28250-88

HEALTHY WATER

HEALTHY PEOPLE

Rivers, Streams, Ponds, and Lakes Testing Kit

Procedures Manual

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Using the Healthy Water, Healthy People Testing Kit Procedure Manual

The Healthy Water, Healthy People Advanced Testing Kit Procedure Manual provides instructions for conducting the water quality tests in this kit. The procedures are given in narrative and illustrated formats to accommodate diverse learning styles. Refer to the Table of Contents as a guide to help locate the procedures for your chosen parameter.

Healthy Water, Healthy People and Hach Company want to ensure that you have an enjoyable water quality testing experience, so expert technicians and educators are available to help you.

Ordering Replacement Chemicals and Equipment?

Contact Healthy Water, Healthy People toll-free at 1-866-337-5486, or place an order online at www.healthywater.org, or fax (406) 994-1919. Order by part number listed next to the item.

Questions about what Chemical Refills and Equipment to Order?

The Chemical Refills and Replacement Parts are located at the end of the procedures for each parameter.

Need Higher-Level or Additional Equipment?

Check out the Additional Water Quality Testing Materials Sheet in this manual for additional items that will enhance your testing methods.

Contact Us:

Healthy Water, Healthy People

1-866-377-5486

Fax: 406-994-1919

healthywater@montana.edu

www.healthywater.org

P. O. Box 170575

201 Culbertson Hall

Montana State University

Bozeman, MT 59717-0575

Discard of Chemical Waste

In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) which directed the U.S. Environmental Protection Agency (EPA) to develop and implement a program to protect human health and the environment from improper hazardous waste management practices. The RCRA program is designed to control the management of hazardous waste from its generation to its ultimate disposal – from “cradle-to-grave”.

The provisions of RCRA hold the generator of hazardous waste responsible for proper collection, storage and disposal from the point of generation. Due to the complexity of the regulations, the following resources may be used to ensure that your operations are conducted in compliance with RCRA:

- Check with your Environmental Compliance Officer.
- Check with your Local, State, and/or Federal Hazardous Waste Division.
- Contact a Treatment Storage and Disposal Facility.
- Contact an Environmental Consulting Firm.

What is a Material Safety Data Sheet?

The United States Occupational Safety and Health Administration (OSHA) requires all manufacturers to issue Material Safety Data Sheets (also known as MSDSs) with the first shipment of any hazardous chemical product. Hach Company issues MSDSs for all chemical shipments, from toxic mercuric acid to substances as benign as sodium chloride (salt). The purpose of the MSDS is to relay important information about the nature of the chemical – such as its flammability, toxicity, the need for protective equipment, and spill or clean-up requirements – to ensure the safety of any potential user of that chemical.

At first glance, the MSDS can seem like an intimidating piece of information. The information is not difficult to understand when broken into its component parts. It is a very important document to read and follow.

When you receive a reagent shipment from Hach, we recommend that you:

1. Read the MSDS carefully.
2. Discuss the cautions specified on the MSDS with your students.
3. Utilize necessary protective equipment.
4. Dispose of the reagent properly (see the MSDS for disposal information).
5. Keep file copies of MSDSs in a central location accessible to all.

What to look for in an MSDS (Q and A)

1. *Where do I find an overall product summary and emergency phone numbers?*

   The chemical product and company identification section provides an overall product summary, including manufacturer address, MSDS date, emergency phone numbers, and a brief description of any hazard.

2. *What is this product made of?*

   The composition and ingredients section explains the following information about each component of the product:

   - PCT—Percent by weight of this component
   - CAS—Number Chemical Abstract Services or CAS registry number
   - SARA—Superfund and Reauthorization Act -- better known as the "Community Right to Know Law". If an MSDS indicates that a component is listed in SARA 313 and more than the specified amount is used, it must be reported to the USEPA every year.
   - TLV—Threshold Limit Value is the maximum airborne concentration allowable for an 8-hour exposure, as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH).
   - PEL—Permissible Exposure Limit is the maximum airborne concentration allowable for an 8-hour exposure, as regulated by the Occupational Safety and Health Administration (OSHA).
   - HAZARD—Any physical or health hazards posed by this chemical are explained here.

3. *What are the hazards of using this product?*

   The hazards identification summary starts with an emergency overview, plus ratings of the product from the Hazardous Materials Information System and the National Fire Protection Association (NFPA). This section also outlines the potential harmful effects of this product.

4. *How do I administer first aid in the event of exposure?*

   The First Aid section explains the medical attention required in the event of an exposure. Be sure to read this section carefully!

5. *What do I do in the event of a fire?*

   The fire fighting measures section lists all of the flammability concerns, what media to use to extinguish a fire, and what safety precautions to take, should you be put in a position to fight a fire.

6. *What happens if it spills?*

   The accidental release measures section explains the personnel who are qualified to respond to an emergency involving hazardous substances and outlines containment techniques, clean-up techniques, and any necessary evacuation procedures.

7. *What are the handling and storage requirements?*

   The handling/storage section provides general guidelines for safe handling of the product and lists all storage requirements.

8. *What protective measures do I need to take in the work environment?*

   The exposure controls/protective equipment section outlines safe laboratory practice (e.g. eyewash station nearby) and any necessary protective gear, such as eye, skin, and inhalation protection.

9. *What does it look/act like?*

   The physical/chemical properties section explains information such as the physical state, color, odor, solubility, boiling point, melting point, specific gravity, pH, vapor density, evaporation rate, corrosivity, stability, and storage precautions.

10. *How stable is this product and what storage precautions need to be taken?*

    The stability/reactivity section explains storage conditions, including moisture and temperature requirements and compatibility with substances stored nearby.

11. *How did this product perform in clinical trials?*

    The toxicological information section summarizes data gathered from research with animals, including lethal dosages and concentrations, effects on reproduction, skin toxicity data, and mutation data.

12. *What is the ecological impact of this product?*

    The ecological information section assesses the material's environmental impact on aquatic and terrestrial plants and animals and the potential of the material to persist in the environment.

13. *How do I safely (and legally) dispose of this product?*

    The disposal considerations section outlines any dilution guidelines, container information, and national environmental regulations that may or may not be reinforced by regional or local entities.

14. *How is this product regulated?*

The regulatory information section outlines all known regulatory guidelines spelled out by OSHA, SARA Title III, the Clean Water Act, RCRA, and any known state regulations.

15. *What is the intended use of this product and how was this MSDS compiled?*

The other information section states the product's intended use and lists all reference materials used to write the MSDS.

16. *What are the shipping requirements?*

The transportation information section explains proper shipping name, hazard class, ID number, and packing group for all chemicals regulated by D.O.T., I.C.A.O., and I.M.O.

Comparison of International Drinking Water Guidelines

Table 1 Comparison of International Drinking Water and FDA Bottled Water Guidelines[1]

Parameter	USEPA[2] Maximum Contaminant Level (MCL)	Canada[3] Maximum Acceptable Concentration	EEC[4] Maximum Admissible Concentration	Japan[5] Maximum Admissible Concentration	WHO[6] Guideline	Bottled Water U.S. Federal Drug Administration Level
Aluminum	0.05–0.2 mg/L[7]		0.2 mg/L	0.2 mg/L	0.2 mg/L	
Ammonium			0.5 mg/L	No standard	1.5 mg/L	
Antimony	0.006 mg/L		0.01 mg/L	0.002 mg/L[8]	0.005 mg/L	
Arsenic	0.05 mg/L	0.025 mg/L	0.05 mg/L	0.01 mg/L	0.01 mg/L	0.05 mg/L
Barium	2.0 mg/L	1.0 mg/L	No standard	No standard	0.7 mg/L	2.0 mg/L
Boron		5.0 mg/L	1.0 mg/L	0.2 mg/L[8]	0.3 mg/L	
Cadmium	0.005 mg/L	0.005 mg/L	0.005 mg/L	0.01 mg/L	0.003 mg/L	0.005 mg/L
Chloride	250 mg/L[7]	250 mg/L	250 mg/L	200 mg/L	250 mg/L	
Chromium	0.1 mg/L	0.05 mg/L	0.05 mg/L	0.05 mg/L	0.05 mg/L	0.1 mg/L
Coliforms, total Organisms/100 mL	≤ 5 %positive samples/month	0	0 or MPN ≤ 1	0	0	≤ 1 MF
Coliforms (*E. coli*) Organisms/100 mL	0	0	0	0	0	
Color	15 cu[7]	15 cu	20 mg Pt-Co/L	5 cu	15 cu	< 15 cu
Copper	1.3 mg/L[7]	1.0 mg/L	2.0 mg/L	1.0 mg/L	1–2 mg/L	1.0 mg/L
Cyanides	0.2 mg/L	0.2 mg/L	0.05 mg/L	0.01 mg/L	0.07 mg/L	
Fluoride	2.0-4.0 mg/L[7]	1.5 mg/L	0.7-1.5 mg/L	0.8 mg/L	1.5 mg/L	
Hardness			50 mg/L	300 mg/L		

Table 1 Comparison of International Drinking Water and FDA Bottled Water Guidelines[1] (Continued)

Parameter	USEPA[2] Maximum Contaminant Level (MCL)	Canada[3] Maximum Acceptable Concentration	EEC[4] Maximum Admissible Concentration	Japan[5] Maximum Admissible Concentration	WHO[6] Guideline	Bottled Water U.S. Federal Drug Administration Level
Iron	0.3 mg/L[7]	0.3 mg/L	0.2 mg/L	0.3 mg/L	0.3 mg/L	
Lead	0.015 mg/L	0.01 mg/L	0.01 mg/L	0.05 mg/L	0.01 mg/L	0.005 mg/L
Manganese	0.05 mg/L	0.05 mg/L	0.05 mg/L	0.01–0.05 mg/L	0.1–0.5 mg/L	
Mercury	0.002 mg/L	0.001 mg/L	0.001 mg/L	0.0005 mg/L	0.001 mg/L	0.002 mg/L
Molybdenum				0.07 mg/L	0.07 mg/L	
Nickel	0.1 mg/L		0.02 mg/L	0.01 mg/L[8]	0.02 mg/L	
Nitrate/Nitrite, total	10.0 mg/L as N			10.0 mg/L as N		10 mg/L as N
Nitrates	10.0 mg/L as N	10.0 mg/L as N	50 mg/L	10 mg/L as N	50 mg/L as NO_3^-	
Nitrites	1 mg/L as N	3.2 mg/L	0.1 mg/L	10 mg/L	3 mg/L as NO_2^-	1 mg/L as N
Odor	3 TON[9]		2 dilution no. @ 12 °C; 3 dilution no. @ 25 °C.	3 TON		
pH	6.5–8.5	6.5–8.5	6.5–9.5	5.8–8.6	6.5–8.5	
Phosphorus			5 mg/L	No Standard		
Phenols		0.002 mg/L	0.5 µg/L C_6H_5OH	0.005 mg/L		
Potassium			12 mg/L	No Standard		
Selenium	0.05 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.01 mg/L	0.05 mg/L
Silica Dioxide			10 mg/L	No Standard		
Silver	0.1 mg/L[7]	0.05 mg/L	0.01 mg/L	No standard	No standard	

Table 1 Comparison of International Drinking Water and FDA Bottled Water Guidelines[1] (Continued)

Parameter	USEPA[2] Maximum Contaminant Level (MCL)	Canada[3] Maximum Acceptable Concentration	EEC[4] Maximum Admissible Concentration	Japan[5] Maximum Admissible Concentration	WHO[6] Guideline	Bottled Water U.S. Federal Drug Administration Level
Solids, total dissolved	500 mg/L[7]	500 mg/L	No standard	500 mg/L	1000 mg/L	
Sodium			75-150 mg/L	200 mg/L	200 mg/L	
Sulfate	250 mg/L[7]	500 mg/L	250 mg/L	No Standard	250 mg/L	
Turbidity	0.3–1 NTU	1 NTU	4 JTU	1–2 units	5 NTU	< 5 NTU
Zinc	5 mg/L[7]	5.0 mg/L	No Standard	1.0 mg/L	3.0 mg/L	

1 To our knowledge, data in this table were accurate and current at the publication date. Contact the regulatory agency in your area for the most current information.

2 United States Environmental Protection Agency.

3 These limits are established by Health Canada.

4 In the EEC (European Economic Community), these limits are set by the European Committee for Environmental Legislation.

5 In Japan, these limits are established by the Ministry of Health and Welfare.

6 World Health Organization.

7 U.S. Secondary MCL.

8 Identified as a parameter to be regulated in the future.

9 Threshold Odor Number.

Additional Water Quality Testing Materials Available Through *Healthy Water, Healthy People*

Item	Part #	Cost $*
Digital Titrator	16900-01	105.00
Turbidity Tube	63010-00	25.00
Pocket Turbidimeter	46500-00	837.00
Chlorine Pocket Colorimeter™†	46700-00	335.30
LeadTrak®‡ Pocket Colorimeter™	46700-21	443.45
Nitrate Pocket Colorimeter™	46700-02	335.30
Phosphate Pocket Colorimeter™	46700-06	335.30
sens*ion*™** 156 pH, DO, Conductivity probes	54650-15	1,350.00
sens*ion* 378 ph, Conductivity, TDS, Salinity, Temperature, DO probes	54750-21	1,575.00
Arsenic Test Kit	28000-00	95.00

Microbiology

Paddle Testers	26109-10	29.15
BART™†† testers, combo pack: IRB (3), SRB (3), SLYM (3)	24348-09	80.00
MEL/850 Potable Water Lab	26888-00	2,453.90
MEL/MPN Total Coliform and E. Coli Lab	25698-00	1,537.00
Portable Incubator, with rechargeable 12 V dc battery	25699-00	850.00
Battery Charger for Portable Incubator, 115 V ac	25803-00	163.00

* Prices subject to change without notice.

† Pocket Colorimeter is a trademark of Hach Company.

‡ LeadTrak is a registered trademark of Hach Company.

** sens*ion* is a trademark of Hach Company.

†† BART is a trademark of Droycon Bioconcepts Inc.

General Apparatus

Glasses, Safety Standard (Clear Plastic) ..... 18421-00 ..... 4.65
Glove, Latex, Powder-Free/100 pk (size Small) ..... 25904-01 ..... 24.75
Glove, Latex, Powder-Free/100 pk (size Medium) ..... 25904-02 ..... 24.75
Notebook, Data, Pocket (64 waterproof pages) ..... 20917-00 ..... 16.50
Stopwatch, Water Resistant ..... 26302-00 ..... 61.80

General Apparatus, continued

Tech Board (clipboard including clock, stopwatch, calculator) ..... 27473-00 ..... 46.35
Tech Board Plus (same as above with an advanced scientific calculator) ..... 27991-00 ..... 61.80
Timer, Mini (up to 99 minutes w/1 second intervals) ..... 27664-00 ..... 37.10
Thermometer, Pocket/non mercury in protective case.
Dual Range (-10 to 110°C/ 0 to 220°F) ..... 26764-00 ..... 22.70
TenSette®* Pipet, 0.1 to 1.0 mL in 0.1 mL increments ..... 19700-01 ..... 165.00
Pipet Tips for19700-01, pk/50 ..... 21856-96 ..... 7.50
TenSette Pipet, 1.0 to 10.0 mL in 1.0 mL increments ..... 19700-10 ..... 165.00
Pipet Tips for 19700-10, pk/50 ..... 21997-96 ..... 6.70
Voluette®† Ampule breaker (for Standards), 10-mL ..... 21968-00 ..... 10.75
Voluette Ampule breaker (for Standards), 2-mL ..... 25640-00 ..... 10.60

pH, Conductivity, and TDS Testers

pH Testr™ 2‡, Oakton, Waterproof, –0.1 to 15 pH, double junction ..... 27993-00 ..... 81.40
pH Testr 2, Oakton, Waterproof, –0.1 to 15 pH ..... 27235-00 ..... 81.40
ECTestr, Low, Oakton Conductivity Tester, 0-1990 microS,
auto-temperature compensation, push-button calibration,
waterproof replaceable sensor ..... 28455-00 ..... 59.95

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* TenSette is a registered trademark of Hach Company.
† Voluette is a registered trademark of Hach Company.
‡ pHTestr 2 is a trademark of Oakton Instruments.

pH, Conductivity, and TDS Testers, continued

ECTestr, High, Oakton Conductivity Tester, 0-19.90 mS, auto-temperature compensation, push-button calibration, waterproof replaceable sensor ..... 28456-00 ..... 59.95

TDSTestr, Low, Oakton, 0 to 1990 ppm, auto-temperature compensation, push-button calibration, waterproof replaceable sensor ..... 28457-00 ..... 59.95

TDSTestr, High, Oakton, 1 to 10 ppt, auto-temperature compensation, push-button calibration, waterproof replaceable sensor ..... 28458-00 ..... 59.95

Replacement Sensor for EC and TDS Testers ..... 28459-00 ..... 37.00

Standards and Buffers (see Replacement Standards and Buffers on page 12)

Refer to the Water Analysis Handbook for specific instructions on how to use standards.

Water Analysis Handbook ..... 23196-00 ..... no charge

DR/890 Procedures Manual ..... 48470-22 ..... 40.00

To Order:

Contact Healthy Water, Healthy People:
toll free 1-866-337-5486
email healthywater@montana.edu
website www.healthywater.org
fax (406) 994-1919

PO Box 170575
201 Culbertson Hall
Montana State University
Bozeman, MT 59717-0575

Replacement Standards and Buffers

Standards	Units	Catalog Number	Advanced Kit	Rivers, Streams, Ponds, and Lakes Kit	Classroom Drinking Water Kit	Drinking Water (Urban) Kit	Watershed Kit
pH Buffers (Singlets)							
pH 7.00 and pH 10.01	10 ea/pkg	27698-00	x	x	x	x	x
pH 4.01 and pH 7.00	10 ea/pkg	27699-20	x	x	x	x	x
pH 4.01	20/pkg	27700-20	x	x	x	x	x
pH 7.00	20/pkg	27701-20	x	x	x	x	x
pH 10.01	20/pkg	27702-20	x	x	x	x	x
Conductivity Standards							
180 ±10 us/cm, 90 ±5 mg/L TDS	100 mL	23075-20	x	x			
1000 ±10 us/cm, 500 ±5 mg/L TDS	100 mL	14400-42	x	x			
1991 ±10 us/cm, 995 ±5 mg/L TDS	100 mL	2105-42	x	x			
Single Parameter Standards							
Alkalinity, 0.500 N	10-mL Voluette® ampules	14278-10	x	x	x		x
BOD, 300 mg/L, Glucose plus Glutamic Acid	10-mL Voluette® ampules	14865-10	x	x			
Chlorine, Free and Total, 23–30 mg/L*	2-mL ampules	26300-20	x		x	x	

Standards	Units	Catalog Number	Advanced Kit	Rivers, Streams, Ponds, and Lakes Kit	Classroom Drinking Water Kit	Drinking Water (Urban) Kit	Watershed Kit
Single Parameter Standards							
Copper, 4 mg/L[1]	2-mL ampules	26057-20				x	
Hardness, 1000 mg/L	500 mL	22403-49	x		x		
Iron, 1 mg/L	500 mL	139-49	x		x		
Manganese, 10 mg/L	2-mL ampules	26058-20	x				
Nitrate -N, 10 mg/L	500 mL	307-49	x		x	x	x
Nitrate-N, 5 mg/L	10-mL Voluette® ampules	25578-10		x			
Nitrate-N, 1 mg/L	500 mL	2046-49	x	x			
Phosphate, 1 mg/L	500 mL	2569-49	x	x			
Phosphate, 15 mg/L	100 mL	14243-42		x			x
Sulfate, 50 mg/L	500 mL	2578-49	x	x			

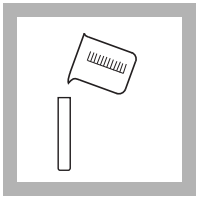
* Some standards are not available in levels within the test range and will require dilution.

Hints for Performing Chemical Tests

- Review the Material Safety Data Sheet (MSDS).
- Read all of the instructions for each test before you perform the procedures.
- Practice! The more familiar you are with the tests, the easier they will be to perform, and the more accurate your results will be.
- Wear protective equipment indicated on the MSDS (i.e. protective gloves and safety goggles).
- When you are finished, wash your hands.
- Obtain your water sample from the stream mainstream flow (usually the middle). Take the sample 3-5 inches under the surface.
- Rinse collection tubes or bottles with sample water before collecting the sample.
- Rinse testing tubes and bottles with distilled water after completing each test.
- Clean lab ware with non-abrasive detergents or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as they may scratch.

Alkalinity, High Range (20–400 mg/L as $CaCO_3$)

WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.



1. Fill the plastic tube full (to the top) with sample.

Note: *Use the plain (unlabeled) plastic tube, approximately ¼ in. in diameter.*

2. Pour the contents of the tube into the square mixing bottle.

3. Add the contents of one Phenolphthalein Indicator Powder Pillow to the mixing bottle.

4. Swirl to mix. If the water remains colorless, the phenolphthalein alkalinity is zero. In this case, proceed to step 7.

5. If the sample turns pink, add Sulfuric Acid Standard Solution one drop at a time. Count each drop. Swirl the mixing bottle after each drop is added. Add drops until the sample turns colorless.

6. Multiply the number of drops of Sulfuric Acid Standard Solution used by 20. This is the mg/L of phenolphthalein alkalinity as calcium carbonate ($CaCO_3$).

7. Add the contents of one Bromcresol Green-Methyl Red Indicator Powder Pillow to the mixing bottle.

8. Swirl to mix.

9. Add Sulfuric Acid Standard Solution one drop at a time. Count each drop. Swirl the mixing bottle after each drop is added. Add drops until the sample turns pink.

10. Multiply the total number of drops of titrant used in both steps 5 and 9 by 20. This is the total mg/L of methyl orange alkalinity as calcium carbonate ($CaCO_3$).

Note: *If no drops were used in step 5, multiply the number of drops used in step 9. by 20 to determine the total alkalinity.*

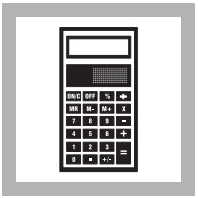
Alkalinity, Low Range (5–100 mg/L as $CaCO_3$)

1. Fill the mixing bottle to the 23-mL mark with the sample water.

2. Add the contents of one Phenolphthalein Indicator Powder Pillow.

3. Swirl to mix. If the sample remains colorless, the phenolphthalein alkalinity is zero. In this case, proceed to step 6.

4. If the sample turns pink, add Sulfuric Acid Standard Solution one drop at a time. Count each drop. Swirl the mixing bottle after each drop is added. Add drops until the sample turns colorless.



5. Multiply the number of drops of titrant used by 5. This is the mg/L of phenolphthalein alkalinity as calcium carbonate ($CaCO_3$).

6. Add the contents of one Bromcresol Green-Methyl Red Indicator Powder Pillow to the mixing bottle.

7. Swirl to mix.

8. Add Sulfuric Acid Standard Solution one drop at a time. Count each drop. Swirl the mixing bottle after each drop is added. Add drops until the sample turns pink.

9. Multiply the total number of drops of titrant used in both steps 4 and 8 by 5. This is the total mg/L of methyl orange alkalinity as calcium carbonate ($CaCO_3$).

Note: *If no drops were used in step 4, multiply the number of drops used in step 8 by 5 to determine the total alkalinity.*

Measuring Hints and General Test Information

• Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl rubbing alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes because they may scratch. Rinse with clean water (preferably deionized water).

• When titrating, count each drop of titrant. Hold the dropper vertically. Swirl the mixing bottle after each drop is added.

• The result can be expressed in grains per gallon (gpg) by dividing the mg/L result by 17.1.

• To open PermaChem® Powder Pillows:

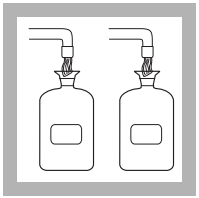
1. Tap the bottom of the pillow on a hard surface.
2. Tear open the pillow along the dashed line.
3. Open the pillow and form a spout by squeezing the side edges.
4. Pour the contents into the sample.

• Hach strongly recommends that, for optimum test results, reagent accuracy be checked with each new lot of reagents. Use the Alkalinity Standard Solution, 0.500 N (Cat. No. 14278-20). Follow the instructions included with each standard solution.

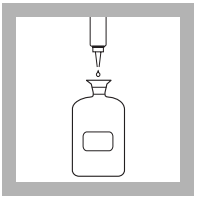
Replacement Parts

Alkalinity Reagent Set, Drop Count Titration 0–400 mg/L as $CaCO_3$..... 100 tests..... .24374-01
Includes: (1) 942-99, (1) 943-99, (1) 23497-32
Bottle, mixing, glass.....6/pkg..... 2327-06
Bromcresol Green-Methyl Red Powder Pillows..... 100/pkg..... 943-99
Instruction Card, AL-AP Test Kit.....each..... 24443-89
Measuring Tube, plastic, 5.83 mL .....each..... 438-00
Phenolphthalein Powder Pillows..... 100/pkg..... 942-99
Sulfuric Acid Standard Solution, 0.035 N ..... 100 mL MDB..... 23497-32

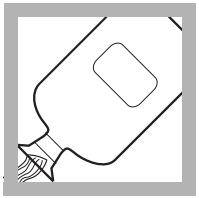
WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.



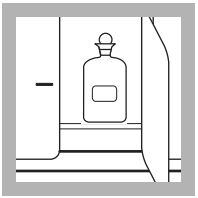
1. Collect two samples in 60-mL BOD bottles, filling them completely and preventing air from being trapped in the bottles. Allow the sample to overflow the bottle for 2-3 minutes to ensure air bubbles are not trapped or stopper the bottle under water.



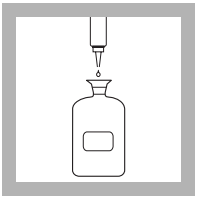
2. Using the first sample, determine the High Range dissolved oxygen concentration with the drop-count titration method for a 60-mL bottle (page 23). Record this value as $DO_{initial}$.



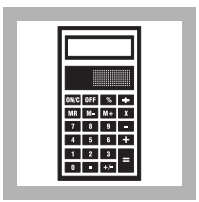
3. Discard the titrated sample.



4. Store the second sample in a warm, dark location for 5 days. If possible, wrap the bottle in aluminum foil and place it on a hot water heater or in a similar warm location.



5. After 5 days, determine the High Range dissolved oxygen concentration of the second sample with the drop-count titration method for a 60-mL bottle (page 23). Record this value as DO_{final}.



6. Calculate the 5-Day BOD of the sample with the following equation:

$$BOD = DO_{initial} - DO_{final}$$

Note: *This procedure is a modification of the Standard Methods 5-Day BOD Test (Standard Methods for the Examination of Water and Wastewater 5210). The results of this modified procedure may not be equivalent to results from the Standard Methods 5-Day BOD Test and may not be compared directly. If BOD results from this test are recorded, note that the results were obtained using the modified procedure.*

Note: *If dissolved oxygen is not detected after the 5-day incubation period, the BOD of the sample cannot be determined. In this case, report BOD as $DO_{initial}$ and note that no DO was detectable after incubation. Incubation in the Standard Methods BOD test is performed at 20 ± 1°C*

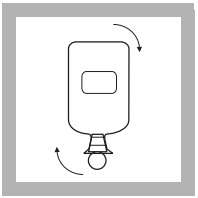
Oxygen, Dissolved (1–20 mg/L as DO), using a 60-mL BOD Bottle

1. Collect one sample in a 300-mL BOD bottle, filling it completely and preventing air from being trapped in the bottle. Allow the sample to overflow the bottle for 2-3 minutes to ensure air bubbles are not trapped or stopper the bottle while both are underwater.

2. Add the contents of one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Reagent Powder Pillow to the 60-mL BOD bottle.

3. Immediately insert the stopper so air is not trapped in the bottle. Invert several times to mix.

Note: *A flocculent precipitate will form. It will be orange-brown if oxygen is present or white if oxygen is absent.*

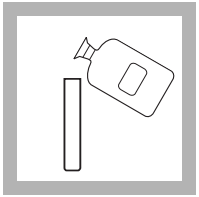


4. Wait until the floc has settled and the top half of the solution is clear (at least 5 minutes). In salt water, the floc will settle more slowly. Again invert the bottle several times and wait until the floc has settled.

Note: *Results are not affected if the floc does not settle or if some of the reagent does not dissolve.*

5. Remove the stopper and add the contents of one Dissolved Oxygen 3 Powder Pillow. Replace the stopper without trapping air in the bottle and invert several times.

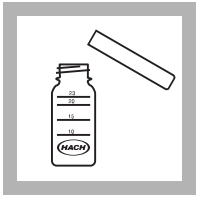
Note: *The floc will dissolve and leave a yellow color if oxygen is present.*



6. Fill plastic tube to the top with prepared sample.

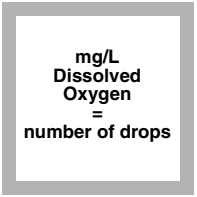
Note: *Save the rest of the prepared sample for the Low Range Test, if necessary.*

Note: *Use the unlabeled tube, approximately ¼ in. in diameter.*



7. Pour the contents of the tube into a square mixing bottle.

8. Add Sodium Thiosulfate Standard Solution one drop at a time to the mixing bottle. Count each drop. Swirl to mix after each drop. Add drops until the sample becomes colorless.



9. The total number of drops of titrant used in step 7. equals the total mg/L Dissolved Oxygen:

mg/L Dissolved Oxygen = number of drops

Note: *If the result of step 8. is 3 mg/L or less, it is advisable to perform a more sensitive test. Follow Low Range Test instructions.*

Sampling and Storage

Sampling and sample handling are important in obtaining meaningful results. The dissolved oxygen content of the sample changes with depth, turbulence, temperature, sludge deposits, light, microbial action, mixing, travel time, and other factors. A single dissolved oxygen test rarely reflects the over-all condition of a body of water. Several samples taken at different times, locations and depths are recommended for most reliable results.

Summary of Method

Samples are treated with manganous sulfate and alkaline iodide-azide reagent to form an orange-brown precipitate. Upon acidification of the sample, this floc reacts with iodide to produce free iodine as tri-iodide in proportion to the oxygen concentration. The iodine is titrated with sodium thiosulfate to a colorless end point.

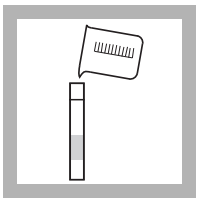
Replacement Parts

Bottle with stopper, BOD, 60-mL	each	1909-02
Bottle with stopper, BOD, 300-mL	each	621-00
Bottle, square glass, 29-mL	each	439-00
Dissolved Oxygen 1 Reagent Powder Pillow	100/pkg	981-99
Dissolved Oxygen 2 Reagent Powder Pillow	100/pkg	982-99
Sodium Thiosulfate Standard Solution, 0.0109N	each	24089-32
Tube, plastic measuring, 5.83-mL	each	438-00

WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

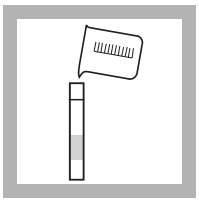
Tips and Techniques

- Use the 5-mL mark, the lowest mark on the tubes.
- If nitrite is present, pretreat the sample with Pretreatment Kit, Model PT-1 (Cat. No. 2268-00), not included in this kit. This will ensure consistent results expressed as total nitrate nitrogen. Nitrite can be determined using the procedure on page 30.
- For best results, the sample temperature should be 20–25 °C (69–77 °F). Colder samples may react more slowly. If samples are consistently cold, determine the optimal time by analyzing a cold standard.
- Make sure to use the appropriate color disk when reading the results in the color comparator. Use Nitrate Color Disc (Cat. No. 14171-00).

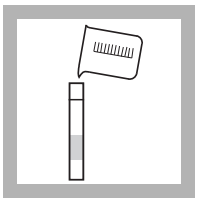


1. Fill the color viewing tube to the 5-mL mark with sample. Stopper the tube and shake vigorously.

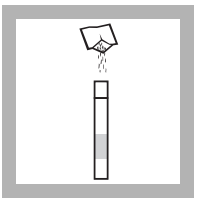
Note: *The 5-mL mark is located approximately 1 in. from the bottom of the tube*



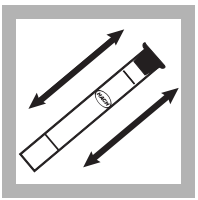
2. Empty the tube and repeat step 1.



3. Fill the color viewing tube to the 5-mL mark with sample (if nitrite is not present) or with the pretreated sample (if nitrite is present).

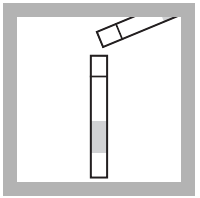


4. Open one NitraVer®6 Nitrate Reagent Powder Pillow. Add the contents to the sample in the tube.

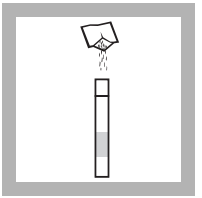


5. Stopper the tube and shake vigorously for 3 minutes. Allow the sample to stand undisturbed for 30 seconds.

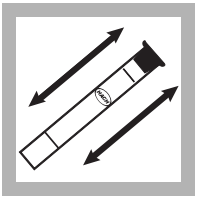
Unoxidized particles of cadmium metal will remain in the sample and settle to the bottom of the tube.



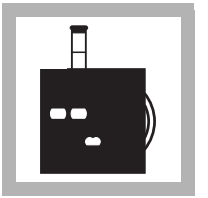
6. Carefully pour the prepared sample into a second color viewing tube so that the cadmium particles remain in the first tube.



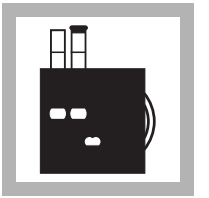
7. Open one NitriVer®3 Nitrite Reagent Powder Pillow. Add the contents to the sample in the tube.



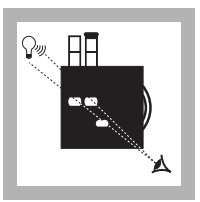
8. Stopper the tube and shake vigorously for 30 seconds. A pink color will develop if nitrate is present. Allow at least 10 minutes, but no more than 20 minutes before completing steps 9 through 11.



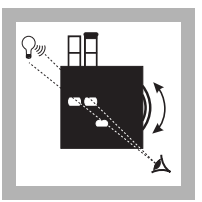
9. Insert the tube of prepared sample into the right top opening of the color comparator (Figure 4).



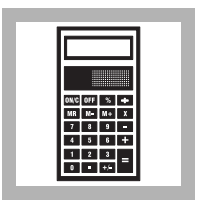
10. Rinse the unoxidized cadmium metal from the color viewing tube used in step 3, see See “Disposal Information” on page 31. Fill to the 5-mL mark with the original water sample and place in the left top opening of the comparator.



11. Orient the comparator with the tube tops pointing to a window or light source as in Figure 3 on page 45. View through the openings in the front of the comparator. Use care not to spill samples from unstoppered tubes.



12. Rotate the disc to obtain a color match. Read the mg/L nitrate–nitrogen (N) through the scale window.

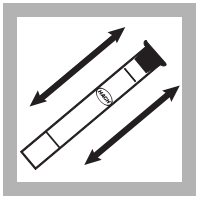


13. Multiply the reading from the scale window by 4.4 to obtain the mg/L nitrate (NO_3).

WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

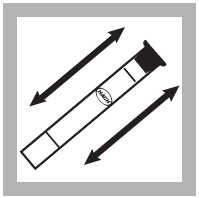
Tips and Techniques

- Use the 5-mL mark, the lowest mark on the tubes.
- If nitrite is present, pretreat the sample with Pretreatment Kit, Model PT-1 (Cat. No. 2268-00), not included in this kit. This will ensure consistent results expressed as total nitrate nitrogen. Nitrite can be determined using the procedure on page 30.
- For best results, the sample temperature should be 20–25 °C (69–77 °F). Colder samples may react more slowly. If samples are consistently cold, determine the optimal time by analyzing a cold standard.
- Make sure to use the appropriate color disk when reading the results in the color comparator.

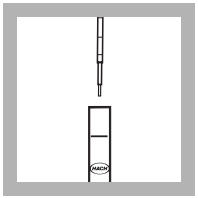


1. Fill the color viewing tube to the 5-mL mark with deionized water. Stopper the tube and shake vigorously.

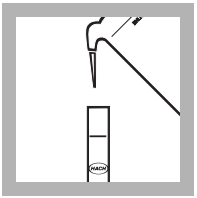
Note: *Distilled water may be used if deionized water is not available. Using distilled water, verify results with a standard.*



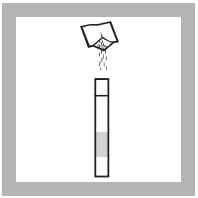
2. Empty the tube and repeat step 1.



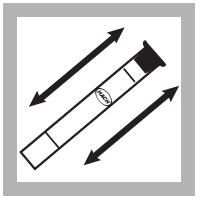
3. Rinse the plastic dropper with the sample or the pretreated sample. Fill to the 0.5-mL mark. Add the contents of the dropper to the rinsed color viewing tube.



4. Fill the color viewing tube to the 5-mL mark with deionized water.

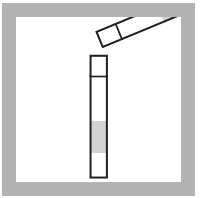


5. Open one NitraVer®6 Nitrate Reagent Powder Pillow. Add the contents to the sample.

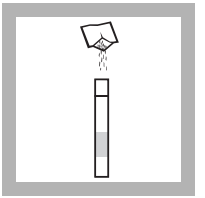


6. Stopper the tube and shake for 3 minutes. Allow the sample to stand undisturbed for 30 seconds.

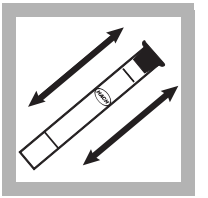
Unoxidized particles of cadmium metal will remain in the sample and settle to the bottom of the tube.



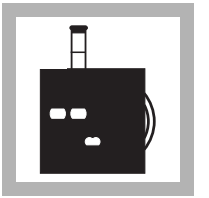
7. Carefully pour the prepared sample into a second color viewing tube so that the cadmium particles remain in the first tube.



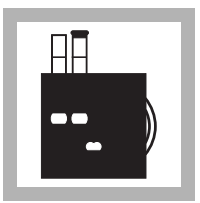
8. Open one NitriVer®3 Nitrite Reagent Powder Pillow. Add the contents to the tube containing sample.



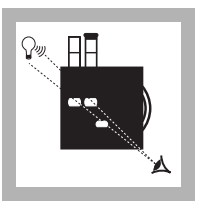
9. Stopper the tube and shake vigorously for 30 seconds. A pink color will develop if nitrate is present. Allow at least 10 minutes, but not more than 20 minutes before completing steps 10 through 12.



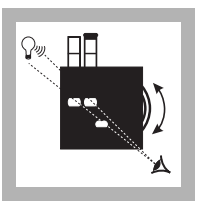
10. Insert the tube of prepared sample into the right top opening of the color comparator (Figure 4).



11. Rinse the unoxidized cadmium metal from the color viewing tube used in step 3, see See “Disposal Information” on page 31. Fill to the 5-mL mark with the original water sample and place in the top left opening of the comparator.

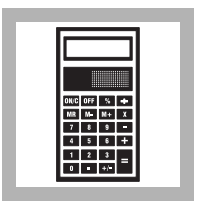


12. Orient the comparator with the tube tops pointing to a window or light source as in Figure 3 on page 45. View through the openings in the front of the comparator.



13. Rotate the disc to obtain a color match. Read the value through the scale window.

14. Multiply this value by 10 to determine the results as mg/L nitrate–nitrogen (N).

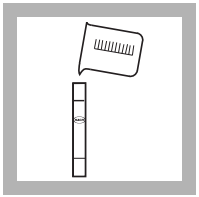


15. Multiply the value in step 13 by 4.4 to obtain the mg/L nitrate (NO_3).

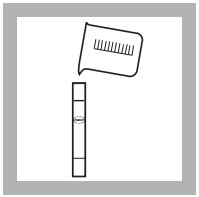
Nitrite, Low Range (0–0.5 mg/L as Nitrite Nitrogen)

WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

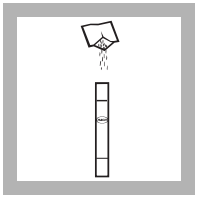
- The result obtained in the nitrate test is actually the sum of the nitrate and nitrite–nitrogen present in the sample. If the amount of nitrite nitrogen is considerable, determine it separately using this procedure.
- Use the 5-mL mark, the lowest mark on the tubes.
- Make sure to use the appropriate color disk when reading the results in the color comparator. Use the Low Range Nitrate Color Disc (Cat. No. 14171-00).



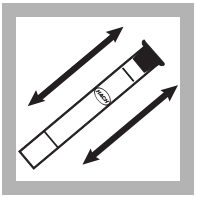
1. Rinse a color viewing tube and a stopper several times with sample.



2. Fill the tube to the 5-mL mark with sample.

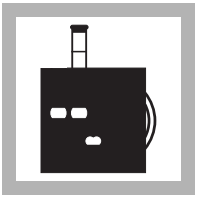


3. Open one NitriVer®3 Nitrate Reagent Powder Pillow. Add the contents to the sample.

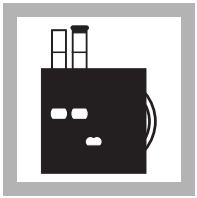


4. Stopper the tube and shake for 30 seconds. Allow at least 10 minutes, but not more than 15 minutes, for proper color development.

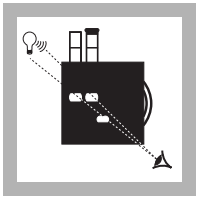
The sample will turn pink if nitrite is present.



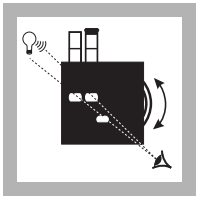
5. Insert the tube of prepared sample into the right top opening of the color comparator. (See Figure 4 on page 45.)



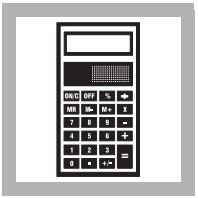
6. Fill a second viewing tube to the mark with the original water sample. Insert this tube into the top left opening of the comparator



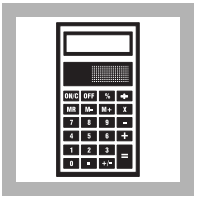
7. Orient the comparator with the tube tops pointing to a window or light source as in Figure 3 on page 45. View through the openings in the front of the comparator.



8. Rotate the disc to obtain a color match. Read the value through the scale window.



9. Multiply this value by 0.53 to determine the results as mg/L nitrite–nitrogen (N).



10. Subtract the mg/L nitrite–nitrogen from the total mg/L nitrate nitrogen (N) to obtain the exact mg/L nitrate nitrogen present in the sample.

Calculate: mg/L Nitrate Nitrogen (read from window) – mg/L Nitrite Nitrogen (N) = actual Nitrate Nitrogen (N).

Nitrate Nitrogen (N) X 4.4 = mg/L Nitrate (NO_3)

Disposal Information

Refer to the MSDS for disposal information.

Replacement Parts

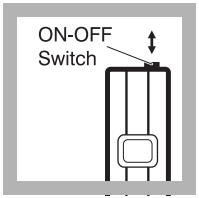
Color Comparator Box ..... each 1732-00
Color Viewing Tube, 5- and 10-mL, ... 6/pkg 1730-00
NitraVer® 6 Reagent Powder Pillows, 5-mL 100/pkg 14120-99
NitriVer® 3 Reagent Powder Pillows, 5-mL 100/pkg 14078-99

Conductivity/Total Dissolved Solids (10 to 1990 µS/cm)

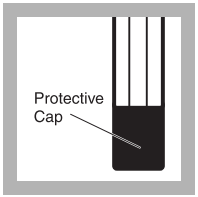
WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

Conductivity Calibration and Test Procedure

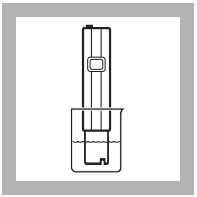
Note: *Verify the accuracy of the tester before use and periodically during use.*



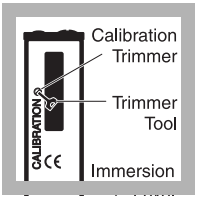
1. Press the **ON-OFF** switch once to turn the tester on.



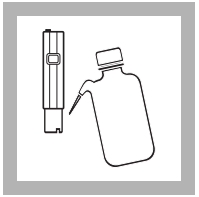
2. Remove the protective cap from the tester.



3. Measure the µS/cm of a known Calibration Standard using the Hach Pocket Pal™ Conductivity Tester.

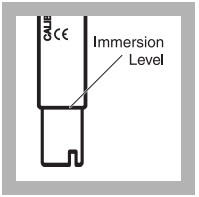


4. If necessary, adjust the Calibration Trimmer using the supplied trimmer tool (or a small flat-head screwdriver) until the reading corresponds to the concentration of the known Calibration Standard.



5. Rinse with deionized water before testing the sample.

6. The test begins with step 7.

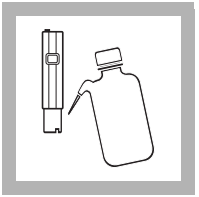


7. Immerse the bottom of the tester 1.0 to 3.5 in. (2.5 to 9 cm) into the sample.

Gently stir the sample with the tester for several seconds. When the digital display stabilizes, read the conductivity value.

Note: *Readings may not stabilize for up to 2 minutes; this is a function of the temperature sensor.*

Note: *Sample may be collected in a container or tester may be immersed directly in the sample water (lake or pond).*



8. Rinse the bottom of the tester. Replace the cap.

Note: *Maintain or improve performance by periodically rinsing the stainless steel electrode in isopropyl alcohol.*

Total Dissolved Solids

Conductivity is an estimate of total dissolved solids (TDS). TDS can be determined from Conductivity by multiplying the Conductivity by a factor of 0.5. This is a common factor used in most water quality measurements. However, this factor is based on sodium chloride being the only salt present, which is rarely the case. If your application calls for a factor more closely representative of all salts present, multiply the Conductivity by a factor of 0.64 to calculate TDS.

Calibration Standards

180 µS/cm NaCl 85.47 mg/L as NaCl 23075-42
1000 µS/cm NaCl 491 mg/L as NaCl 14400-42
1990 µS/cm NaCl 1000 mg/L as NaCl 2105-42

Battery Replacement

1. Use a coin to turn the battery compartment cover, located on the top of the tester, to the left ¼ turn.
2. Remove the cover.
3. Replace all four batteries with Eveready E675E, Duracell RM675, or Hach, Cat. No. 23678-00.
4. Replace the cover.

Replacement Parts

Deionized Water (demineralized).....100 mL.....272-42
Pocket Pal™ Conductivity Tester.....each..... 26866-01

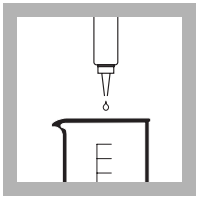
WARNING: Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.

Tips and Techniques

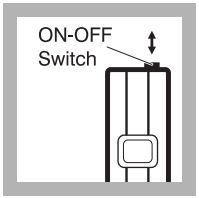
- For faster response and longer tester life, place several drops of deionized water in the protective cap to prevent the glass bulb from drying out between use.
- When using potassium chloride as reference solution electrolyte, a white deposit may form on the tester. Although the deposits are normal and do not affect performance, they may be removed with a damp cloth or tissue.
- If pH readings become erratic, replace the batteries as instructed on page 36.

Verification and Testing Procedure

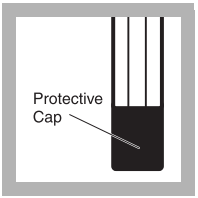
Note: *Verify the accuracy of the tester before use and periodically during use.*



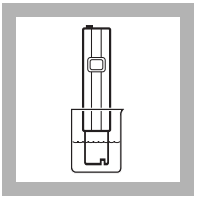
1. Prepare a pH 7.00 and a pH 4.00 or 10.00 buffer.



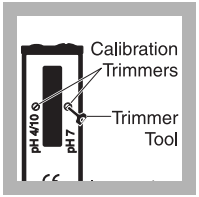
2. Press the ON-OFF switch once to turn the tester on.



3. Remove the protective cap from the tester.

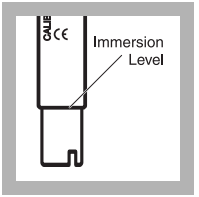


4. Measure the pH using the Pocket Pal™ pH Tester.



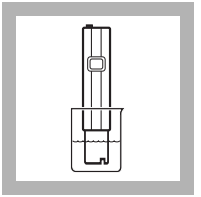
5. If necessary, adjust the Calibration Trimmer using the supplied trimmer tool (or a small flat-head screwdriver) until the reading corresponds to the pH of the buffer (7.0, or 4.0/10.0 pH).

6. The test begins with step 7.

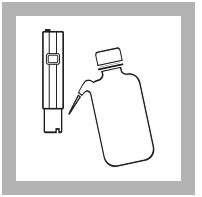


7. Immerse the bottom of the tester 1.0 to 3.5 in. (2.5 to 9 cm) into the sample.

Sample may be collected in a container or tester may be immersed directly into the sample stream.



8. Gently stir the sample with the tester for several seconds. When the digital display stabilizes, read the pH value.



9. Rinse the bottom of the tester with deionized water and blot dry. Replace the cap.

Note: *Soak the electrode tip in tap water or a pH 7 buffer before use and for a few minutes each week to condition the electrode.*

Battery Replacement

1. Use a coin to turn the battery compartment cover, located on the top of the tester, to the left ¼ turn.
2. Remove the cover.
3. Replace all four batteries with Eveready E675E, Duracell RM675, or Hach, Cat. No. 23678-00.
4. Replace the cover.

Replacement Parts

Buffer Solution, red, pH 4.01	500 mL	22834-49
Buffer Solution, yellow, pH 7.00	500 mL	22835-49
Buffer Solution, blue, pH 10.01	500 mL	22836-49
Pocket Pal™ pH Tester	each	44350-01

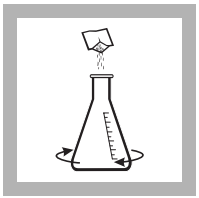
Total Phosphorus Modified Digestion Notes

While the modified total phosphorus procedure does not include boiling, a traditional phosphorus digestion includes boiling the sample on a hot plate after acid is added. Because boiling is omitted in this procedure, the modified digestion will give lower results than a traditional hot plate digestion. Results from the original and modified methods cannot be directly compared. Results from a modified total phosphorus digestion may not reflect a true total phosphorus measurement and should not be reported as such.

If facilities and resources are available, a hot plate digestion can be performed on the sample to obtain the true total phosphorus results. After *step 4* of the modified procedure, boil the sample for 30 minutes. Deionized water must be added to maintain the volume at 20 mL. Do not boil to dryness. Allow the sample to cool and proceed with *step 6*. If the sample is digested by boiling, **do not** multiply the final result by 1.2.

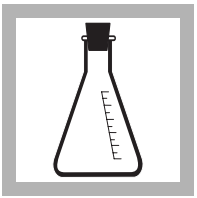
1. Rinse a square mixing bottle with sample, then fill it to the 20-mL mark with sample.

2. Rinse a 50-mL Erlenmeyer flask with sample, then pour the sample from the mixing bottle into the flask.

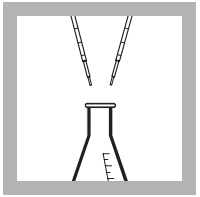


3. Open one Potassium Persulfate Powder Pillow. Add the contents of the pillow to the flask. Swirl to mix.

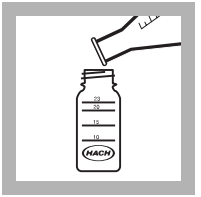
4. Add 2.0 mL of 5.25 N Sulfuric Acid Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask. Swirl to mix.



5. Stopper the flask and let the sample sit for at least 12 hours but no more than 24 hours before proceeding to *step 6*.

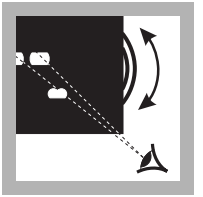


6. Add 2.0 mL of 5.0 N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask.



7. Return the sample to the square mixing bottle.

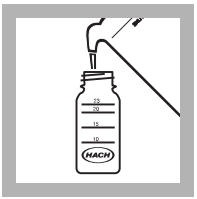
Note: *For best results, rinse a the bottle with a small portion of sample before proceeding. Be sure at least 20 mL of sample remains for analysis.*



8. Proceed with the Orthophosphate test of the appropriate range, reading the mg/L phosphate as total phosphate (PO_4). The reading on the color wheel must be multiplied by a factor of 1.2 to account for the dilutions in this procedure from acid and base addition.

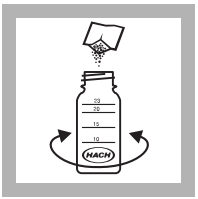
Note: *Orthophosphate procedures are located on page 39, page 41, and page 43. Use the correct procedure for your expected phosphorus range. If the expected range is unknown, phosphate test strips (Cat. No. 27571-50) may help determine the range.*

- A reagent blank is suggested for most accurate results. To run a reagent blank, react 20 mL of deionized water with one PhosVer™3 Powder Pillow. Then pour the blank into a viewing tube as described in *step 7*. Place this viewing tube in the Untreated Sample position to run the test.
- Glass tubes are recommended for phosphate analysis.

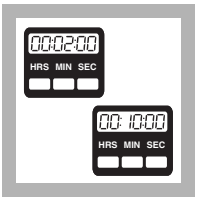


1. Rinse the square mixing bottle with sample.

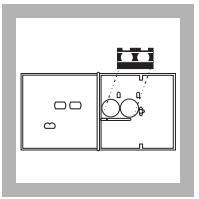
2. Fill the square mixing bottle to the 20-mL mark with the water to be tested.



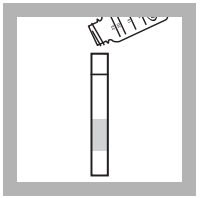
3. Open one PhosVer® 3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle and swirl to mix as shown in Figure 1 on page 45.



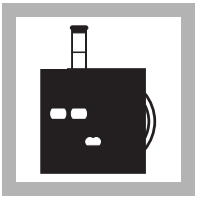
4. Allow at least two but not more than 10 minutes for color development. If phosphate is present, a blue-violet color will develop.



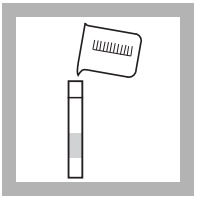
5. Insert the lengthwise viewing adapter into the comparator as illustrated in Figure 2 on page 45.



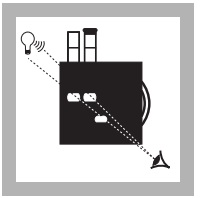
6. Fill one sample tube to the line underlining "Cat. 1730-00" with the prepared sample. If not using the 1730-00 tubes, the line is approx. 1 in. below the top of the tube.



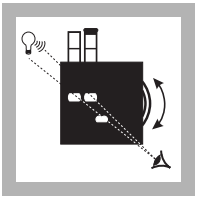
7. Place the tube containing the prepared sample into the comparator opening labeled "Prepared Sample Position" in Figure 4 on page 45.



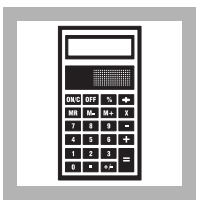
8. Fill a second sample tube with untreated water to the line as described in step 6. Insert this tube into the comparator opening labelled "Untreated Sample Position", see Figure 4 on page 45.



9. Orient the comparator with the tube tops pointing to a window or light source as in Figure 3 on page 45. View through the openings in the front of the comparator. Use care not to spill samples from unstoppered tubes.



10. Rotate the disc to obtain a color match. Read the concentration of the measured parameter through the scale window.



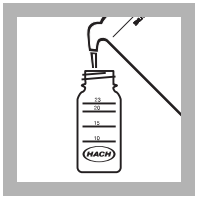
11. Divide the reading from the scale window by 50 to obtain the mg/L phosphate (PO_4). To obtain the value as mg/L phosphorus (P), divide the PO_4 value by 3.

Note: *If the modified digestion procedure was performed, multiply the final reading by a factor of 1.2 to account for dilutions.*

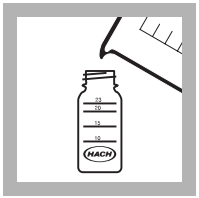
Note: *If Low Range test is overrange, remove the Long Path Viewing Adapter and read the results again. Divide the reading from the scale window by 10 to obtain the mg/L PO_4.*

Orthophosphate (Medium Range, 0–5 mg/L Phosphate)

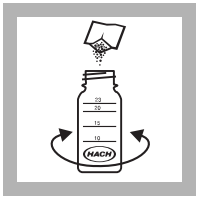
- Glass tubes are recommended for phosphate analysis.



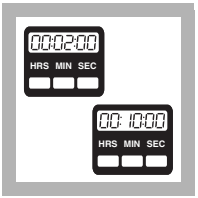
1. Rinse the square mixing bottle with sample.



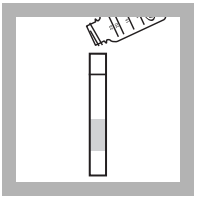
2. Fill the square mixing bottle to the 20-mL mark with the water to be tested.



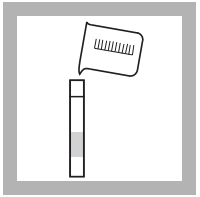
3. Open one PhosVer®3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle and swirl to mix as shown in Figure 1 on page 45.



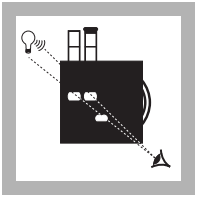
4. Allow at least two but not more than 10 minutes for color development. If phosphate is present, a blue-violet color will develop.



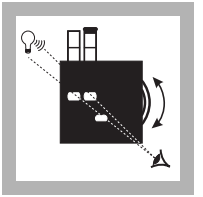
5. Fill one of the color viewing tubes to the lowest mark with the prepared sample (approx. 5 mL). Insert it into the top right opening of the color comparator (“Prepared Sample Position” in Figure 4 on page 45).



6. Fill the other tube to the lowest mark with the untreated sample (approx. 5 mL). Insert this tube into the top left opening of the color comparator (“Untreated Sample Position” in Figure 4 on page 45).



7. Hold the comparator up to a light source such as the sky, a window, or a lamp and view through the openings in front.



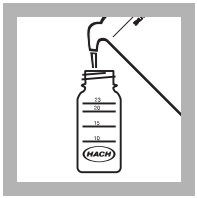
8. Rotate the disc to obtain a color match. Read the concentration of the measured parameter through the scale window.

9. Divide the reading from the scale window by 10 to obtain the mg/L phosphate (PO_4). To obtain the value as mg/L phosphorus (P), divide the PO_4 value by 3.

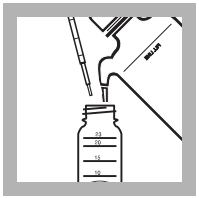
Note: *If the modified digestion procedure was performed, multiply the final reading by a factor of 1.2 to account for dilutions.*

Orthophosphate (High Range, 0–50 mg/L Phosphate)

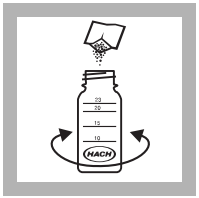
- Glass tubes are recommended for phosphate analysis.



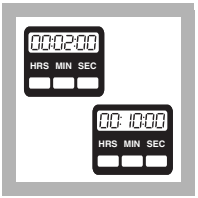
1. Rinse the square mixing bottle with deionized water.



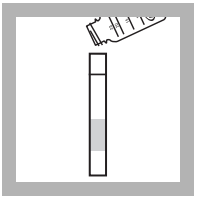
2. Add 2.0 mL of sample using the 1-mL dropper. Fill the square mixing bottle to the 20-mL mark with the deionized water. Swirl to mix as shown in Figure 1 on page 45.



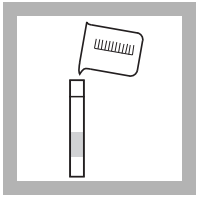
3. Open one PhosVer®3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle and swirl to mix as shown in Figure 1 on page 45.



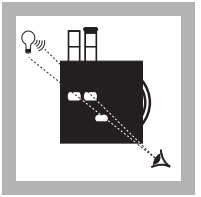
4. Allow at least two but not more than 10 minutes for color development. If phosphate is present, a blue-violet color will develop.



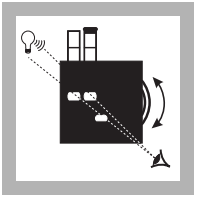
5. Fill one of the color viewing tubes to the lowest mark with the prepared sample (approx. 5 mL). Insert it into the top right opening of the color comparator (“Prepared Sample Position” in Figure 4 on page 45).



6. Fill the other tube to the lowest mark with the untreated sample (approx. 5 mL). Insert this tube into the top left opening of the color comparator (“Untreated Sample Position” in Figure 4 on page 45).



7. Hold the comparator up to a light source such as the sky, a window, or a lamp and view through the openings in front.



8. Rotate the disc to obtain a color match. Read the mg/L phosphate (PO_4) through the scale window.

9. To obtain the value as mg/L phosphorus (P), divide the value in *step 8* by 3.

Note: *If the modified digestion procedure was performed, multiply the final reading by a factor of 1.2 to account for dilutions.*

Figure 1 Swirling the Sample Cell

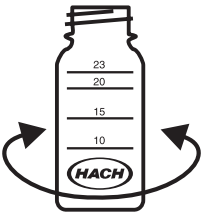


Figure 2 Inside the Color Comparator

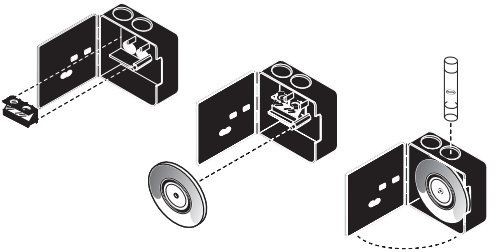


Figure 3 Viewing the Results

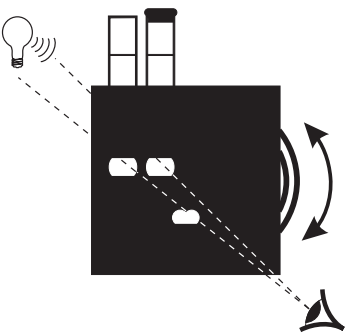
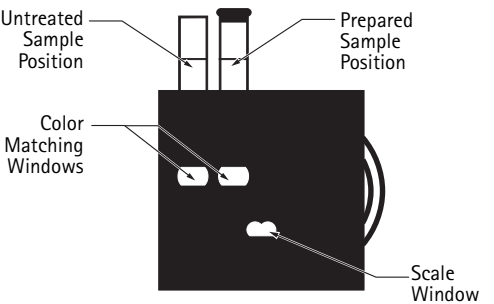


Figure 4 Color Comparator



Sampling and Storage

Collect sample in plastic or glass bottles that have been cleaned with 1:1 Hydrochloric Acid Solution and rinsed with deionized water. Do not use commercial detergents containing phosphate for cleaning glassware used in this test. If 1:1 HCl is not available, rinse sample cells with a dilute acid solution.

Testing Turbid Samples

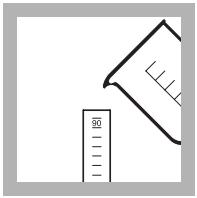
A considerable amount of turbidity often is present in natural water samples. The particles may contain phosphate which can be picked up when the test is run, although the phosphate contained in the particles are not soluble. These must be removed to obtain accurate test results for soluble phosphate. A funnel, filter paper, and two square bottles are provided for filtering the sample. Do not filter total phosphorus samples because much organic phosphate may be insoluble.

Filtration Procedure

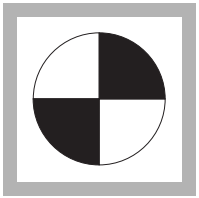
1. Fill a square mixing bottle with sample.
2. Set up the funnel on the other square mixing bottle. Insert a piece of folded filter paper into the funnel.
3. Pour the water sample into the filter paper. As the sample filters, collect it in the other square mixing bottle. The resulting clear sample should be used as the sample to be tested.

Replacement Parts

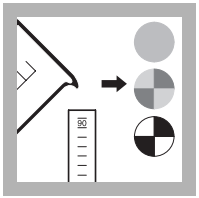
Bottle for mixing	each	2327-00
Color Comparator Box	each	1732-00
Color Viewing Tube, 5–10 mL	each	1730-00
Long Path Viewing Adapter	each	24122-01
Erlenmeyer Flask, 50-mL	each	505-41
PhosVer™ 3 Reagent Powder Pillows, 25-mL	100/pkg	2125-99
Potassium Persulfate Reagent Powder Pillow	100/pkg	2451-99
Sodium Hydroxide Solution, 5.0 N	100 mL	2450-32



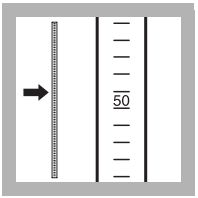
1. Fill and drain the turbidity tube three times with the sample to be tested.



2. Holding the tube vertically, look down into the tube and view the Secchi Disk, composed of two black and two white quadrants, at the bottom of the tube.



3. Fill the tube to the top with sample. Drain the sample slowly through the valve at the bottom of the tube. Stop as soon as the quadrants of the Secchi Disk become visible again.



Note: Record the water level using the centimeter scale on the side of the tube. Measure the water level at the bottom of the meniscus. Over time, changes in water level are indicative of changes in turbidity.

Note: *Rinse the tube three times with clean water immediately after use.*

Important Note:

The scale on the side of the turbidity tube is in units of centimeters. When using the turbidity tube, turbidity is measured by recording the height of the water column at the point where the quadrants of the Secchi Disk become visible as the sample is drained. The greater the height of the water, the lower the turbidity. The lower the height of the water, the greater the turbidity. The turbidity tube is useful for trending, since changes in water height reflect changes in turbidity over time. Measurements from the turbidity tube cannot be compared with turbidimeter NTU measurements unless a correlation between cm and NTU is established by the user. If the quadrants of the Secchi Disk are still visible when the tube is completely filled, record the water level as > 60 cm.

Replacement Parts

Turbidity Tube.....each..... 63010-00