

# TOTAL PHOSPHATE TEST KIT

Model PO-24

Cat. No. 2250-01



## ORTHOPHOSPHATE

### Low Range, 0-1 mg/L Phosphate

1. Fill the square mixing bottle to the 20-mL mark with the water to be tested.
2. 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. Allow at least two but not more than 10 minutes for color development. If phosphate is present, a blue violet color will develop.
3. Insert the lengthwise viewing adapter into the comparator as illustrated in Figure 2.
4. Fill one sample tube to the line underlining "Cat. 1730-00" with the prepared sample. If not

***WARNING: The chemical in this kit may be hazardous to the health and safety of the user if inappropriately handled. Please read all warnings before performing the tests and use appropriate safety equipment.***

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using 1730-00 tubes, this will be the line found approximately 1 inch below the top of the tube.

5. Place the tube containing the prepared water sample into the comparator opening labelled "Prepared Sample Position" in Figure 2..
6. Fill the other sample tube with untreated water or a reagent blank to the line as described in Step 4. Insert this tube into the comparator opening labelled "Clear Sample Position" in Figure 2.
7. Orient the comparator with the tube tops pointing to a window or light source as in Figure 2a. View through the openings in the front of the comparator. When viewing, use care to not spill samples from unstoppered tubes.
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 50 to obtain the mg/L phosphate ( $\text{PO}_4$ ). To obtain the value as mg/L phosphorus (P), divide by three.

### **Medium Range, 0-5 mg/L Phosphate**

1. Perform Steps 1 and 2 of the Low Range Procedure.
2. Fill one of the color viewing tubes to the lowest mark with the prepared sample (approx. 5 mL). Insert it into the right top opening of the color comparator (Prepared Sample Position in Figure 4).
3. Fill the other tube to the lowest mark with the untreated sample (approx. 5 mL). Insert this

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tube into the left top opening of the color comparator (Untreated Sample Position in Figure 4).

4. Hold the comparator up to a light such as the sky, a window, or lamp and view through the openings in front. Rotate the disc to obtain a color match. Divide the reading from the scale window by 10 in order to obtain the mg/L phosphate.
5. To obtain the value as mg/L phosphorus (P), divide by 3 the value obtained in Step 4.

### **High Range 0-50 mg/L Phosphate**

1. Rinse the square mixing bottle with demineralized water.
2. Add 2.0 mL of the water to be tested by twice filling the dropper to the 1 mL mark with the sample and discharging the contents into the mixing bottle.
3. Add demineralized water to the mixing bottle to the 20-mL mark. Swirl to mix as shown in Figure 1.
4. Open one PhosVer® 3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle and swirl to mix. Allow at least two minutes but no more than 10 minutes for color development. If phosphate is present a blue-violet color will develop.
5. Follow Steps 2 and 3 of the Medium Range Procedure.
6. Hold the comparator up to a light source such as the sky, a window or lamp and view through the openings in front. Rotate the disc to obtain a color match. Read the mg/L phosphate ( $\text{PO}_4$ ) from the scale window.
7. To obtain the value as mg/L phosphorus (P), divide by 3 the value obtained in Step 6.

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## META (POLY) PHOSPHATE

In the test for orthophosphate, meta (or poly) phosphate will not register. To determine the amount of meta (or poly) phosphate, one test is made for total inorganic phosphate (ortho plus meta) and another for orthophosphate alone. The orthophosphate value is subtracted from the total inorganic phosphate value, and the difference is the mg/L meta (or poly) phosphate.

The meta (or poly) phosphate is hydrolyzed to orthophosphate by heating with acid and then is determined as orthophosphate ( $\text{PO}_4$ ).

1. Fill the mixing bottle to the 20-mL mark with the water to be tested. Pour the sample into a clean 50-mL erlenmeyer flask.
2. Add 2.0 mL of 5.25N Sulfuric Acid Solution by twice filling the dropper exactly to the 1.0 mL mark and discharging into the flask. Swirl to mix.
3. Set up the boiling apparatus as shown in Figure 3. The use of a boiling aid is recommended to prevent violent boiling of the sample. *See replacements.*
4. Boil the sample for 10 minutes, adding a little demineralized water occasionally to keep the volume near 20 mL. Do not bring the volume above the 20-mL mark near the end of the 10 minute period. Do not boil to dryness.
5. Allow to cool.
6. Add 2.0 mL of 5.0N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging into the flask. Swirl to mix.
7. Return the sample to the square mixing bottle with the 20-mL mark. If the volume is less than 20 mL, add demineralized water to return the volume to 20 mL.

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8. Proceed with the orthophosphate test of the appropriate range, except read the mg/L phosphate as total inorganic phosphate ( $\text{PO}_4$ ).
9. If only the mg/L meta (poly) phosphate is required, subtract the value obtained in the orthophosphate test from the value obtained for total inorganic phosphate.

## PHOSPHATE, ORGANIC

The total phosphate (inorganic and organic) in a sample is determined by an acid oxidation to orthophosphate. It has been determined that mere acid treatment of organic phosphates does not give a quantitative determination, so the acid-persulfate method is used. The organic phosphate is determined by the difference and the total inorganic determination.

## TOTAL PHOSPHATE

1. Fill the square mixing bottle to the 20 mL mark with the water to be tested. Pour the sample into a clean 50 mL erlenmeyer flask.
2. Open one Potassium Persulfate Powder Pillow. Add the contents of the pillow to the flask. Swirl to mix.
3. Add 2.0 mL of 5.25N Sulfuric Acid Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask. Swirl to mix.
4. Set up the boiling apparatus as shown in Figure 3. The use of a boiling aid is recommended to prevent boiling of the sample. *See replacements.*
5. Boil the sample for 30 minutes. Add a little demineralized water occasionally to keep the

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volume near 20 mL. Do not bring the volume above the 20 mL mark near the conclusion of the 30 minute period. Do not boil to dryness.

6. Allow the sample to cool.
7. Add 2.0 mL of 5.0N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask.
8. Return the sample to the square mixing bottle. If the volume is less than 20 mL, add demineralized water to return the volume to 20 mL.
9. Proceed with the orthophosphate test of the appropriate range, except read the mg/L phosphate as total phosphate ( $\text{PO}_4$ ).
10. At this point three values are known: ortho, total inorganic, and total phosphate. Other values may be obtained as follows: total phosphate less total inorganic phosphate equals organic phosphate; total inorganic phosphate less orthophosphate equals meta (poly) phosphate.

## TESTING BOILER OR OTHER TURBID WATERS

A considerable amount of turbidity often is present in the sample when testing boiler water. This 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. Often the turbidity in the sample is so fine that it cannot be removed by direct filtration. If this is the case, a bottle of Filtration Aid Solution is included in this kit.

One exception to the above comments is the organic phosphate determination because much organic phosphate may be insoluble.

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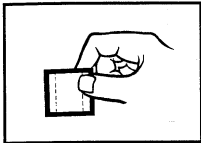
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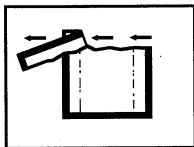
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## FILTRATION PROCEDURE

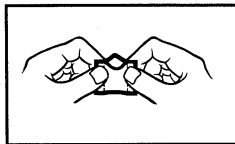
1. Fill a square mixing bottle with the water to be tested.
2. Add one Drop of Filtration Aid Solution to the bottle and swirl to mix.
3. Set up the funnel on the other square mixing bottle. Insert a piece of folded filter paper into the funnel.
4. Pour the water sample into the filter paper. As the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



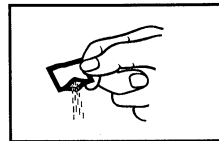
**1. Tap**



**2. Tear**



**3. Push**



**4. Pour**

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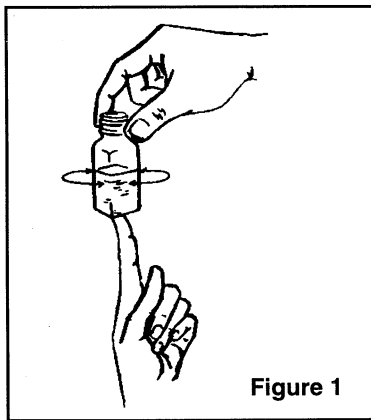


Figure 1

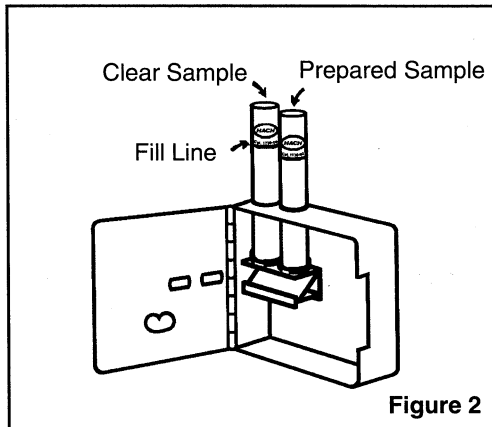


Figure 2

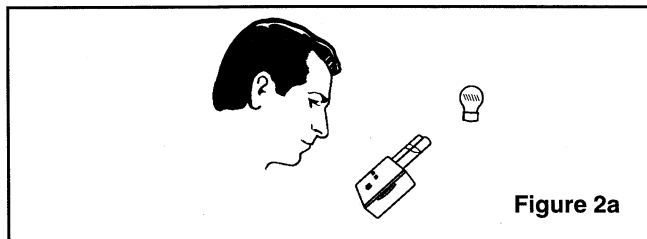


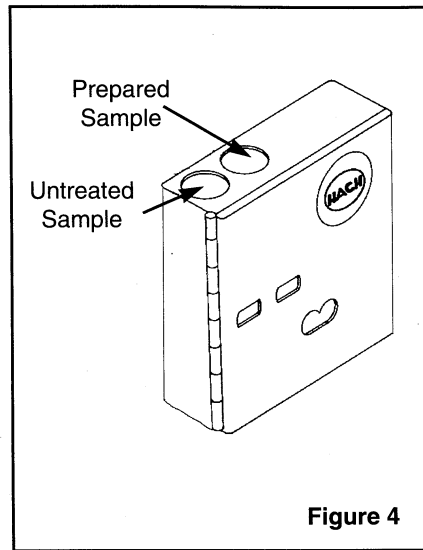
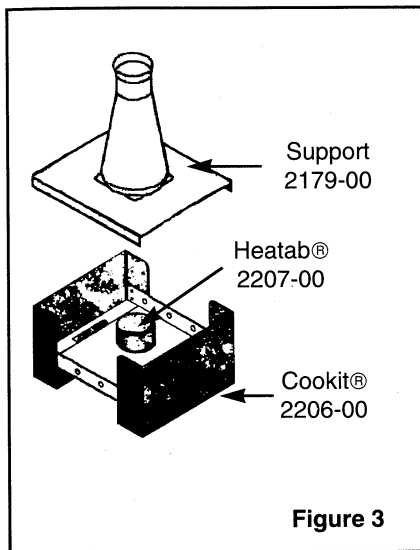
Figure 2a

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## REPLACEMENTS

<b>Cat. No.</b>	<b>Description</b>	<b>Unit</b>
272-28	Demineralized Water .....	118 mL (4oz)
2125-99	PhosVer® 3 Phosphate Reagent Powder Pillows..... for 25 mL sample	pk/100
2451-66	Potassium Persulfate Powder Pillows .....	pk/50
2450-37	Sodium Hydroxide Solution 5.0N .....	118 mL (4oz) MDB*
2449-37	Sulfuric Acid Solution, 5.25N .....	118 mL (4oz) MDB*
2327-06	Bottle, mixing .....	pk/6
439-06	Bottle, mixing, unmarked .....	pk/6
968-00	Clippers.....	each
1732-00	Color Comparator .....	each
1730-00	Color Viewing Tube .....	each
14197-00	Dropper, Plastic, 0.5 and 1 mL marks .....	each
1046-33	Filter Aid Solution.....	29 mL (1oz) DB**
1894-57	Filter Paper .....	box of 100
505-41	Flask, erlenmeyer, 50 mL .....	each
1083-67	Funnel, 65 mm, plastic.....	each
2206-00	Heatab® Cookit, complete with 1 box of Heatabs .....	each
2207-00	Heatab replacements.....	pk/9
2414-00	Holder for dropper.....	each
634-00	Holder for test tube .....	each

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<b>Cat. No.</b>	<b>Description</b>	<b>Unit</b>
24122-00	Lengthwise Viewing Adapter .....	each
21084-00	Phosphate Color Disc, 0-50 mg/L .....	each
14480-00	Stopper, hollow, No. 0 .....	pk/6
2179-00	Support for Cookit .....	each
2569-11	Phosphate Standard Solution, 1 mg/L as PO <sub>4</sub> .....	473 mL (pt)
	(not included in kit)	
14835-31	Boiling Chips .....	pk/227 g

\*Marked Dropping Bottle

\*\*Dropping Bottle

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