

Methods

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

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

The Vanadomolybdophosphoric Acid Method

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

In test kits employing the vanadomolybdophosphoric acid method, phosphate reacts with ammonium molybdate under acid conditions and in the presence of vanadium to form a yellow-colored product. Results are expressed as ppm (mg/L) PO₄.

The Stannous Chloride Method

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

Test kits employing this chemistry utilize a stannous chloride reduction. Phosphate reacts with ammonium molybdate and is then reduced by stannous chloride to form a blue complex. Results are expressed as ppm (mg/L) PO₄.



Visual Kits

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

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-8510
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 ¹
Low Range Comparator 0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm	C-8501
High Range Comparator 1, 2, 3, 4, 5, 6, 7, 8, 10 ppm	C-8510

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

Range: 2-30 ppm
MDL: 2 ppm / Method: Vanadomolybdophosphoric Acid

CHEMets Kit	Cat#
CHEMets Refill, 30 ampoules	R-8515
Comparator 2, 4, 6, 8, 10, 15, 20, 30 ppm	C-8530

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

Range: 10-150 ppm
MDL: 10 ppm / Method: Vanadomolybdophosphoric Acid

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

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

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

Range: 0-30 & 30-300 ppm MDL: 5 ppm / Method: Stannous Chloride	
VACUettes Kit	Cat# K-8510D
VACUettes Refill, 30 ampoules	R-8510D
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 ¹
Low Range Comparator 0, 5, 7.5, 10, 15, 20, 25, 30 ppm	C-8501D
High Range Comparator 30, 60, 90, 120, 150, 175, 200, 250, 300 ppm	C-8510D
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube and instructions.	

Range: 0-60 & 60-600 ppm MDL: 10 ppm / Method: Stannous Chloride	
VACUettes Kit	Cat# K-8510A
VACUettes Refill, 30 ampoules	R-8510A
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 ¹
Low Range Comparator 0, 10, 15, 20, 30, 40, 50, 60 ppm	C-8501A
High Range Comparator 60, 120, 180, 240, 300, 350, 400, 500, 600 ppm	C-8510A
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube and instructions.	

Range: 0-120 & 120-1200 ppm MDL: 20 ppm / Method: Stannous Chloride	
VACUettes Kit	Cat# K-8510B
VACUettes Refill, 30 ampoules	R-8510B
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 ¹
Low Range Comparator 0, 20, 30, 40, 60, 80, 100, 120 ppm	C-8501B
High Range Comparator 120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm	C-8510B
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube and instructions.	

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

Range: 0-1200 & 1200-12,000 ppm MDL: 200 ppm / Method: Stannous Chloride	
VACUettes Kit	Cat# K-8510C
VACUettes Refill, 30 ampoules	R-8510C
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 ¹
Low Range Comparator 0, 200, 300, 400, 600, 800, 1000, 1200 ppm	C-8501C
High Range Comparator 1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm	C-8510C
Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube and instructions.	



Instrumental Kits

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

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

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

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

Range: 0-80.0 ppm
Method: Vanadomolybdophosphoric Acid

	Cat#
Vacu-vials Kit	K-8503

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

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

Kit Components common to Phosphate

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

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

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

Method

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

The Persulfate Digestion-Ascorbic Acid Method

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

The Total Phosphate Vials measure those forms of phosphate that are converted to orthophosphate during an acid oxidation digestion. This includes many organically bound and condensed phosphates. Once converted to orthophosphate, the reaction with molybdate in acidic solution produces phosphomolybdic acid, which is reduced by ascorbic acid to a blue complex. Results are expressed as ppm (mg/L) P or PO₄.

Instrumental Kit

Multi-Analyte Photometers

V-2000 / V-3000 Series

(See page 14 for instrumental features)

Range: 0-2.30 ppm as P / 0-7.00 ppm as PO₄
Method: Ascorbic Acid

Total Phosphate Vials Kit, Shelf-life: 18 months	Cat# K-8540
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Kit comes in a cardboard box and contains everything needed to perform 50 tests: 50 ampoules sets, Oxidizer Powder, Neutralizer Solution, Stabilizer Solution, Reducer Powder with scoop, Oxidizer Powder Dispenser Cap, 3 mL syringe with tip, tip breaking tool, funnel and instructions.

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

Kit Components common to Total Phosphate

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

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

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

