A-4401 is supplied as a dry chemical with **NO** expiration date. Once reconstituted, the solution has a limited shelf-life.

Instructions and SDSs are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 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 zircon indicator. Results are expressed as ppm (mg/L) CaCO₃.

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) CaCO₃.

Visual Kits

Range: 50-500 ppm as CaCO₃
MDL: 50 ppm / Method: EGTA

| | |
|---|------------------------------|
| Hardness (calcium) Titrets Kit , Shelf-life 8 months | Cat# 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 CaCO₃
MDL: 100 ppm / Method: EGTA

| | |
|---|------------------------------|
| Hardness (calcium) Titrets Kit , Shelf-life 8 months | Cat# 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 CaCO₃
MDL: 2.0 ppm / Method: EDTA

| | |
|-------------------------------------|------------------------------|
| Hardness (total) Titrets Kit | Cat# 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 CaCO₃
MDL: 20 ppm / Method: EDTA

| | |
|-------------------------------------|------------------------------|
| Hardness (total) Titrets Kit | Cat# 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 CaCO₃
MDL: 100 ppm / Method: EDTA

| | |
|-------------------------------------|------------------------------|
| Hardness (total) Titrets Kit | Cat# 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 CaCO₃
MDL: 250 ppm / Method: EDTA

| | |
|-------------------------------------|------------------------------|
| Hardness (total) Titrets Kit | Cat# 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 SDSs 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 ($\mu\text{g/L}$) or ppm (mg/L) N_2H_4 .

Visual Kits

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

| | Cat# |
|---|---------------|
| ULR CHEMets Kit | 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

| | Cat# |
|--|---------------|
| CHEMets Kit | 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: 0-12.5 ppm
MDL: 0.25 ppm / Method: PDMAB

| | Cat# |
|---|----------------|
| VACUettes Kit | 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

| | Cat# |
|--|----------------|
| VACUettes Kit | 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.





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 SDSs are posted on our website.

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

| Range: 0-50 ppm MDL: 1 ppm / Method: PDMAB | |
|---|-------------------------|
| VACUettes Kit | Cat# 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 | |
|---|-------------------------|
| VACUettes Kit | Cat# 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. | |



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) H₂O₂.

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) H₂O₂.

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 (%) H₂O₂. The test range can be modified by performing a sample dilution. **Details are provided in the kit instructions for ranges of 0.01 - 0.1% through 2-20%.**

Visual Kits

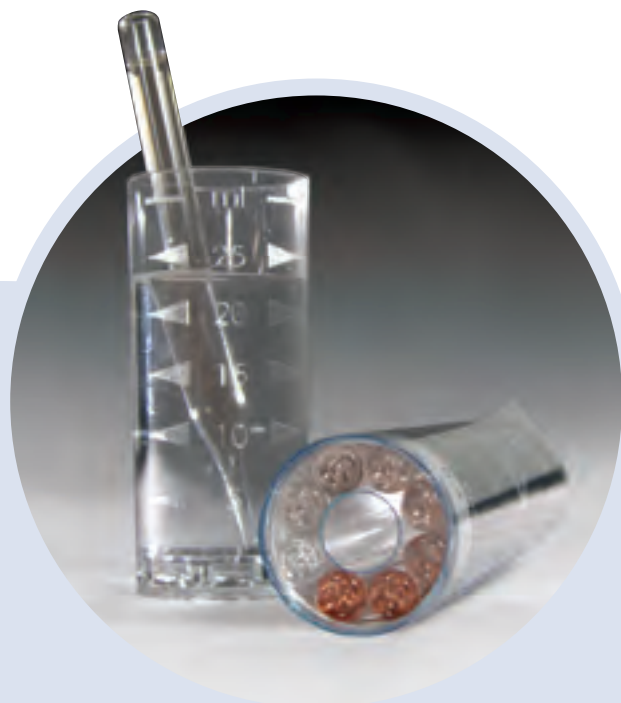
Range: 0-0.5 ppm
MDL: 0.025 ppm / Method: DPD

| CHEMets Kit | Cat# |
|---|---------------------|
| CHEMets Kit | 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 | C-5502 |
| 0, 0.05, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50 ppm | |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solutions, 25 mL sample cup and instructions. | |

Range: 0-0.8 & 1-10 ppm
MDL: 0.05 ppm /Method: Ferric Thiocyanate

| CHEMets Kit | Cat# |
|--|--------|
| CHEMets Kit | K-5510 |
| CHEMets Refill, 30 ampoules | R-5510 |
| Low Range Comparator | C-5501 |
| 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.8 ppm | |
| High Range Comparator | C-5510 |
| 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm | |
| 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. | |

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



Range: 0-25 & 30-300 ppm
MDL: 5 ppm / Method: Ferric Thiocyanate

| | Cat# |
|---|----------------|
| VACUettes Kit | K-5510D |
| VACUettes Refill, 30 ampoules | R-5510D |
| Low Range Comparator 0, 5, 7.5, 10, 12.5, 15, 20, 25 ppm | C-5501D |
| High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm | C-5510D |

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

Range: 0-100 & 120-1200 ppm
MDL: 20 ppm / Method: Ferric Thiocyanate

| | Cat# |
|--|----------------|
| VACUettes Kit | K-5510B |
| VACUettes Refill, 30 ampoules | R-5510B |
| Low Range Comparator 0, 20, 30, 40, 55, 70, 85, 100 ppm | C-5501B |
| High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm | C-5510B |

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

Range: 0-50 & 60-600 ppm
MDL: 10 ppm / Method: Ferric Thiocyanate

| | Cat# |
|---|----------------|
| VACUettes Kit | K-5510A |
| VACUettes Refill, 30 ampoules | R-5510A |
| Low Range Comparator 0, 10, 15, 20, 25, 35, 40, 50 ppm | C-5501A |
| High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm | C-5510A |

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

Range: 0-1000 & 1200-12,000 ppm
MDL: 200 ppm / Method: Ferric Thiocyanate

| | Cat# |
|---|----------------|
| VACUettes Kit | K-5510C |
| VACUettes Refill, 30 ampoules | R-5510C |
| Low Range Comparator 0, 200, 300, 400, 550, 700, 850, 1000 ppm | C-5501C |
| High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm | C-5510C |

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

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

| | Cat# |
|--------------------|---------------|
| Titrets Kit | K-5530 |

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

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, 1.0 mL syringe, 3.0 mL syringe, titrettor, 25 mL sample cup and instructions.



 Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-3.00 ppm

Method: DPD

| | |
|-----------------------|------------------------|
| Vacu-vials Kit | Cat# 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

| | |
|-----------------------|------------------------|
| Vacu-vials Kit | Cat# 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

| | |
|----------------------------------|------------------------|
| Hydrogen Peroxide SAM Kit | Cat# 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 |
| Syringe Pack, 3.0 mL (6 ea) | A-0063 |

Instructions and SDSs 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

| | Cat# |
|--|---------------------|
| Iron (total & ferrous) CHEMets Kit | 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: 0-30 & 30-300 ppm
MDL: 5 ppm / Method: Phenanthroline

| | Cat# |
|---|----------------|
| Iron (total & ferrous) VACUettes Kit | K-6210D |
| VACUettes Refill, 30 ampoules | R-6201D |
| Activator Solution Pack, six 10 mL bottles | A-6000 |
| Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm | C-6001D |
| High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm | C-6010D |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tubes, and instructions. | |

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

Iron (total) Vacu-vials Kit

Cat#

K-6023

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

Range: 0-6.00 ppm

Method: Phenanthroline

Iron (total & ferrous) Vacu-vials Kit

Cat#

K-6203

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

Range: 0-6.00 ppm

Method: Phenanthroline

Iron (total & soluble) Vacu-vials Kit

Cat#

K-6003

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

Range: 0-25.0 ppm

Method: Phenanthroline

Iron (total & soluble) Vacu-vials Kit

Cat#

K-6013

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

¹The 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 SDSs 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

| | Cat# |
|--|---------------------|
| CHEMets Kit | 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

| | Cat# |
|--|---------------------|
| VACUettes Kit | 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.

¹The 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

| | Cat# |
|-----------------------|---------------|
| Vacu-vials Kit | 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 SDSs 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 SDSs 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

| | Cat# |
|--|---------------|
| CHEMets Kit | 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

| | Cat# |
|--|---------------|
| CHEMets Kit | 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

| | Cat# |
|---|---------------|
| CHEMets Kit | 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

| | Cat# |
|-----------------------|---------------|
| Vacu-vials Kit | 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 SDSs 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-NO₃⁻ 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) NO₃-N or NO₃.

The Zinc Reduction Method

References: ASTM D 3867-09, Nitrate-Nitrite in Water, Test Method B. APHA Standard Methods, 22nd ed., Method 4500-NO₃⁻ 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) NO₃-N.



| Range: 0-3.4 ppm as N MDL: 0.3 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, 0.3, 0.6, 0.9, 1.3, 1.7, 2.2, 2.8, 3.4 ppm | C-6906 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Acidifier Solution, reaction tube and cap, 25 mL sample cup and instructions. | |

| Range: 0-4.5 ppm as N MDL: 0.4 ppm / Method: Cadmium Reduction | |
|--|--------------------|
| 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, 0.7, 1.0, 1.4, 1.8, 2.5, 3.5, 4.5 ppm | C-6904 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, reaction tube with cap and instructions. | |

| Range: 0-45 ppm as N MDL: 4 ppm / Method: Cadmium Reduction | |
|---|---------------------|
| 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, 7, 10, 14, 18, 25, 35, 45 ppm | C-6909D |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 3.0 mL syringe, reaction tube with cap and instructions. | |

| Range: 0-225 ppm as N MDL: 20 ppm / Method: Cadmium Reduction | |
|---|---------------------|
| 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, 35, 50, 70, 90, 125, 175, 225 ppm | C-6909A |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 1.0 mL syringe, reaction tube with cap and instructions. | |

| Range: 0-675 ppm as N MDL: 60 ppm / Method: Cadmium Reduction | |
|--|---------------------|
| CHEMets Kit | Cat# K-6909B |
| CHEMets Refill, 30 ampoules, 30 cadmium foil packs, and 30 pipette tips, Shelf-life 12 months | R-6909 |
| Comparator, Shelf-life 12 months 0, 60, 105, 150, 210, 270, 375, 525, 675 ppm | C-6909B |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 100 uL MiniPet®, reaction tube with cap and instructions. | |

| Range: 0-2700 ppm as N MDL: 240 ppm / Method: Cadmium Reduction | |
|---|---------------------|
| 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, 420, 600, 840, 1080, 1500, 2100, 2700 ppm | C-6909C |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, 25 uL MiniPet®, reaction tube with cap and instructions. | |

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: 0-1.50 ppm as N
Method: Zinc Reduction

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

Vacu-vials Kit, Shelf-life 12 months **Cat# 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: 0-7.50 ppm as N
Method: Cadmium Reduction

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

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 3 mL syringe, 25 mL sample cup, reaction tube with lid, ampoule blank and instructions.

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

Range: 0-50.0 ppm as NO₃
Method: Cadmium Reduction

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

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

Instructions and SDSs are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 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-NO₂⁻ 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) NO₂-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) NaNO₂.

Visual Kits

Range: 0-2.5 ppm as N
MDL: 0.2 ppm / Method: Azo Dye Formation

| | Cat# |
|--|---------------|
| CHEMets Kit | K-7004 |
| CHEMets Refill, 30 ampoules, Shelf-life 12 months | R-7002 |
| Comparator, Shelf-life 12 months 0, 0.2, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0, 2.5 ppm | C-7004 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup and instructions. | |

Range: 0-80 ppm as N
MDL: 4 ppm / Method: Azo Dye Formation

| | Cat# |
|---|----------------|
| VACUettes Kit | K-7004D |
| VACUettes Refill, 30 ampoules, Shelf-life 12 months | R-7002D |
| Comparator, Shelf-life 12 months 0, 4, 8, 16, 24, 30, 45, 65, 80 ppm | C-7004D |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube and instructions. | |

Range: 0-170 ppm as N
MDL: 10 ppm / Method: Azo Dye Formation

| | Cat# |
|---|----------------|
| VACUettes Kit | K-7004A |
| VACUettes Refill, 30 ampoules, Shelf-life 12 months | R-7002A |
| Comparator, Shelf-life 12 months 0, 10, 20, 30, 55, 70, 105, 145, 170 ppm | C-7004A |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube and instructions. | |

Range: 0-300 ppm as N
MDL: 20 ppm / Method: Azo Dye Formation

| | Cat# |
|---|----------------|
| VACUettes Kit | K-7004B |
| VACUettes Refill, 30 ampoules, Shelf-life 12 months | R-7002B |
| Comparator, Shelf-life 12 months 0, 20, 40, 70, 90, 115, 170, 245, 300 ppm | C-7004B |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube and instructions. | |

 Instrumental Kit

Range: 0-3000 ppm as N
MDL: 200 ppm / Method: Azo Dye Formation

| | |
|--|---------------------|
| VACUettes Kit | Cat# K-7004C |
| VACUettes Refill, 30 ampoules, Shelf-life 12 months | R-7002C |
| Comparator, Shelf-life 12 months 0, 200, 400, 700, 1000, 1300, 1800, 2400, 3000 ppm | C-7004C |

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

Range: 250-2500 ppm as NaNO₂
MDL: 250 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

| | |
|--------------------|--------------------|
| Titrets Kit | Cat# 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 NaNO₂
MDL: 500 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

| | |
|--------------------|--------------------|
| Titrets Kit | Cat# 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.

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

Range: 0-1.00 ppm as N
Method: Azo Dye Formation

| | |
|--|--------------------|
| Vacu-vials Kit , Shelf-life 12 months | Cat# 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 SDSs 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) O₂.

The Rhodazine D™ Method

References: Developed by CHEMetrics, Inc. ASTM Power Plant Manual, 1st ed. p. 169 (1984). ASTM D 5543-15, Low Level Dissolved Oxygen in Water. Department of the Navy, Final Report of NAVSECPHILADIV Project A-1598, Evaluation of CHEMetrics Feedwater Dissolved Oxygen Test Kit (1975).

Test kits for boiler waters and applications requiring trace levels of D.O. (ppb range) employ the Rhodazine D methodology. Developed by CHEMetrics, 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) O₂.

Low-range dissolved oxygen test kits include a special *sampling tube* (diagram) for use with boiler feedwater. This device allows the user to break the tip of the ampoule in a flowing sample stream in order to preclude error from contamination by atmospheric oxygen. A video illustrating this sampling procedure is posted on the Dissolved Oxygen analyte page of our website.



 **Visual Kits**

Range: 0-20 ppb
MDL: 2 ppb / Method: Rhodazine D

| | Cat# |
|---|---------------|
| ULR CHEMets Kit | 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: 5-180 ppb
MDL: 5 ppb / Method: Rhodazine D

| | Cat# |
|--|---------------|
| CHEMets Kit | 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: 0-40 ppb
MDL: 2.5 ppb / Method: Rhodazine D

| | Cat# |
|--|---------------|
| CHEMets Kit | 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: 0-1 ppm
MDL: 0.025 ppm / Method: Rhodazine D

| | Cat# |
|--|---------------|
| CHEMets Kit | 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: 0-100 ppb
MDL: 5 ppb / Method: Rhodazine D

| | Cat# |
|--|---------------|
| CHEMets Kit | 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: 1-12 ppm
MDL: 1 ppm / Method: Indigo Carmine

| | Cat# |
|---|---------------|
| CHEMets Kit | 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 SDSs 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

Vacu-vials Kit

Cat#

K-7553

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

Range: 0-2.00 ppm

Method: Indigo Carmine

Vacu-vials Kit

Cat#

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

Vacu-vials Kit

Cat#

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

SAM Kit

Cat#

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 SDSs 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) O₃.

The Indigo Method

References: Bader H. and J. Hoigné, "Determination of Ozone in Water by the Indigo Method," Water Research Vol. 15, pp. 449-456, 1981. APHA Standard Methods, 22nd ed., Method 4500-O₃ B - 1997.

With the indigo method, indigo trisulfonate dye immediately reacts with ozone. The color of the blue dye decreases in intensity in proportion to the amount of ozone present in the sample. The test reagent is formulated with malonic acid to prevent interference from up to at least 10 ppm chlorine. Results are expressed as ppm (mg/L) O₃.

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

Visual Kit

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

| | Cat# |
|--|---------------------|
| 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, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60 ppm | C-7404 |
| High Range Comparator 0.6, 0.8, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0 ppm | C-7405 |

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

Instrumental Kits

Multi-Analyte Photometers
V-2000 / V-3000 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. | |

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

Range: 0-0.75 ppm
Method: Indigo

| | Cat# |
|--|---------------|
| Vacu-vials Kit, Shelf-life 8 months | K-7433 |
| 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: 0-0.75 ppm

Method: Indigo

| | Cat# |
|---|---------------|
| SAM Kit | I-2022 |
| Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank and instructions. Shelf-life 8 months. | K-7433 |
| 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. | |

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 |

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

Instructions and SDSs are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 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, and cupric ions will produce high test results. Hydrogen peroxide does not interfere if present at levels comparable to the peracetic acid levels.

Instrumental Kits

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-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

| | Cat# |
|---------|--------|
| SAM Kit | 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 |

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

Instructions and SDSs are posted on our website.

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

Visual Kit

Range: 0-1 & 0-5 ppm

MDL: 0.05 ppm / Method: DPD

| | Cat# |
|--|---------------------|
| CHEMets Kit | K-7904 |
| CHEMets Refill, 30 ampoules | R-7904 |
| Activator Solution Pack, six 10 mL bottles | A-7900 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 0, 1.0, 1.5, 2.0, 2.6, 3.2, 3.8, 4.4, 5.0 ppm | C-7904 |

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



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

Visual Kit

Range: 0-5.6 & 7-70 ppm as $\text{Na}_2\text{S}_2\text{O}_8$
MDL: 0.35 ppm / Method: Ferric Thiocyanate

| | Cat# |
|--|---------------|
| CHEMets Kit | K-7870 |
| CHEMets Refill, 30 ampoules | R-7870 |
| Low Range Comparator 0, 0.7, 1.4, 2.1, 2.8, 3.5, 4.2, 5.6 ppm | C-7807 |
| High Range Comparator 7, 14, 21, 28, 35, 42, 49, 56, 70 ppm | C-7870 |

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

Kit Components common to Persulfate

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

*Instructions and SDSs are posted on our website.
 If no shelf-life is listed for a product, then the shelf-life is at least 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 <i>Singles</i> buffer solution assortment (5 ea), 4.0, 7.0, 10.0, and rinse, Shelf-life 3 months | A-0175 |
| Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters) | A-0179 |

Instructions are posted on our website.



FEATURES

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

Method

Phenol (hydroxybenzene) is the simplest of a group of similar organic chemicals, which includes cresols, xylenols, and catechols. Phenol itself is a common ingredient of disinfectants. In drinking water, low-level phenolic concentrations impart a foul taste and odor, especially upon chlorination. High phenol concentrations can indicate contamination from industrial effluents or waste discharge.

The 4-Aminoantipyrine Method

References: APHA Standard Methods, 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.



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

| CHEMets Kit | Cat# |
|--|--------|
| 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# |
|---|---------|
| 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# |
|---|---------|
| 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# |
|---|---------|
| 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# |
|---|---------|
| VACUettes Refill, 30 ampoules | R-8012C |
| Low Range Comparator 0, 100, 200, 300, 400, 600, 800, 1000 ppm | C-8001C |
| High Range Comparator 0, 1000, 2000, 3000, 5000, 7000, 9000, 11,000, 13,000 ppm | C-8012C |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube and instructions. | |

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

Vacu-vials Kit

Cat#

K-8003

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

Range: 0-20.0 ppm

Method: 4-Aminoantipyrine

Vacu-vials Kit

Cat#

K-8023

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank 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 SDSs 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 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) PO₄.

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) PO₄.



Visual Kits

| Range: 0-1 & 1-10 ppm MDL: 0.05 ppm / Method: Stannous Chloride | |
|--|---------------------|
| CHEMets Kit | Cat# |
| CHEMets Refill, 30 ampoules | R-8510 |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months | A-8500 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# |
| CHEMets Refill, 30 ampoules | R-8515 |
| Comparator 2, 4, 6, 8, 10, 15, 20, 30 ppm | C-8530 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup and instructions. | |

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

Instructions and SDSs are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 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: 0-1200 & 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. | |

| 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. | |



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 | |
|---|--------------------|
| Vacu-vials Kit , Shelf-life 20 months | Cat# K-8513 |
| 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: 0-120 & 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. | |

| 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 |

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

Instructions and SDSs are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 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 SDSs 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 (SiO₂) 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-SiO₂ 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) SiO₂.

Visual Kits

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

| | Cat# |
|---|---------------------|
| ULR CHEMets Kit | 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

| | Cat# |
|---|---------------------|
| CHEMets Kit | 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

| | Cat# |
|-----------------------|---------------|
| Vacu-vials Kit | 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 |

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

²Shelf-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 SDSs 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) SO₄.



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 SDSs 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-S²-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. | |

 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 |

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

Instructions and SDSs are posted on our website.

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

| | |
|---|-------------------------------|
| 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. | |



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-SO₃²⁻ B-2000. USEPA Methods for Chemical Analysis of Water and Wastes, Method 377.1 (1983).

CHEMetrics' sulfite test kits employ the iodometric chemistry in which sulfite is titrated with iodide-iodate titrant in an acid solution using a starch indicator. Thiosulfate will titrate as sulfite. Sulfamic acid is added to the sample to prevent interference from nitrite. Results are expressed as ppm (mg/L) SO₃.

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-SO₃²⁻ 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) SO₂.

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 SO₃ MDL: 2.0 ppm / Method: Iodometric | |
| Sulfite Titrets Kit | Cat# K-9602 |
| Increments: 2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm | |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup and instructions. | |

| | |
|---|--------------------|
| Range: 5-50 ppm as SO₃ MDL: 5.0 ppm / Method: Iodometric | |
| Sulfite Titrets Kit | Cat# K-9605 |
| Increments: 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm | |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup and instructions. | |

| | |
|---|--------------------|
| Range: 10-100 ppm as SO₃ MDL: 10 ppm / Method: Iodometric | |
| Sulfite Titrets Kit | Cat# K-9610 |
| Increments: 10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm | |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup and instructions. | |

| | |
|---|--------------------|
| Range: 50-500 ppm as SO₃ MDL: 50 ppm / Method: Iodometric | |
| Sulfite Titrets Kit | Cat# K-9650 |
| Increments: 50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm | |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup and instructions. | |

Range: 10-100 ppm as SO₂
MDL: 10 ppm / Method: Ripper

Sulfite in Wine Titrets Kit

Cat#
K-9610W

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

Kit comes in a cardboard box and contains everything needed to perform 10 tests: ten ampoules, ten valve assemblies 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 SDSs 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-SO₃²⁻-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. The kit contains a sulfamic acid solution which can be used to prevent nitrite interference. Results are expressed as ppm (mg/L) S₂O₃.

Visual Kit

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

| Titrets Kit | Cat# |
|-------------|--------|
| | 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 SDSs are posted on our website.
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.



Method

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

Method of Operation

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

FEATURES

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

Resolution: 10 ppm; 0.10 ppt.

Accuracy: ± 1% full scale

Calibration Type: Manual

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

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

Pocket-sized: 6.5" length x 1.5" diameter

Weight: 3.25 oz.(90 g)

Warranty: 1 year (electrode: 6 months)



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

- Replaceable electrode
- Waterproof, dustproof
- Push-button calibration
- Automatic Temperature Compensation (ATC)
 - Auto-shutoff

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

Ranges¹:

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 bottles of sodium sulfate will be depleted after approximately 8 tests.

Instructions and SDSs are posted on our website.

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

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

Range: 0-15.0 ppm

Method: Zincon

| | Cat# |
|---|---------------|
| Vacu-vials Kit , Shelf-life 8 months | K-9923 |
| Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, Indicator Solution, 25 mL sample cup, 10 mL syringe, ampoule blank and instructions. | |

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

Kit Components common to Zinc

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

Instructions and SDSs are posted on our website.

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



Customer Testimonials



"Why choose CHEMETRICS? It's easy for the students to use and it's visual. They can see everything. It makes the students feel like they are scientists!"

*—Hayley Usedom, Education Coordinator
Marine Watershed Project, Marine Science Institute
(Referring to K-7512 Oxygen products)*

"Thank you for the product being sent on time. The product works great. Very satisfied customer."

*—Michael Walet
Better Water Quality*

"CHEMetrics' tests give fast results. They're accurate and convenient. Great products, great service!"

*—Mark Henry, Quality Shift Manager
HP Hood, LLC
(Referring to Hydrogen Peroxide products)*

"I highly recommend the use of CHEMetrics self-filling reagent ampoules. They make our field testing 'dummy-proof!' It is important for us to get quick accurate data safely, when we are monitoring or characterizing a site for remediation. Using the ampoules as visual colorimetric or with the V-2000 Multi-Analyte Photometer makes sampling cleaner, faster with fewer reagents to carry."

*—DeAna Vitela-Hayashi, Director
AquaBio Environmental Technologies, Inc.*

"The CHEMetrics field kits and associated equipment are critical components we need to get accurate, cost-effective, rapid results for these projects. Without these kits we would not be able to make the right field calls to maximize the results of our onsite experiments."

*—Brian Timmins, Director
ETEC, LLC Environmental
Technologies*

"I appreciate you shipping the test kit promptly as you said you would. The test kit is exactly what we were looking for. It worked flawlessly and gave us accurate results so easily. THANKS A MILLION!!"

*—Bill Galkowski, Manager
Supreme Fulvic, LLC*

To Place an Order ● Write: CHEMetrics, Inc.
4295 Catlett Road
Midland, VA 22728
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Fax: 1.540.788.4856
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Web: www.chemetrics.com

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VISA, MasterCard, and American Express accepted.

Quantity Discounts ● Quantity discounts off list price are as follows for identical items:

| Test Kits, Refills, and Components | | CHEMetrics photometric kits: | |
|------------------------------------|----------|------------------------------|----------|
| Quantity | Discount | Quantity | Discount |
| 50-99 | 10% | 5-9 | 5% |
| 100-199 | 15% | 10-19 | 10% |
| 200 or more | 20% | 20 or more | 15% |

Quantity discounts are not available for the following products: Digestors, I-1000 pH Tester, I-1100 Total Dissolved Solids Tester, I-1200 Conductivity Tester, Total Petroleum Hydrocarbons (TPH), and ULR CHEMetrics® products.

Substantially higher discounts are available for large quantity orders. Contact the Marketing Department for details. See Product Price List or Website for Quantity Discount Schedule for COD kits.

Shipping ● In the absence of instructions from the customer, merchandise will be shipped via UPS whenever possible. Freight cost plus \$4.00 handling will be added to the invoice. Claims for transportation damage must be submitted to the common carrier.

Returns of Merchandise ● CHEMetrics generally accepts returns of resellable merchandise for credit when such merchandise is returned within 60 days. Products with a shelf-life of less than 1 year may need to be returned within 30 days to be considered "resellable" and receive credit. Customers who wish to return merchandise should call CHEMetrics in advance to obtain authorization. Restocking fees of 20% may be imposed except on instruments returned within 30 days of purchase. Additional fees may be imposed for special handling.

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