

## 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, 21<sup>st</sup> ed., Method 4500-P C (2005).

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) PO<sub>4</sub>.

### The Stannous Chloride Method

References: APHA Standard Methods, 21<sup>st</sup> ed., Method 4500-P D (2005).

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) PO<sub>4</sub>.

## 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 <sup>1</sup>
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, instructions, and MSDS.

**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, instructions, and MSDS.

**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, instructions, and MSDS.

*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	
<b>VACUettes Kit</b>	<b>Cat# K-8510D</b>
VACUettes Refill, 30 ampoules	R-8510D
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
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, instructions, and MSDS.	

Range: 0-60 & 60-600 ppm MDL: 10 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510A</b>
VACUettes Refill, 30 ampoules	R-8510A
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
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, instructions, and MSDS.	

Range: 0-120 & 120-1200 ppm MDL: 20 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510B</b>
VACUettes Refill, 30 ampoules	R-8510B
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
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, instructions, and MSDS.	

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

Range: 0-1200 & 1200-12,000 ppm MDL: 200 ppm / Method: Stannous Chloride	
<b>VACUettes Kit</b>	<b>Cat# K-8510C</b>
VACUettes Refill, 30 ampoules	R-8510C
Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months	A-8500 <sup>1</sup>
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, instructions, and MSDS.	



### Instrumental Kits

#### V-2000 Multi-Analyte Photometer (See page 12 for instrumental features)

Range: V-2000: 0.30-8.00 ppm / Spec: 0.20-5.00 ppm  
Method: Stannous Chloride

Range: V-2000: 0.30-8.00 ppm / Spec: 0.20-5.00 ppm Method: Stannous Chloride	
<b>Vacu-vials Kit</b> , Shelf-life 20 months	<b>Cat# K-8513</b>
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, instructions, calibration table, and MSDS.	

Range: 5.0-80.0 ppm  
Method: Vanadomolybdophosphoric Acid

Range: 5.0-80.0 ppm Method: Vanadomolybdophosphoric Acid	
<b>Vacu-vials Kit</b>	<b>Cat# K-8503</b>
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.	

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### 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 are posted on our website.

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