

Appendix C
Hach “Visual”
Kit (old)
Instructions

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ANALYTICAL PROCEDURES

For EASI Water Quality Test Kits

SAFETY AND DISPOSAL CONSIDERATIONS

CAUTION

This set contains chemicals that may be harmful if misused. Carefully read cautions on individual containers. The same safety considerations that apply to current testing in your EASI programs apply to the use of Hach equipment. "Always be careful" is the first rule for handling glassware, apparatus, thermometers, chemical reagents, and laboratory equipment. Before starting work read each activity carefully to become familiar with the experimental procedure and safety precautions.

Protective Eyewear

As a part of good laboratory technique, wear lab grade goggles when handling chemicals or pipetting solutions. Glasses may be worn under the goggles. Wearing contact lenses while performing analytical tests may be hazardous because there is a danger of volatile or corrosive material dissolving in the lenses or getting beneath them.

Chemical Reagents

Hach test kits are equipped with convenient premeasured chemicals conveniently packed in lengths of sealed plastic tubing, sealed foil packets, or plastic dropping bottles. Such packaging minimizes chemical measuring, spillage, and clean-up.

Material Safety Data Sheets (MSDS)

The Hach chemical reagents that are used in the test kits come with MSDS. These MSDS can be used as a basic tool to carry out safe experiments. Each MSDS provides information about product ingredients, physical characteristics, health hazard data, precautionary measures, first aid, spill and disposal information, transportation, and other pertinent data. Refer to it for information about safety, first aid, and disposal requirements.

SAFETY AND DISPOSAL CONSIDERATIONS, continued

Disposal Information

Several federal, state, and local regulations govern the safe disposal of waste chemicals and reagents. Section VIII of the MSDS provides information regarding spill and disposal guidelines. Always dispose of waste chemicals and spent samples in accordance with all applicable federal, state, and local regulations. Part 261 of 40 Code of Federal Regulations (CFR) covers federal regulations for the identification and listing of hazardous wastes. The U.S. Environmental Protection Agency (USEPA) maintains a Resource Conservation and Recovery Act (RCRA) Hotline number 1-800-424-9346 to assist in disposal. Also, your State Department of Natural Resources may provide assistance on waste disposal.



ANALYTICAL PROCEDURES

For EASI Water Quality Test Kits

ALKALINITY

5–100, 20–400 mg/L CaCO₃

Model AL-AP MG/L

Cat. No. 24443-01

To ensure accurate results, read carefully before proceeding.

CAUTION

Handling chemical samples, standards, and reagents can be dangerous.

Review the Material Safety Data Sheets before handling any chemicals.

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 as this may scratch them. 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.

ALKALINITY, continued

Using PermaChem[®]* Powder Pillows

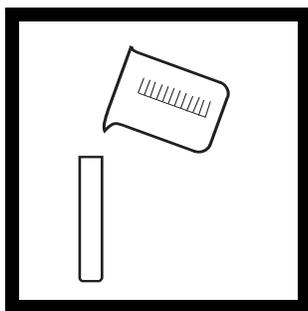
To open PermaChem Powder Pillows:

- 1. Tap** the PermaChem pillow on a hard surface to collect the powdered reagent in the bottom.
- 2. Tear** across on the dotted pillow line marked “TEAR.” Be sure to hold the pillow away from your face.
- 3.** Using two hands, **push** both sides toward each other until thumbs and forefingers form a diamond. Make Sure to **crease** the foil pack, so that it forms a spout.
- 4. Pour** the pillow contents into the sample. The polyfilm lining is specially formulated to deliver all the powder necessary for accurate results (no tapping on the vessel edge is necessary).

* PermaChem[®] is a registered trademark of Hach Company.

ALKALINITY, continued

Alkalinity (20–400 mg/L)



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

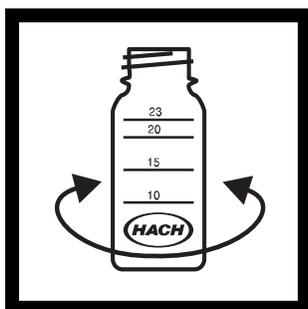
Note: Sample water should be level with the top of the plastic tube.



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



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



4. Swirl to mix.

ALKALINITY, continued



5. 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.

Note: Results will vary if the dropper is not held vertically.



6. Multiply the total number of drops of titrant used in *step 5* by 20. This is the total mg/L of methyl orange alkalinity as calcium carbonate (CaCO_3).

$\text{mg/L CaCO}_3 \text{ methyl orange alkalinity} = \text{number of drops} \times 20$

ALKALINITY, continued

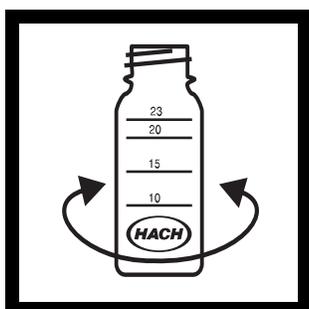
Alkalinity (5–100 mg/L)



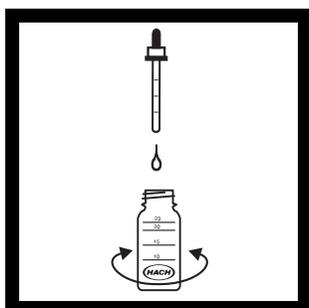
1. Fill the mixing bottle to the 23-mL mark with the sample water.



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

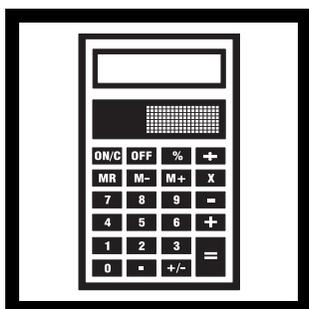


3. Swirl to mix.



4. 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.

Note: Results will vary if the dropper is not held vertically.



5. Multiply the total number of drops of titrant used in *step 4* by 5. This is the total mg/L of methyl orange alkalinity as calcium carbonate (CaCO_3).

mg/L CaCO_3 methyl orange alkalinity = number of drops x 5

ALKALINITY, continued

REQUIRED REAGENTS AND APPARATUS

Description	Unit	Cat. No.
Bottle, mixing, glass	6/pkg	2327-06
Bromcresol Green-Methyl Red Powder Pillows.....	100/pkg	943-99
Measuring Tube, plastic, 5.83 mL	each	438-00
Sulfuric Acid Standard Solution, 0.035 N	100 mL MDB*	23497-32

* Marked Dropping Bottle



ANALYTICAL PROCEDURES

For EASI Water Quality Test Kits

DISSOLVED OXYGEN

0.2–4, 1–20 mg/L O₂

Model OX-2P

Cat. No. 1469-00

To ensure accurate results, read carefully before proceeding.

CAUTION

Handling chemical samples, standards, and reagents can be dangerous.

Review the Material Safety Data Sheets before handling any chemicals.

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 as this may scratch them. 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.
- For optimum test results, Hach strongly recommends that reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit or listed in the *Optional Reagents and Equipment* section. Follow the instructions included with each standard solution.

DISSOLVED OXYGEN, continued

Using PermaChem®* Powder Pillows

To open PermaChem Powder Pillows:

1. **Tap** the PermaChem pillow on a hard surface to collect the powdered reagent in the bottom.
2. **Tear** across on the dotted pillow line marked “TEAR.” Be sure to hold the pillow away from your face.
3. Using two hands, **push** both sides toward each other until thumbs and forefingers form a diamond. Make sure to **crease** the foil pack, so that it forms a spout.
4. **Pour** the pillow contents into the sample. The polyfilm lining is specially formulated to deliver all the powder necessary for accurate results (no tapping on the vessel edge is necessary).

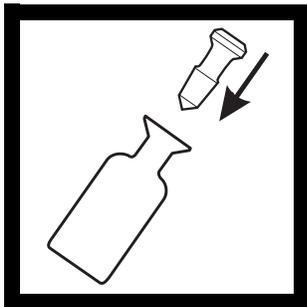
* PermaChem® is a registered trademark of Hach Company.

DISSOLVED OXYGEN, continued

Dissolved Oxygen (1–20 mg/L)



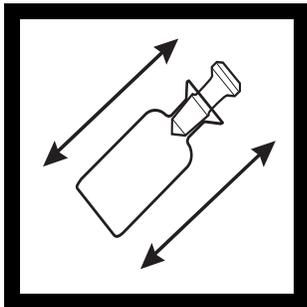
1. Fill the Dissolved Oxygen bottle (round bottle with glass stopper) with sample water by allowing the sample water to overflow the bottle for 2 to 3 minutes. Avoid turbulence and bubbles in the sample while filling.



2. Incline the bottle slightly and insert the stopper with a quick thrust to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.



3. Remove the stopper and add the contents of one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.

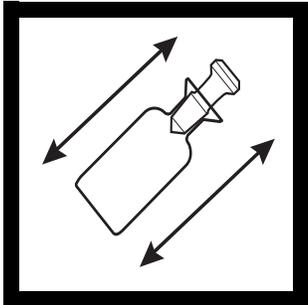


4. Shake the bottle vigorously to mix. A flocculent precipitate (floc) will form. Brownish-orange precipitate indicates oxygen is present.

DISSOLVED OXYGEN, continued



5. Wait for floc to settle to approximately half the bottle volume.



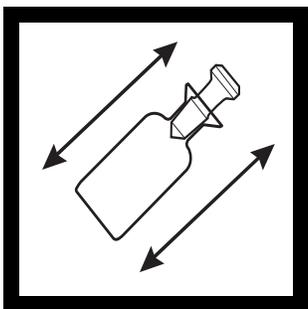
6. Shake the bottle vigorously again.



7. Wait for floc to settle halfway.

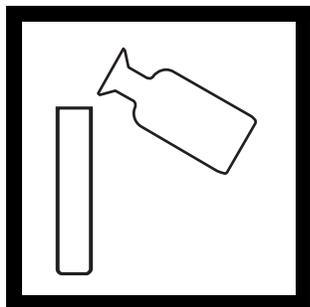


8. Remove the stopper and add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.



9. Shake the bottle vigorously to mix. Floc will dissolve and the sample will turn yellow if oxygen is present.

DISSOLVED OXYGEN, continued



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

Note: Prepared sample water should be level with the top of the plastic tube.

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

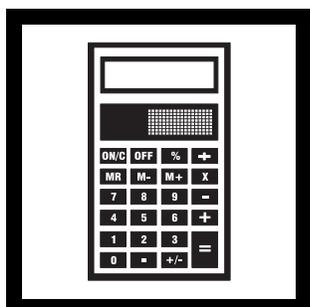


11. Pour the contents of the tube into a square mixing bottle.



12. 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.

Note: Results will vary if the dropper is not held vertically.



13. The total number of drops of titrant used in *step 12* equals the total mg/L dissolved oxygen.

mg/L dissolved oxygen = number of drops

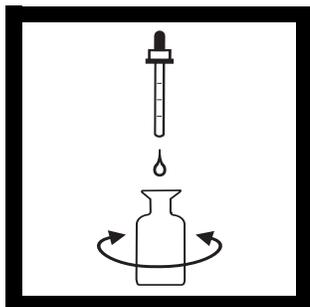
Note: If the result of step 13 is 3 mg/L or less, it is advisable to perform a more sensitive test. Follow the Low Range Test instructions.

DISSOLVED OXYGEN, continued

Dissolved Oxygen (0.2–4 mg/L)

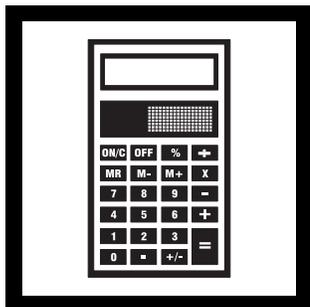


1. Use the prepared sample left from *step 10* of the High Range Test. Pour off the contents of the Dissolved Oxygen bottle until the level reaches the 30-mL mark on the bottle.



2. Add Sodium Thiosulfate Standard Solution one drop at a time to the Dissolved Oxygen bottle. Count each drop. Swirl the bottle after each drop is added. Add drops until the sample becomes colorless.

Note: Results will vary if the dropper is not held vertically.



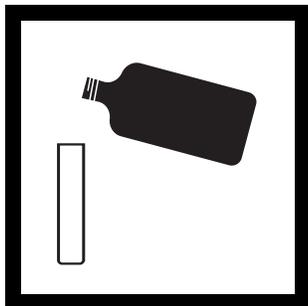
3. Multiply the number of drops of titrant used by 0.2. This is the total mg/L dissolved oxygen.

mg/L Dissolved oxygen = number of drops x 0.2

DISSOLVED OXYGEN, continued

Accuracy Check

Check the strength of the Sodium Thiosulfate Standard Solution with Potassium Iodide-Iodate Standard Solution:



1. Fill plastic tube with 0.00125 N Potassium Iodide-Iodate Standard Solution.



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



3. Add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow to the bottle and swirl to mix.



4. 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. It should take 10 drops of 0.0109 N Sodium Thiosulfate Standard Solution for the titration end point.

Note: Results will vary if the dropper is not held vertically.

Note: If fewer than 10 drops Sodium Thiosulfate Standard Solution are required, repeat the test carefully. If more than 10 drops are required, replace the standard solution.

DISSOLVED OXYGEN, continued

REQUIRED REAGENTS AND APPARATUS

Dissolved Oxygen Reagent Set (100 tests)..... 24398-02
Includes:(1) 981-99, (1) 982-99, (1) 987-99, (1) 24089-32 (standard solution)

Description	Unit	Cat. No.
Bottle, BOD, 60 mL, 30-mL mark, glass with stopper.....	each	1909-02
Bottle, square, glass	6/pkg	439-06
Clippers for medium powder pillows.....	each	968-00
Dissolved Oxygen 1 Reagent Powder Pillows.....	100/pkg	981-99
Dissolved Oxygen 2 Reagent Powder Pillows.....	100/pkg	982-99
Dissolved Oxygen 3 Reagent Powder Pillows.....	100/pkg	987-99
Measuring Tube, plastic, 5.83 mL	each	438-00
Sodium Thiosulfate Standard Solution, stabilized, 0.0109 N.....	100 mL MDB*	24089-32

OPTIONAL REAGENTS AND APPARATUS

Potassium Iodide-Iodate Standard Solution, 0.00125 N..... 500 mL 401-49
Stopper, for dissolved oxygen bottle, BOD, 60 mL..... each 1909-01

* Marked Dropping Bottle



ANALYTICAL PROCEDURES

For EASI Water Quality Test Kits

NITRATE-NITROGEN *0–1, 0–10 mg/L NO₃⁻-N*

Model NI-14

Cat. No. 14161-33

To ensure accurate results, read carefully before proceeding.

CAUTION

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

Measuring Hints and General Test Information

- For best results, perform this test with a sample temperature of 20–25 °C (69 –77 °F).
- 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 as this may scratch them. Rinse with clean water (preferably deionized water).
- For optimum test results, Hach strongly recommends that reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit or listed in the *Optional Reagents and Equipment* section. Follow the instructions included with each standard solution.

NITRATE–NITROGEN, continued

Using PermaChem®* Powder Pillows

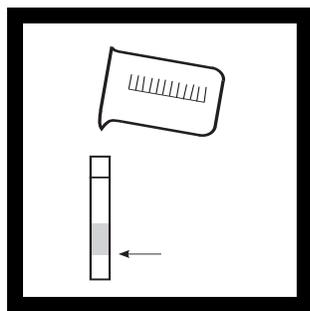
To open PermaChem Powder Pillows:

- 1. Tap** the PermaChem pillow on a hard surface to collect the powdered reagent in the bottom.
- 2. Tear** across on the dotted pillow line marked “TEAR.” Be sure to hold the pillow away from your face.
- 3.** Using two hands, **push** both sides toward each other until thumbs and forefingers form a diamond. Make sure to **crease** the foil pack, so that it forms a spout.
- 4. Pour** the pillow contents into the sample. The polyfilm lining is specially formulated to deliver all the powder necessary for accurate results (no tapping on the vessel edge is necessary).

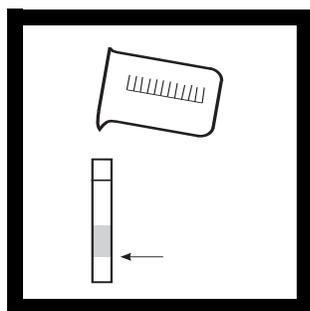
* PermaChem® is a registered trademark of Hach Company.

NITRATE–NITROGEN, continued

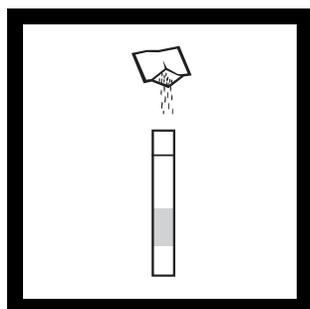
Nitrate-Nitrogen (0–1 mg/L)



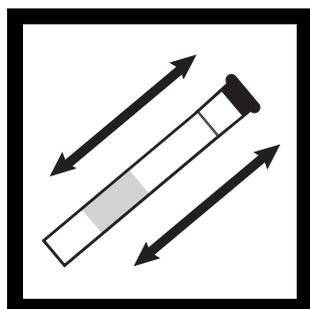
1. Fill a viewing tube to the first (5-mL) line with sample water. Cap the tube and shake vigorously. Empty the tube and repeat this procedure. This process rinses the tube to remove any reagents from the previous analysis.



2. Fill the rinsed tube to the first (5-mL) line with sample water.



3. Add the contents of one NitraVer[®] 6 Nitrate Reagent Powder Pillow to the tube. Tap the pillow until no more powder pours out.

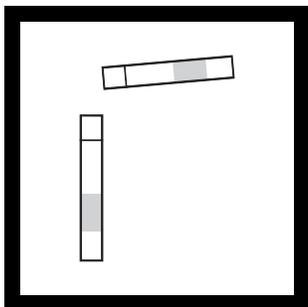


4. Cap the tube and shake vigorously for three minutes. Allow this sample to sit undisturbed for 30 seconds.

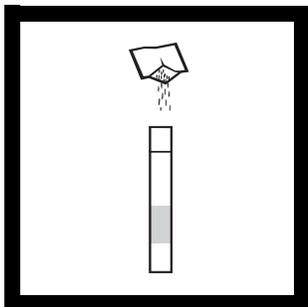
Note: Unoxidized particles of cadmium metal will remain in the sample water and settle to the bottom of the viewing tube.

Note: Shaking time and technique influence color development. For the most accurate results, analyze a standard solution several times and adjust the shaking time to obtain the correct result.

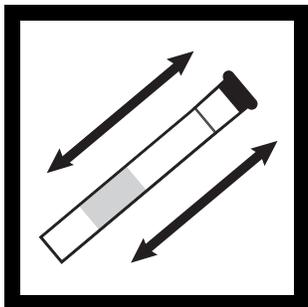
NITRATE–NITROGEN, continued



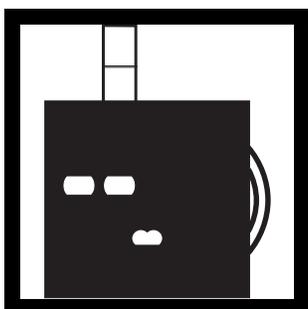
5. Pour the prepared sample into a second viewing tube carefully so that the cadmium particles remain in the first viewing tube.



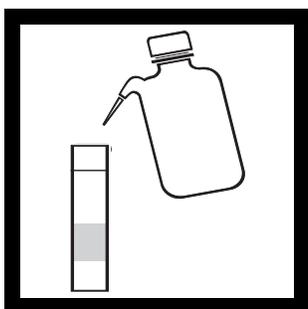
6. Add the contents of one NitriVer[®] 3 Nitrite Reagent Powder Pillow to the second tube.



7. Cap the tube and shake vigorously for 30 seconds. A red color will develop if nitrate is present.



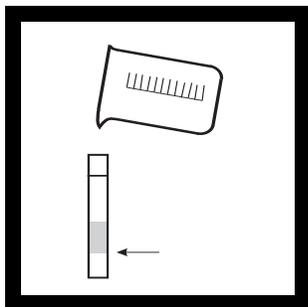
8. Place this tube in the top right opening of the color comparator and let stand at least 10 minutes, but not more than 20 minutes.



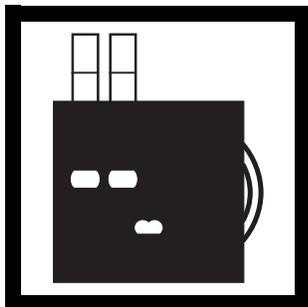
9. Rinse the unoxidized cadmium metal from the first color viewing tube used in *step 5*

Note: Final samples contain cadmium at concentration levels regulated as hazardous waste under RCRA. Contact your governing local, state, or federal agency for further information on the proper disposal of these materials.

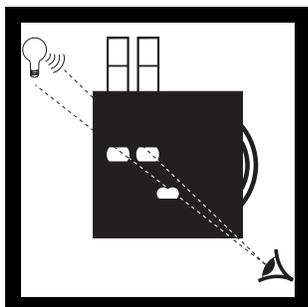
NITRATE–NITROGEN, continued



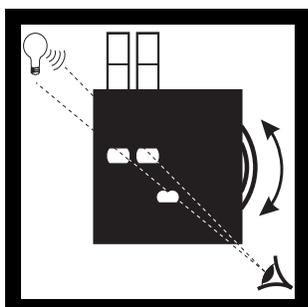
10. Fill to the first (5-mL) line with the original water sample.



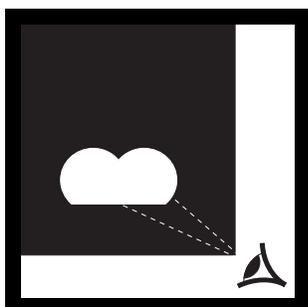
11. Place this tube in the top left opening of the color comparator.



12. After the sample prepared in *step 8* has stood for at least 10 minutes, hold comparator up to a light source such as the sky, a window, or a lamp. Look through the openings in front.

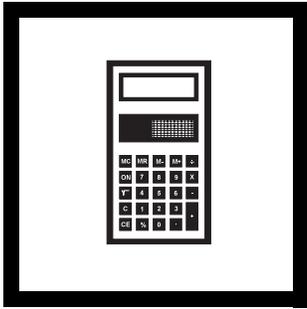


13. Rotate the color disc until the color matches in the two openings.



14. Read the mg/L nitrate–nitrogen value in the scale window.

NITRATE–NITROGEN, continued

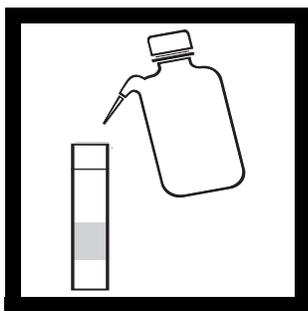


- 15.** Multiply the mg/L nitrate–nitrogen value by 4.4 to obtain the mg/L nitrate.

Note: Final samples contain cadmium at concentration levels regulated as hazardous waste under the Resource Conservation and Recovery Act (RCRA). Contact your governing local, state, or federal agency for further information on proper disposal of these materials.

NITRATE–NITROGEN, continued

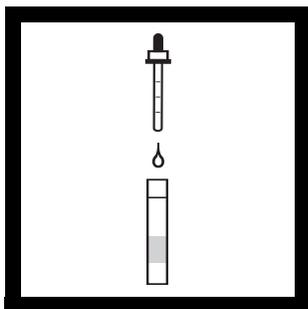
Nitrate-Nitrogen (0–10 mg/L)



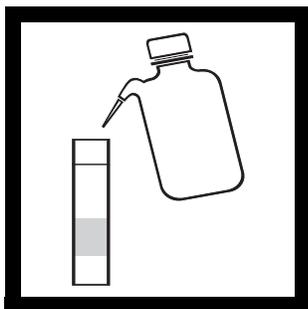
1. Fill a viewing tube to the first (5-mL) line with deionized water. Cap the tube and shake vigorously. Empty the tube and repeat this procedure. This process rinses the tube to remove any reagents from the previous analysis.



2. Rinse the glass dropper with sample water. Fill glass dropper to the 0.5-mL mark with sample water.

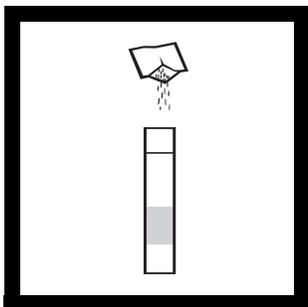


3. Add contents of the dropper to the rinsed tube.

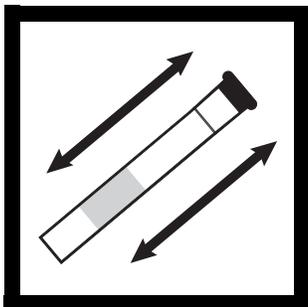


4. Fill the tube to the first (5-mL) line with deionized water.

NITRATE–NITROGEN, continued



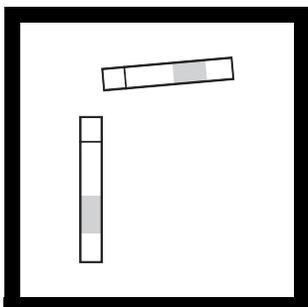
5. Add the contents of one NitraVer® 6 Nitrate Reagent Powder Pillow to the tube. Tap the pillow until no more powder pours out.



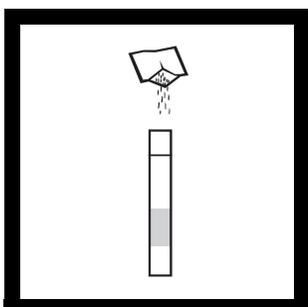
6. Cap the tube and shake vigorously for three minutes. Allow this sample to sit undisturbed for 30 seconds.

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

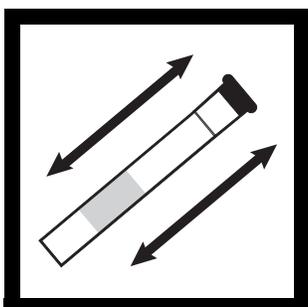
Note: Shaking time and technique influence color development. For the most accurate results, analyze a standard solution several times and adjust the shaking time to obtain the correct result.



7. Pour the prepared sample into a second viewing tube carefully so that the cadmium particles remain in the first viewing tube.

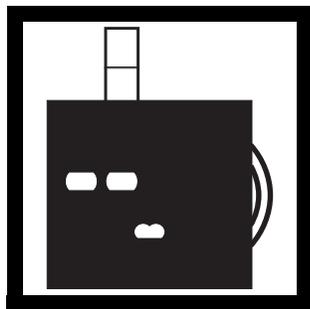


8. Add the contents of one NitriVer® 3 Nitrite Reagent Powder Pillow to the second tube.

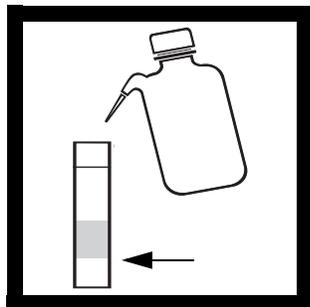


9. Cap the tube and shake vigorously for 30 seconds. A red color will develop if nitrate is present.

NITRATE-NITROGEN, continued

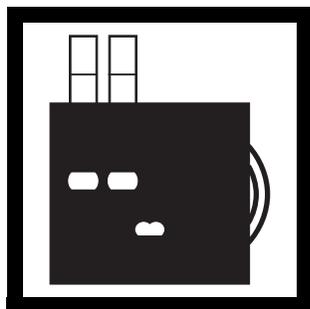


10. Place this tube in the top right opening of the color comparator. Allow this sample to sit undisturbed for at least 10 minutes, but not more than 20 minutes, before completing *step 11* through *step 17*.

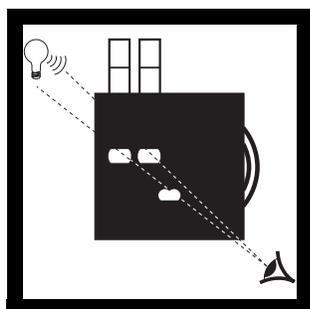


11. Rinse the unoxidized cadmium from the first viewing tube used in *step 7*. Fill to the first (5-mL) line with the original water sample.

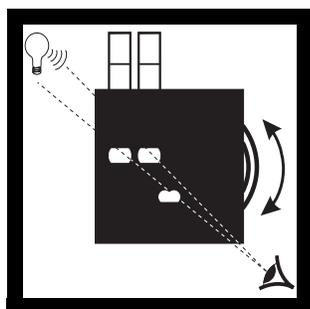
Note: Final samples contain cadmium at concentration levels regulated as hazardous waste under RCRA. Contact your governing local, state, or federal agency for further information on the proper disposal of these materials.



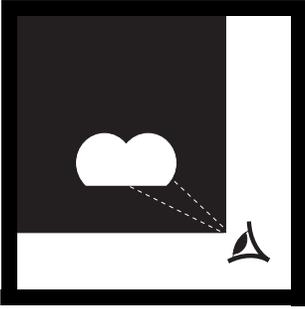
12. Place this tube in the top left opening of the color comparator.



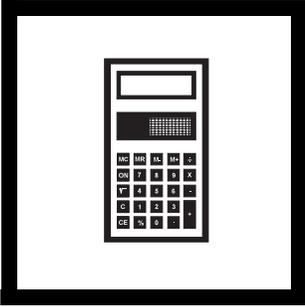
13. Hold comparator up to a light source such as the sky, a window, or a lamp. Look through the openings in front.



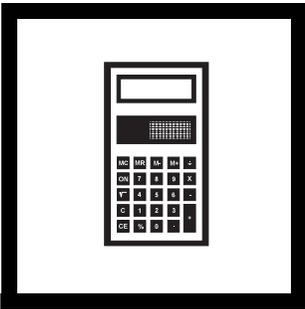
14. Rotate the color disc until the color matches in the two openings.



15. Read the apparent mg/L nitrate–nitrogen in the scale window.



16. Multiply the apparent mg/L nitrate–nitrogen value by 10 to obtain the actual mg/L nitrate–nitrogen.



17. Multiply the actual mg/L nitrate–nitrogen value by 4.4 to obtain the mg/L nitrate.

Note: Final samples contain cadmium at concentration levels regulated as hazardous waste under RCRA. Contact your governing local, state, or federal agency for further information on the proper disposal of these materials.

NITRATE–NITROGEN, continued

REQUIRED REAGENTS AND APPARATUS

Nitrate–Nitrogen Reagent Set (100 tests) 24608-00
Includes: (1) 14078-99, (1) 14120-99, (1) 25578-20 (standard solution)

Description	Unit	Cat. No.
Color Comparator Box.....	each	1732-00
Color Disc, Low Range Nitrate–Nitrogen	each	14171-00
Color Viewing Tube	each	46600-00
Color Viewing Tube, cap	each	46600-10
Dropper, 0.5 and 1.0-mL marks.....	each	14197-00
NitraVer® 6 Nitrate Reagent Powder Pillows*	100/pkg	14120-99
NitriVer® 3 Nitrite Reagent Powder Pillows*	100/pkg	14078-99

OPTIONAL REAGENTS AND APPARATUS

Bottle, demineralizer	177 mL	14299-00
Bottle, wash, for deionized water	500 mL	620-11
Nitrate–Nitrogen Standard Solution, 1.0 mg/L,.....	500 mL	2046-49
Nitrate–Nitrogen Standard Solution, 10.0 mg/L,.....	500 mL	307-49
Nitrate–Nitrogen Standard Solution, 5.0 mg/L, 2-mL PourRite™ Ampule	20/pkg	25578-20
Water, deionized	100 mL	272-42

* NitraVer® and NitriVer® are registered Hach Company trademarks.



ANALYTICAL PROCEDURES ***For EASI Water Quality Test Kits***

TOTAL PHOSPHATE

0–1, 0–5, 0–50 mg/L PO₄³⁻

Model PO-24

Cat. No. 2250-01

To ensure accurate results, read carefully before proceeding.

CAUTION

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

Measuring Hints and General Test Information

- Wash all labware between tests. Contamination may alter test results. Do not use a phosphate-based detergent. For best results, rinse with 6.0 N (1:1) Hydrochloric Acid Solution, not included in this kit. (See *Optional Reagents and Equipment* to order.) Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).
- Rinse all viewing tubes thoroughly with the sample water before testing.
- Accuracy is not affected by undissolved powder.
- For optimum test results, Hach strongly recommends that reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit or listed in the *Optional Reagents and Equipment* section. Follow the instructions included with each standard solution.
- If the color from the Low-Range test is so dark that it reads off the high end of the scale, repeat the test using a new sample and the Mid-Range instructions.
- If the sample is turbid, it must be filtered before being digested. (See the filtration procedures under *Sample Preparation for Testing Turbid Waters* on page 47.)

TOTAL PHOSPHATE, continued

Using PermaChem®* Powder Pillows

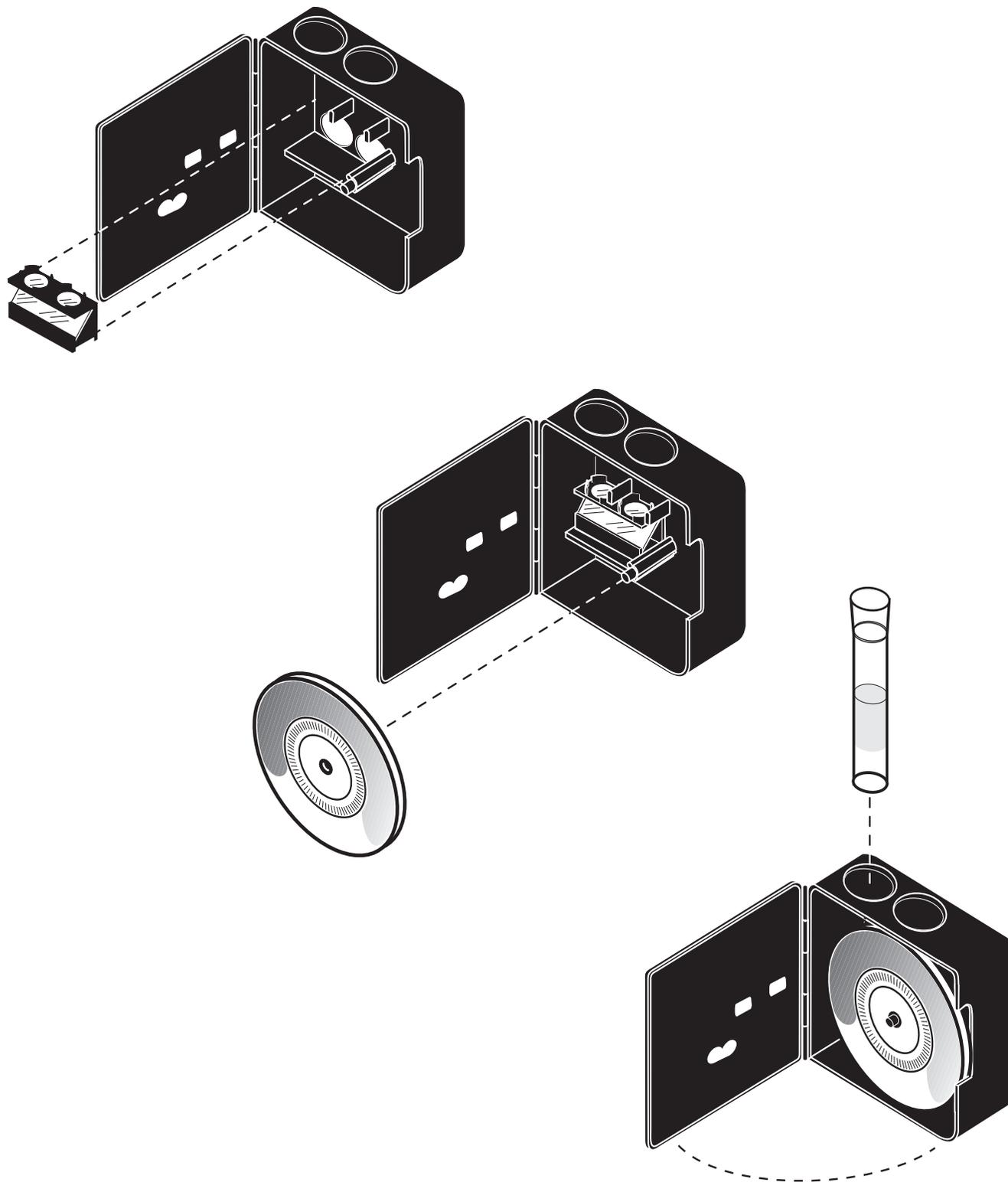
To open PermaChem Powder Pillows:

1. **Tap** the PermaChem pillow on a hard surface to collect the powdered reagent in the bottom.
2. **Tear** across on the dotted pillow line marked “TEAR,” holding the pillow away from your face.
3. Using two hands, **push** both sides toward each other until thumbs and forefingers form a diamond. Make sure to **crease** the foil pack, so that it forms a spout.
4. **Pour** the pillow contents into the sample. The polyfilm lining is specially formulated to deliver all the powder necessary for accurate results (no tapping on the vessel edge is necessary).

* PermaChem® is a registered trademark of Hach Company.

The Long Path Viewing Adaptor

Figure 1 Using the Long Path Viewing Adaptor in the Color Comparator

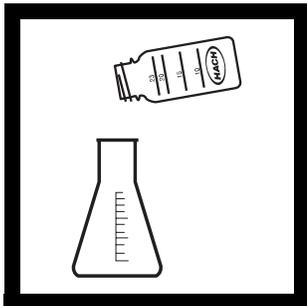


TOTAL PHOSPHATE, continued

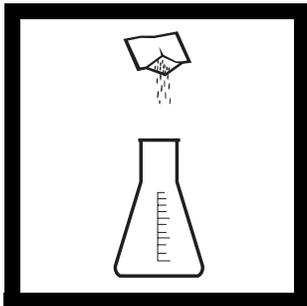
Acid Persulfate Digestion



1. Fill the square mixing bottle to the 20-mL mark with sample water.



2. Pour the sample into a clean 50-mL Erlenmeyer flask.



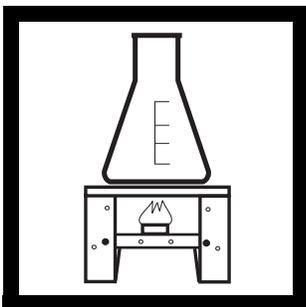
3. Add the contents of one Potassium Persulfate Powder Pillow to the flask. Swirl to mix.



4. Add 2.0 mL of 5.25 N Sulfuric Acid Solution. Swirl to mix.

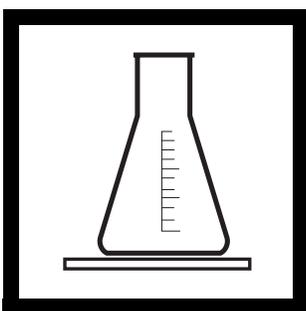
Note: Use the 1-mL calibrated dropper provided.

TOTAL PHOSPHATE, continued

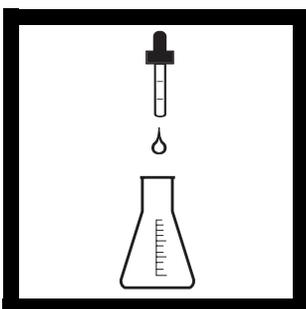


5. Set up the folding stove (Heatab[®] Cookit). Use a boiling aid such as boiling chips (see *Optional Reagents and Equipment*) to prevent violent boiling of the sample. Place the flask (the prepared sample) on the folding stove. Boil gently for 30 minutes.

Note: Concentrate the sample to less than 15 mL for best recovery. After concentration, maintain the volume near 15 mL by adding small amounts of deionized water. Do not exceed 15 mL.



6. Cool the sample to room temperature.



7. Add 2.0 mL of 5.0 N Sodium Hydroxide Solution. Swirl to mix.

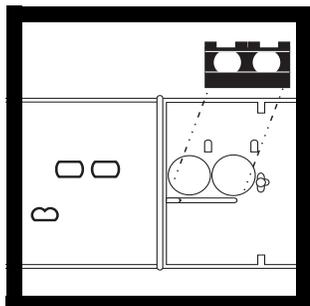
Note: Use the 1-mL calibrated dropper provided.



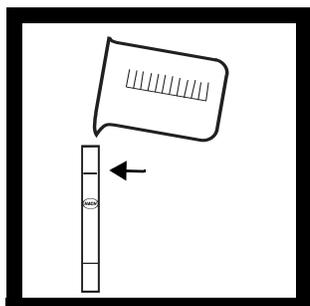
8. Return the sample to the square mixing bottle. Add deionized water rinsings from the flask to return the volume to 20 mL. Swirl to mix. Proceed with a total phosphate ascorbic acid test in the expected concentration range.

TOTAL PHOSPHATE, continued

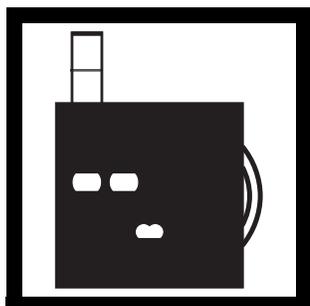
Ascorbic Acid Test, (0–1 mg/L)



1. Insert the Long Path Viewing Adaptor into the color comparator (see *Figure 1* on page 35).



2. Fill a viewing tube rinsed with the untreated sample water to the top line, which underlines “No. 1730,” with sample water. This is the blank.



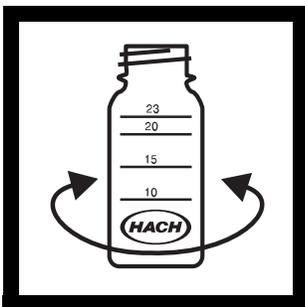
3. Place this unstoppered tube in the top left opening of the color comparator.



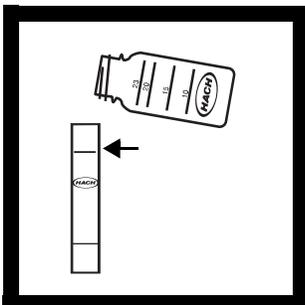
4. Add the contents of one PhosVer[®] 3 Phosphate Reagent Powder Pillow to the bottle containing 20 ml of digested sample water.

Note: This is the square mixing bottle from step 8 of the Acid Persulfate Digestion procedure on page 36.

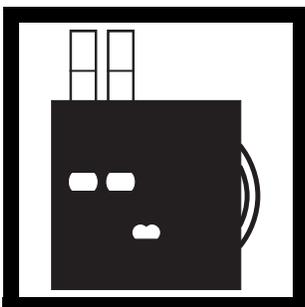
TOTAL PHOSPHATE, continued



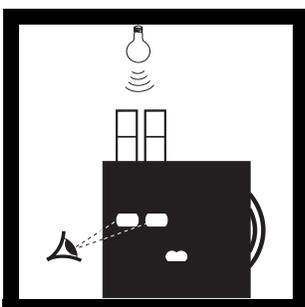
5. Swirl to mix. Wait two minutes for full color development. If phosphate is present, a blue-violet color develops. Complete the test and read the result within 10 minutes of the addition of the powder.



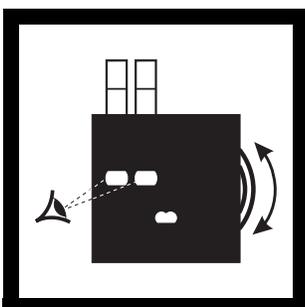
6. Fill another clean, dry viewing tube to the top line, which underlines "No. 1730," with the prepared sample from the square mixing bottle.



7. Place the second unstoppered tube in the top right opening of the color comparator.

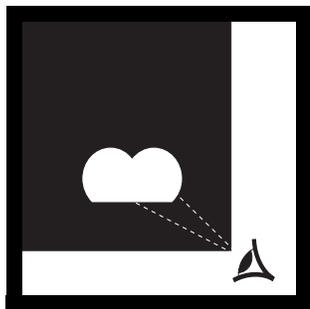


8. Hold the comparator with the tube tops pointing toward a light source such as the sky, a window or a lamp. Look through the openings in the front of the comparator. Be careful not to spill samples from unstoppered tubes.

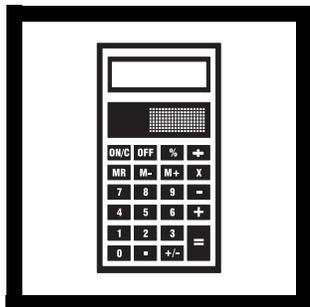


9. Rotate the color disc until the color matches in the two openings.

TOTAL PHOSPHATE, continued



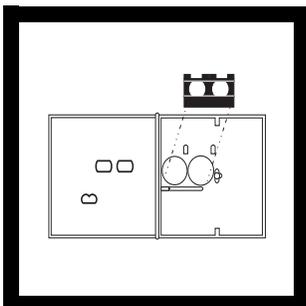
10. Read the apparent mg/L total phosphate in the scale window.



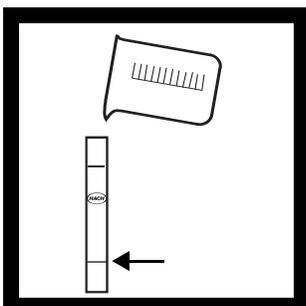
11. Divide the apparent mg/L total phosphate value by 50 to obtain the actual mg/L total phosphate.

TOTAL PHOSPHATE, continued

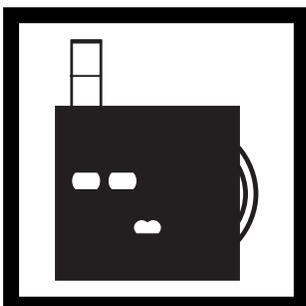
Ascorbic Acid Test, (0–5 mg/L)



1. If the color comparator has the Long Path Viewing Adaptor in place, remove it (see *Figure 1* on page 35).



2. Fill a viewing tube rinsed with the untreated sample water to the first (5-mL) line with the untreated sample water.



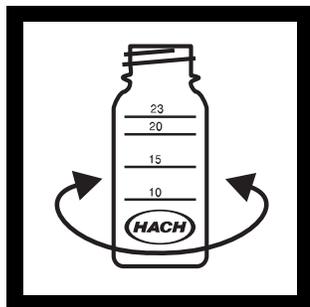
3. Place this tube in the top left opening of the color comparator.



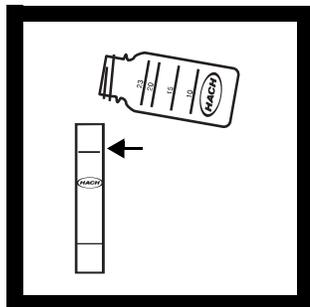
4. Add the contents of one PhosVer[®] 3 Phosphate Reagent Powder Pillow to the bottle containing 20 ml of digested sample water.

Note: This is the square mixing bottle from step 8 of the Acid Persulfate Digestion procedure on page 36.

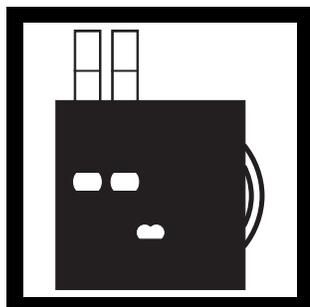
TOTAL PHOSPHATE, continued



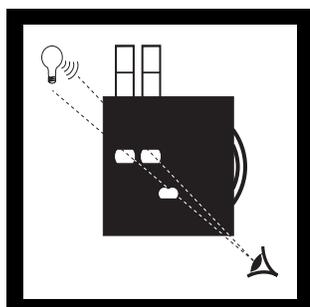
5. Swirl to mix. Wait two minutes for full color development. If phosphate is present, a blue-violet color develops. Complete the test and read the result within 10 minutes of the addition of the powder.



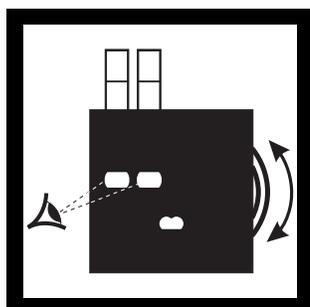
6. Fill a clean, dry viewing tube to the top line, which underlines "No. 1730," with the prepared sample from the square mixing bottle.



7. Place this tube in the top right opening of the color comparator.

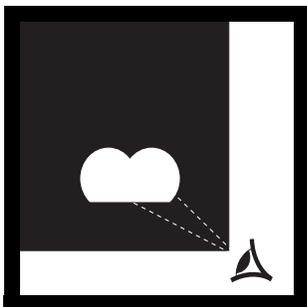


8. Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.



9. Rotate the color disc until the color matches in the two openings.

TOTAL PHOSPHATE, continued



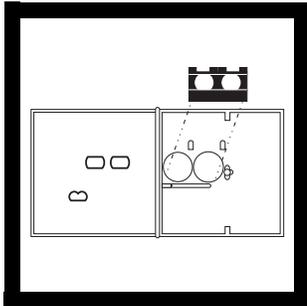
10. Read the value for apparent mg/L total phosphate in the scale window.



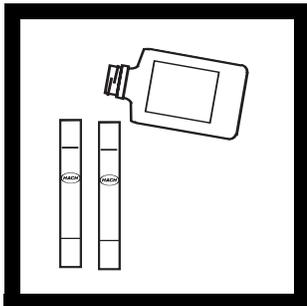
11. Divide the apparent mg/L total phosphate value by 10 to obtain the actual mg/L total phosphate.

TOTAL PHOSPHATE, continued

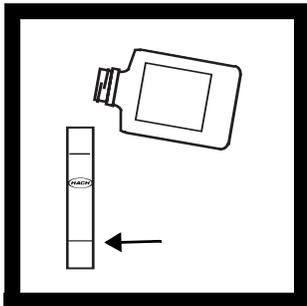
Ascorbic Acid Test (0–50 mg/L)



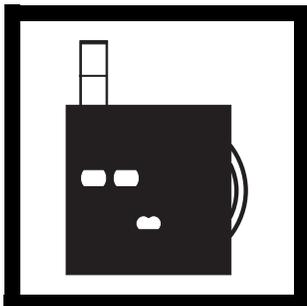
1. If the color comparator has the Long Path Viewing Adaptor in place, remove it (see *Figure 1* on page 35).



2. Rinse two viewing tubes with deionized water.



3. Fill one viewing tube to the first (5-mL) line with deionized water. This is the blank.



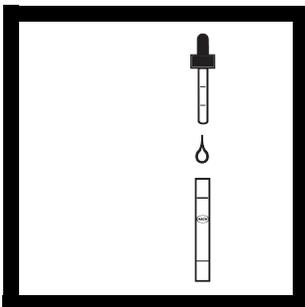
4. Place this tube in the top left opening of the color comparator.

TOTAL PHOSPHATE, continued

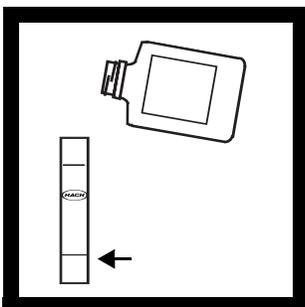


5. Rinse the glass dropper several times with the digested sample water.

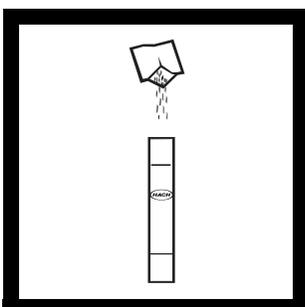
Note: Digested sample water is from “Acid Persulfate Digestion” on page 36. When rinsing, return the sample to the square mixing bottle.



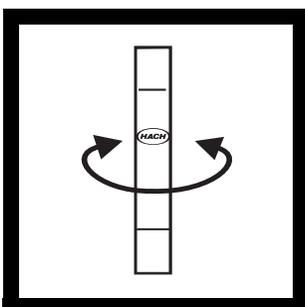
6. Fill the dropper to the first (0.5-mL) mark with the digested sample water. Put the dropper contents in the second viewing tube.



7. Add deionized water to the first (5-mL) line on the second tube.

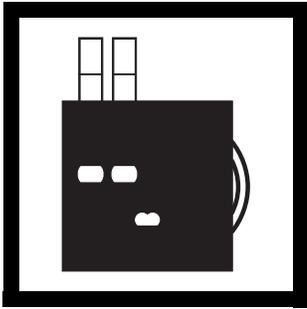


8. Add the contents of one PhosVer[®] 3 Phosphate Reagent Powder Pillow to the second tube.

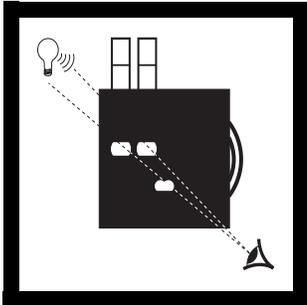


9. Swirl to mix. Wait at least one minute for full color development. If phosphate is present, a blue-violet color develops. Complete the test and read the result within five minutes of the addition of the powder.

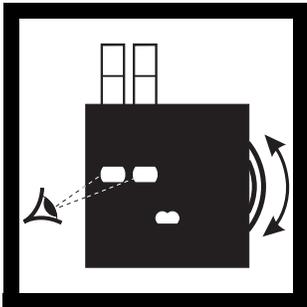
TOTAL PHOSPHATE, continued



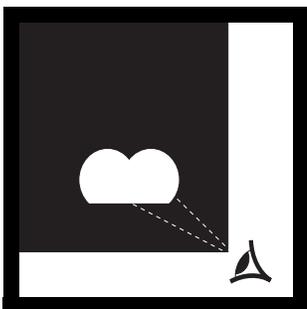
10. Place the second tube in the top right opening of the color comparator.



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



12. Rotate the color disc until the color matches in the two openings.



13. Read the value for mg/L total phosphate in the scale window.

TOTAL PHOSPHATE, continued

Sample Preparation for Testing Turbid Waters

Turbidity is sometimes present in water and must be removed to obtain accurate test results for soluble phosphate. This kit includes a funnel, filter paper and two square mixing bottles for filtering the sample. Since the turbidity may be so fine that it cannot be removed by direct filtration, a bottle of Filtration Aid Solution has been included in this kit.

Note: If the sample is filtered, report the results as total soluble phosphate.

Filtration



1. Fill one square mixing bottle to the shoulder with the sample water.



2. Add one drop of Filtration Aid Solution to the bottle.

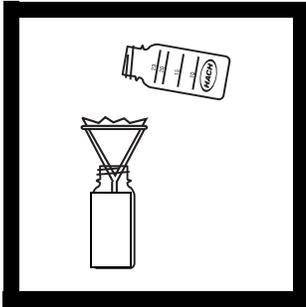


3. Swirl to mix.

TOTAL PHOSPHATE, continued



4. Place the funnel in the other square mixing bottle. Insert a folded filter paper into the funnel.



5. Pour the water sample into the filter paper and allow the sample to filter through. Test this clear water sample for total phosphate.

TOTAL PHOSPHATE, continued

REQUIRED REAGENTS AND APPARATUS

Phosphorus Digestion Reagent Set (approx. 100 tests)	24590-00
<i>Includes: (1) 2449-32, (1) 2450-32, (1) 2451-99</i>	
Total Phosphorus Reagent Set (approx. 100 tests).....	24403-00
<i>Includes: (1) 272-42, (1) 1046-33, (1) 2125-99</i>	

Description	Unit	Cat. No.
Bottle, mixing, marked, square glass, 29 mL	each	2327-00
Bottle, mixing, unmarked, square glass, 29 mL	each	439-00
Clamp, test tube holder	each	634-00
Color Comparator Box.....	each	1732-00
Color Disc, Phosphate, 0-50 mg/L.....	each	24898-00
Color Viewing Tube, glass, w/ 5-mL mark.....	each	1730-00
Cover for Cookit	each	2179-00
Cylinder, holder for dropper	each	2414-00
Dropper, glass, w/0.5- and 1-mL marks.....	each	14197-00
Filtration Aid Solution	29 mL DB*	1046-33
Filter Paper, folded, 12.5 cm.....	100/pkg	1894-57
Flask, Erlenmeyer, 50 mL.....	each	505-01
Funnel, analytical, 65 mm, plastic	each	1083-67
Heatab® Cookit, complete with 1 box of Heatabs**	each	2206-00
Heatab® replacements**	9/pkg	2207-00
Long Path Viewing Adaptor	each	24122-01
PhosVer® 3 Phosphate Reagent Powder Pillows****	100/pkg	2125-49
Potassium Persulfate Powder Pillows	100/pkg	2451-99
Sodium Hydroxide Solution 5.0 N	100 mL MDB****	2450-32
Sulfuric Acid Solution, 5.25 N	100 mL MDB****	2449-32
Water, deionized	100 mL	272-42

OPTIONAL REAGENTS AND APPARATUS

Boiling Chips, carbon	227 g/pkg	14835-31
Caps, for plastic Color Viewing Tubes	4/pkg	46600-14
Color Viewing Tube, plastic, w/cap.....	4/pkg	46600-04
Hydrochloric Acid Solution, 6.0 N (1:1)	500 mL	884-49
Phosphate Standard Solution, 1 mg/L.....	500 mL	2569-49
Phosphate Standard Solution, 10 mg/L.....	946 mL	14367-16
Phosphate Standard Solution, 50 mg/L, 2-mL PourRite™***** Ampule	20/pkg	171-20
Stopper, blue rubber, hollow	6/pkg	1731-06

* Unmarked Dropping Bottle

**Heatab® is a registered trademark of Eichner Engineering.

***PhosVer® is a registered trademark of Hach Company.

****Marked Dropping Bottle

*****PourRite™ is a trademark of Hach Company



ANALYTICAL PROCEDURES

For EASI Water Quality Test Kits

SULFATE

50–200 mg/L SO₄²⁻

Model SF-1

Cat. No. 2251-00

To ensure accurate results, read carefully before proceeding.

CAUTION

Handling chemical samples, standards, and reagents can be dangerous.

Review the Material Safety Data Sheets before handling any chemicals.

Measuring Hints and General Test Information

- The sample cell with cover, graduated cylinder and dipstick should be cleaned thoroughly after each use. If this is not done, a white film will form on the wall of the apparatus.
- 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 sample cells as this may scratch them. Rinse with clean water (preferably deionized water).
- For optimum test results, Hach strongly recommends that reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit or listed in the *Optional Reagents and Equipment* section.

SULFATE, continued

Using PermaChem®* Powder Pillows

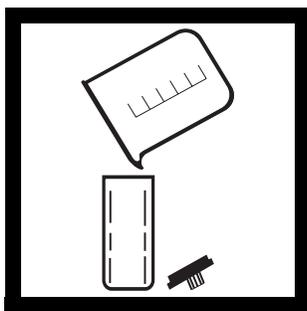
To open PermaChem Powder Pillows:

1. **Tap** the PermaChem pillow on a hard surface to collect the powdered reagent in the bottom.
2. **Tear** across on the dotted pillow line marked “TEAR.” Be sure to hold the pillow away from your face.
3. Using two hands, **push** both sides toward each other until thumbs and forefingers form a diamond. Make sure to **crease** the foil pack, so that it forms a spout.
4. **Pour** the pillow contents into the sample. The polyfilm lining is specially formulated to deliver all the powder necessary for accurate results (no tapping on the vessel edge is necessary).

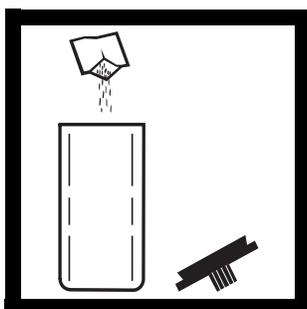
* PermaChem® is a registered trademark of Hach Company.

SULFATE, continued

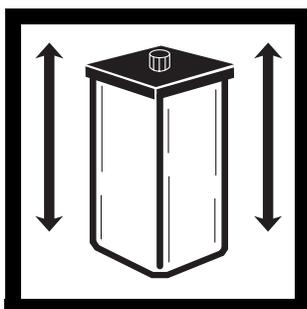
Sulfate (50–200 mg/L)



1. Fill the sample cell to the 25-mL mark with sample water.

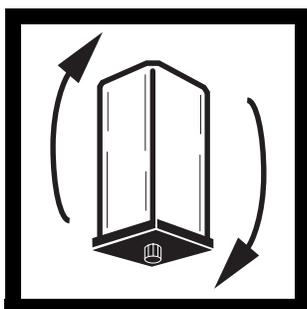


2. Add the contents of one SulfaVer[®] 4 Powder Pillow to the sample cell.



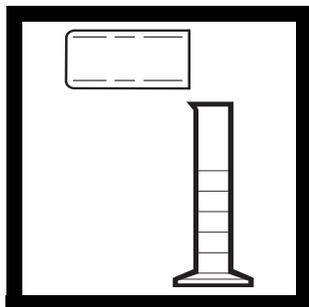
3. Press the cover on tightly and shake the sample cell for 15 seconds. Allow this sample to sit undisturbed for five minutes.

Note: A white turbidity will appear if sulfate is present.



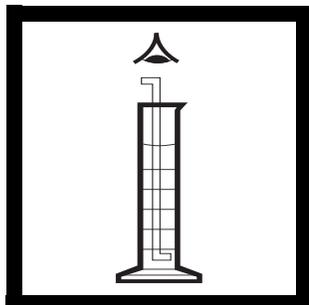
4. Invert the sample cell to mix any solids left on the bottom.

SULFATE, continued



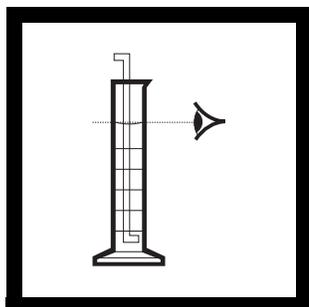
5. Slowly pour the contents of the sample cell into the 25 mL graduated cylinder.

Note: The volume will be more than 25 mL.



6. Hold the cylinder in a vertical position, with the graduations (measuring marks) to one side or the other. While looking straight down into the cylinder, slowly lower the sulfate dipstick into the cylinder until the black dot is no longer visible.

Note: If the black dot on the sulfate dipstick disappears quickly, before the 200 mg/L mark, the concentration of sulfate is greater than 200 mg/L. If the black dot is still visible after the dipstick is lowered into the cylinder past the 50 mg/L mark, the sulfate concentration is less than 50 mg/L.



7. While holding the dipstick in this position, raise the cylinder to eye level. Ignoring the graduations on the cylinder, read the mg/L sulfate indicated on the dipstick at the sample surface.

Note: Final samples contain barium at concentration levels regulated as hazardous waste under the Resource Conservation and Recovery Act (RCRA). Contact your governing local, state, or federal agency for further information on the proper disposal of these materials.

REQUIRED REAGENTS AND APPARATUS

Description	Unit	Cat. No.
Cylinder, graduated, polymethylpentene, 25 mL.....	each	2172-40
Dipstick, Sulfate Measure.....	each	46814-00
Sample cell, 1-inch molded polystyrene.....	each	24102-01
Sample cell cover, molded polypropylene.....	each	24102-02
SulfaVer®* 4 Powder Pillows	100/pkg	12065-49

OPTIONAL REAGENTS

Sulfate Standard Solution, 100 mg/L, (approx. 100 tests).....	500 mL	891-49
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* SulfaVer® is a registered Hach Company trademark.



ANALYTICAL PROCEDURES

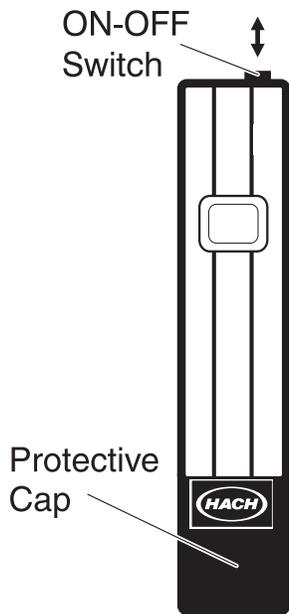
For EASI Water Quality Test Kits

POCKET PAL™ CONDUCTIVITY

TESTER

10 to 1990 $\mu\text{S}/\text{cm}$

Instructions For Use



1. Press the ON/OFF switch once to turn the tester on. Refer to the illustration to the left.
2. Remove protective cap from the bottom.
3. Immerse the bottom of the tester 1.0 to 3.5 in. (2.5 to 8.9 cm) into the sample.
4. Using the tester, gently stir the sample for several seconds.
5. When the digital display stabilizes, read the conductivity value.

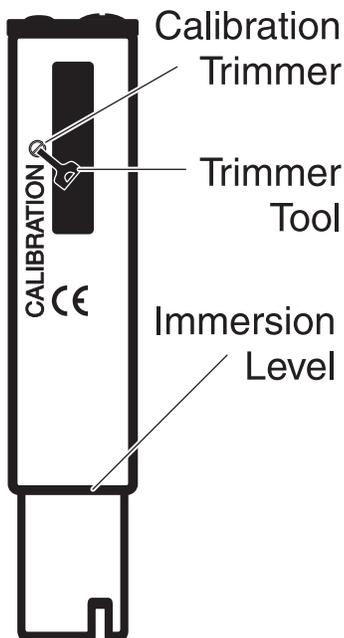
Note: Readings may not stabilize for up to 2 minutes; this is a function of the temperature sensor.

6. Rinse the bottom of the tester with deionized water. Replace the cap.

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

Calibration

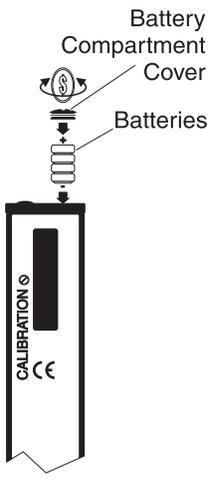
Verify the accuracy of the tester before use and periodically thereafter as follows:



1. Measure the $\mu\text{S}/\text{cm}$ of a known Calibration Standard using the tester.
2. If necessary, adjust the Calibration Trimmer (shown at left) using the supplied trimmer tool (or a small flat-bladed screwdriver) until the reading corresponds to the concentration of the known Calibration Standard.

POCKET PAL™ CONDUCTIVITY TESTER, continued

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. Replace all four batteries with Eveready® E675E, Duracell® RM675, or Hach Cat. No. 23678-00, in the same orientation (polarity) as they were removed.
3. Replace the cover.

Warranty

Hach Company warrants this product against defective materials or workmanship for six months from date of shipment. Warranty does not apply to batteries. See back of invoice for complete warranty information.

Specifications

Accuracy: $\pm 2\%$ of reading at 25 °C calibration and 25 °C sample. $\pm 10\%$ of temperature-compensated $\mu\text{S}/\text{cm}$ readings over 0 to 50 °C range.

Operating Temperature: 0 to 50 °C

Temperature Compensation: 2% per °C

Battery Life: 1000 hours (approximately)

IP 67 Rated: Waterproof (immersible); dustproof

POCKET PAL™ CONDUCTIVITY TESTER, continued

REAGENTS

Description	Unit	Cat. No.
Sodium Chloride Conductivity Standard, 180 $\mu\text{S/cm}$ (85.47 mg/L)	100 mL	23075-42
Sodium Chloride Conductivity Standard, 1000 $\mu\text{S/cm}$ (491 mg/L)	100 mL	14400-42
Sodium Chloride Conductivity Standard, 1990 $\mu\text{S/cm}$ (1000 mg/L)	100 mL	2105-42



ANALYTICAL PROCEDURES

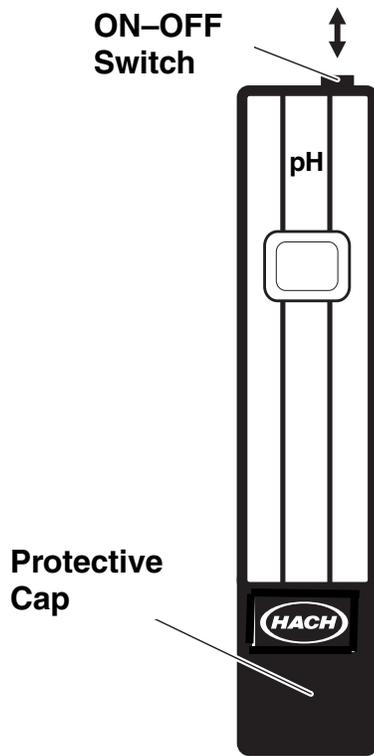
For EASI Water Quality Test Kits

POCKET PAL™ pH TESTER

0.0 to 14.0 pH

Cat. No. 44350-01

Instructions For Using the Pocket Pal pH Tester



1. Press the ON/OFF switch once to turn the tester on. Refer to the illustration to the left.
2. Remove protective cap from the bottom.
3. Immerse the bottom of the tester 1.0 to 3.5 in. (2.5 to 8.9 cm) into the sample.
4. Using the tester, gently stir the sample for several seconds. When the digital display stabilizes, read the pH value.
5. Rinse the bottom of the tester with deionized water; replace the cap.
6. 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.

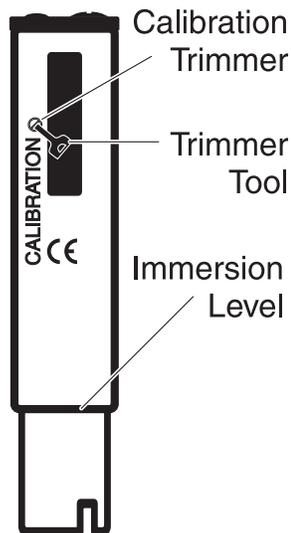
Note: Soak the electrode tip in tap water for a few minutes each week to condition the electrode.

Note: If pH readings become erratic, replace the batteries as instructed below.

Note: Potassium chloride, used as reference solution electrolyte, may deposit on the tester as a white precipitate. Although the precipitate is normal and does not affect performance, it may be removed with a damp cloth or tissue.

POCKET PAL™ pH TESTER, continued

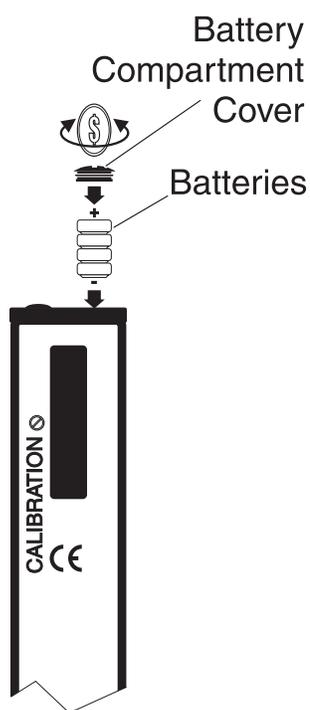
Calibration



Verify the accuracy of the tester before use and periodically thereafter as follows:

1. Prepare a pH 7.00 and a pH 4.00 or 10.01 buffer (Cat. Nos. 22835-49, 22834-49, and 22836-49, respectively).
2. Measure the pH using the tester.
3. If necessary, adjust the Calibration Trimmer (shown at left) using the supplied trimmer tool (or a small flat-bladed screwdriver) until the reading corresponds to the pH of the buffer (7.0 or 4.0/10.00 pH).

Battery Replacement



1. Use a coin to turn the battery compartment cover, located on the top of the tester, to the left $\frac{1}{4}$ turn.
2. Remove the cover. Replace all four batteries with Eveready E675E, Duracell RM675, or Hach Cat. No. 23678-00, in the same orientation (polarity) as they were removed.
3. Replace the cover.

POCKET PAL™ pH TESTER, continued

Warranty

Hach Company warrants this product against defective materials or workmanship for six months from date of shipment. Warranty does not apply to batteries. See back of invoice for complete warranty information.

Specifications

Accuracy: ±0.1 pH at 20 °C

Operating Temperature: 0 to 50 °C

Battery Life: 1000 hours continuous use (approximately)

IP 67 Rated: Waterproof (immersible); dustproof

OPTIONAL REAGENTS

Description	Unit	Cat. No.
Buffer, Powder Pillows, pH 7.00 (Yellow)	15	22270-95
Buffer, Powder Pillows, pH 7.00 (Yellow)	50	22270-66
Buffer, Powder Pillows, pH 7.00 (Yellow)	250	22270-64