Method Abstract

Scope

This method is used for the determination of total phosphorus in drinking water, surface water, and domestic and industrial wastes according to USEPA Method 365.4 and Standard Methods 4500–P B/F. This method can also be used to determine total phosphorus potassium chloride (KCl) extracts of soils and plants.

Summary

Prior to analysis, samples are digested via Kjeldahl digestion to hydrolyze phosphorus to orthophosphate. Orthophosphate reacts with molybdenum(VI) and antimony(III) in an acidic solution to form an antimony-phosphomolybdate complex. Ascorbic acid reduces this complex to form a blue color, and the absorbance is measured at 660 nm.

Interferences

Filter turbid samples prior to analysis. Samples containing iron, copper, or silicate at concentrations greater than 50, 10, and 10 mg/L, respectively, interfere with this assay. Samples with background absorbance at the analytical wavelength may interfere. Residual phosphate in the flow system components and from continuous phosphate analysis may interfere. Wash the system and glassware with 0.1 N HCl to correct phosphate interferences.

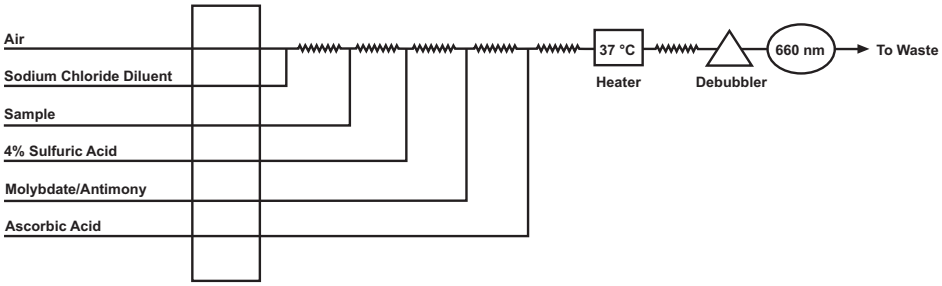
Performance Specifications

Range:	0.01–20 mg/L
Throughput:	65 samples/hour
Precision (at 0.1 mg/L):	<2% RSD
Precision (at 1.0 mg/L):	<1% RSD
Precision (at 10.0 mg/L):	<1% RSD
Method Detection Limit (MDL):	0.003 mg/L
Accuracy:	107.06%

Chemicals

- Ammonium Molybdate Tetrahydrate, $(NH_4)_6Mo_7O_{24}\bullet 4H_2O$
- Antimony Potassium Tartrate Hemihydrate $K(SbO)C_4H_4O_6\bullet ½H_2O$
- Ascorbic Acid, $C_6H_8O_6$
- Deionized (DI) Water, ASTM Type I or II
- DOWFAX® 2A1, part number A000080
- Hydrochloric Acid, HCl
- Potassium Phosphate Monobasic, KH_2PO_4
- Potassium Sulfate, K_2SO_4
- Red Mercuric Oxide, HgO
- Sodium Chloride, NaCl
- Sodium Hydroxide, NaOH
- Sulfuric Acid, concentrated, H_2SO_4

Basic Flow Diagram



Selected Reference

Methods for the Chemical Analysis of Water and Wastes; EPA/600/4-79/020; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring Systems Laboratory: Cincinnati, OH, 1974; Method 365.4.

Standard Methods for the Examination of Water and Wastewater, 21st ed.; American Public Health Association: Washington, D.C., 2005

Figures

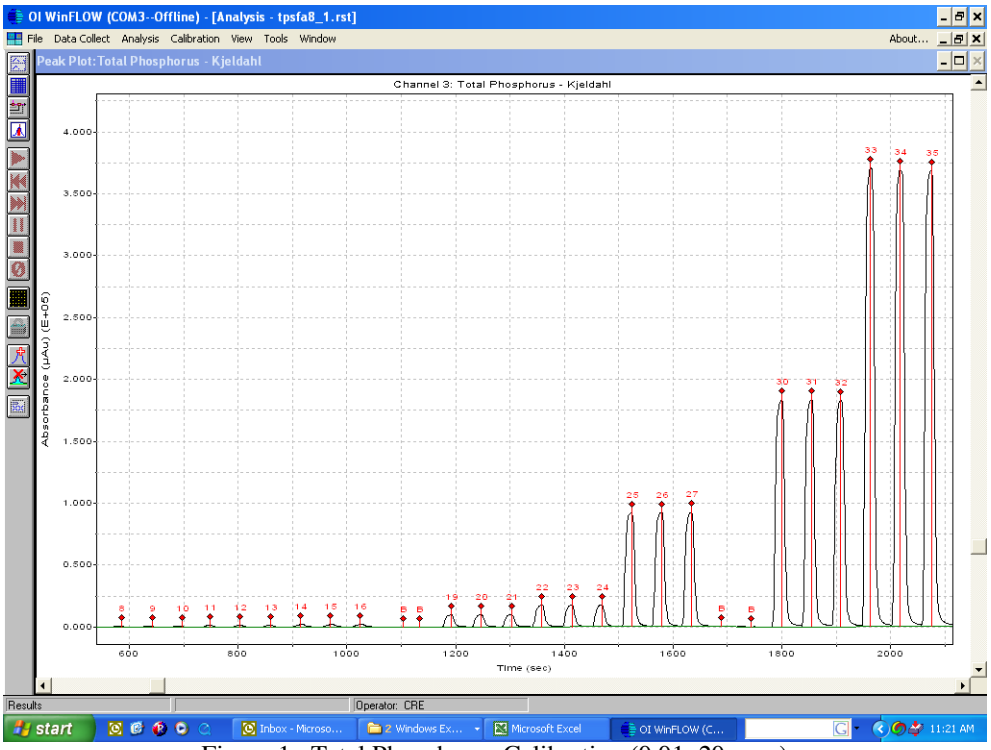


Figure 1. Total Phosphorus Calibration (0.01–20 ppm)

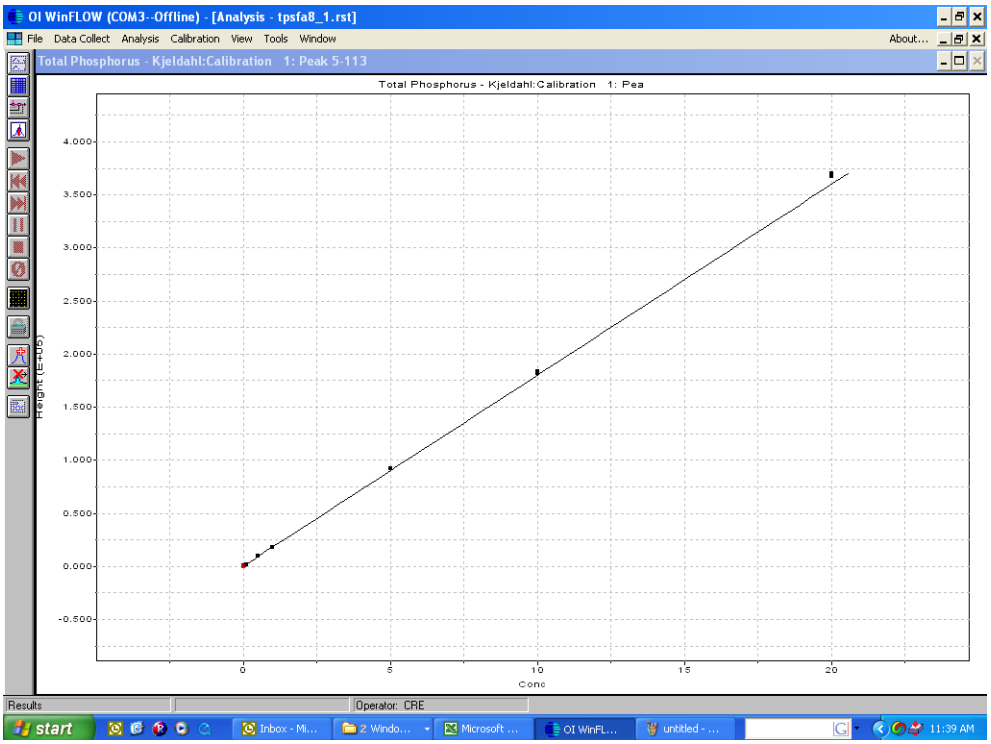


Figure 2. Total Phosphorus Calibration Curve (0.01–20 ppm)

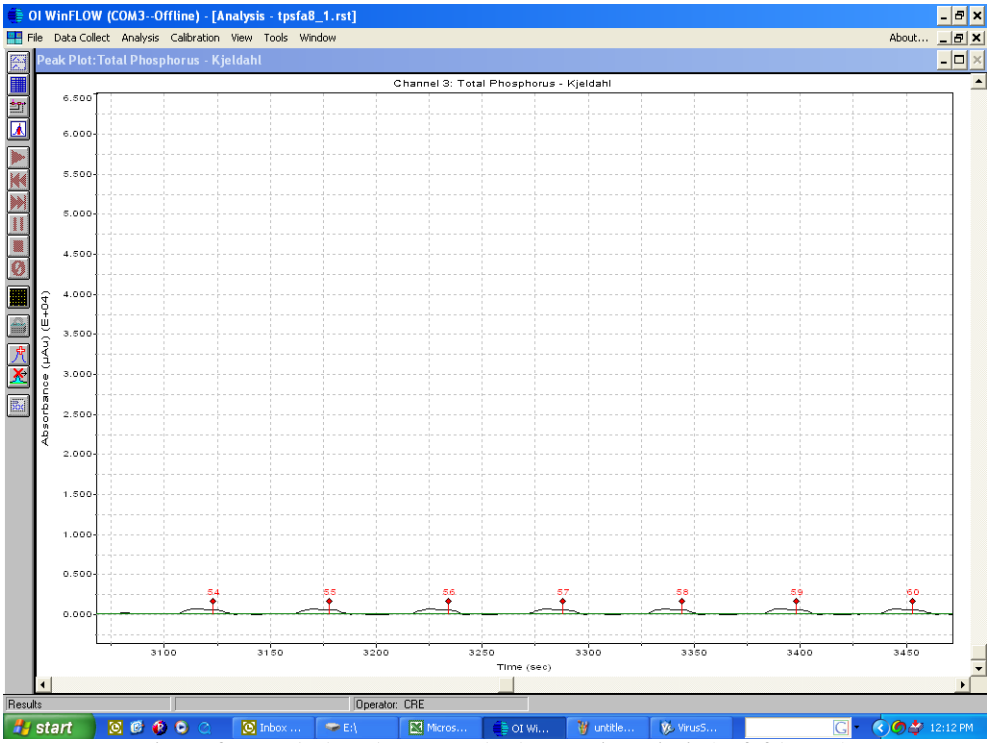


Figure 3. Total Phosphorus Method Detection Limit (at 0.01 ppm)

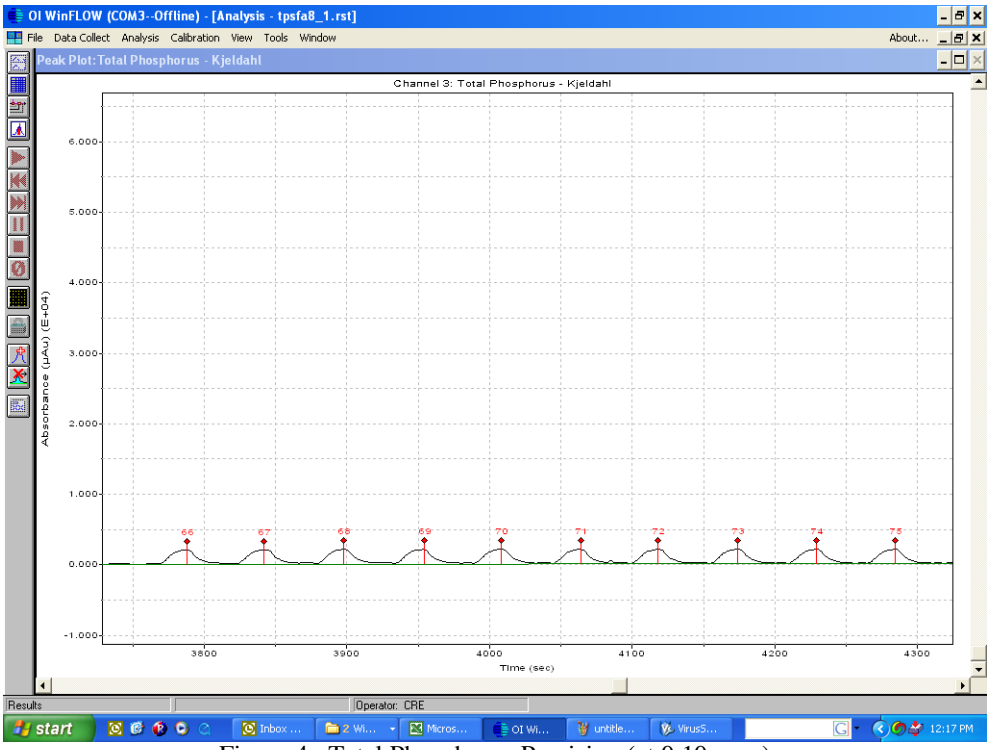


Figure 4. Total Phosphorus Precision (at 0.10 ppm)

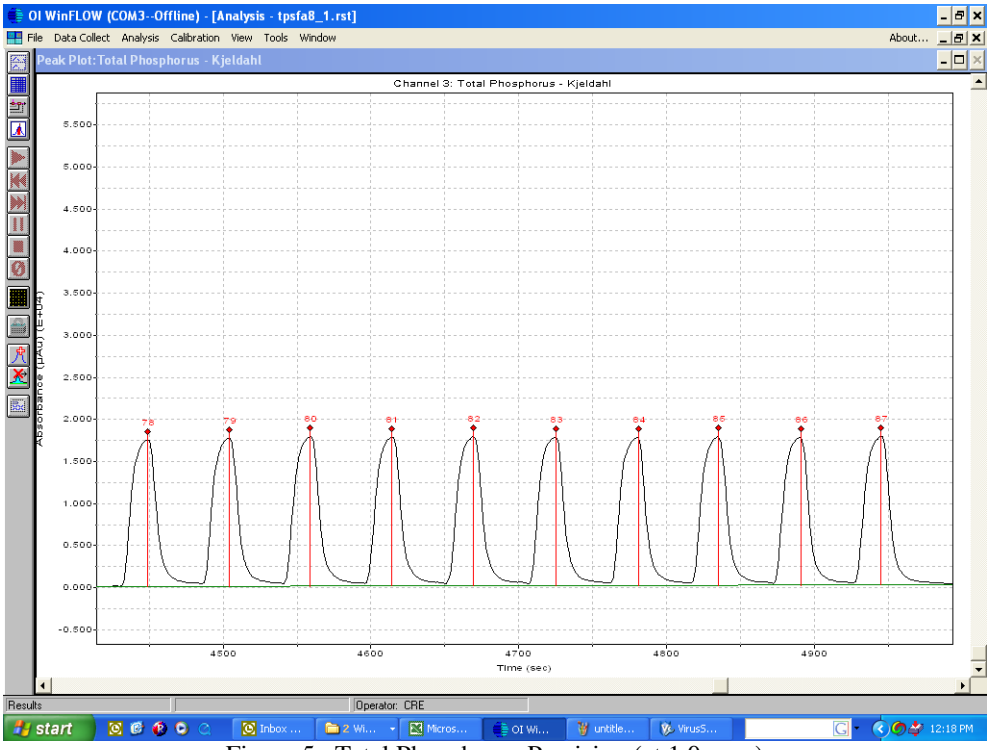


Figure 5. Total Phosphorus Precision (at 1.0 ppm)

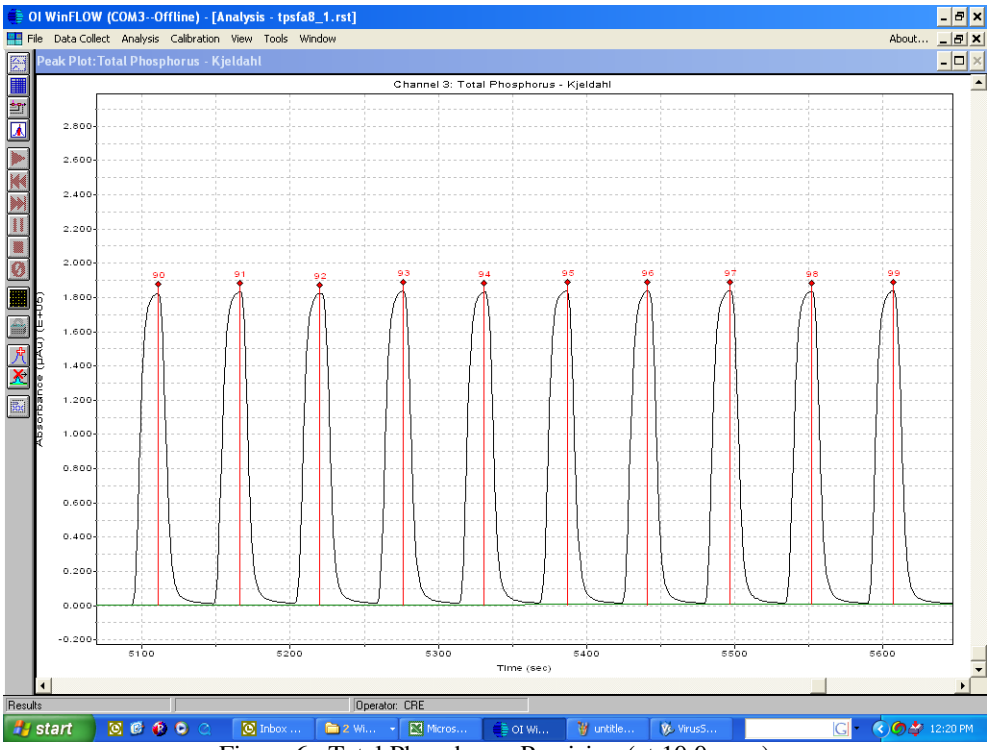


Figure 6. Total Phosphorus Precision (at 10.0 ppm)

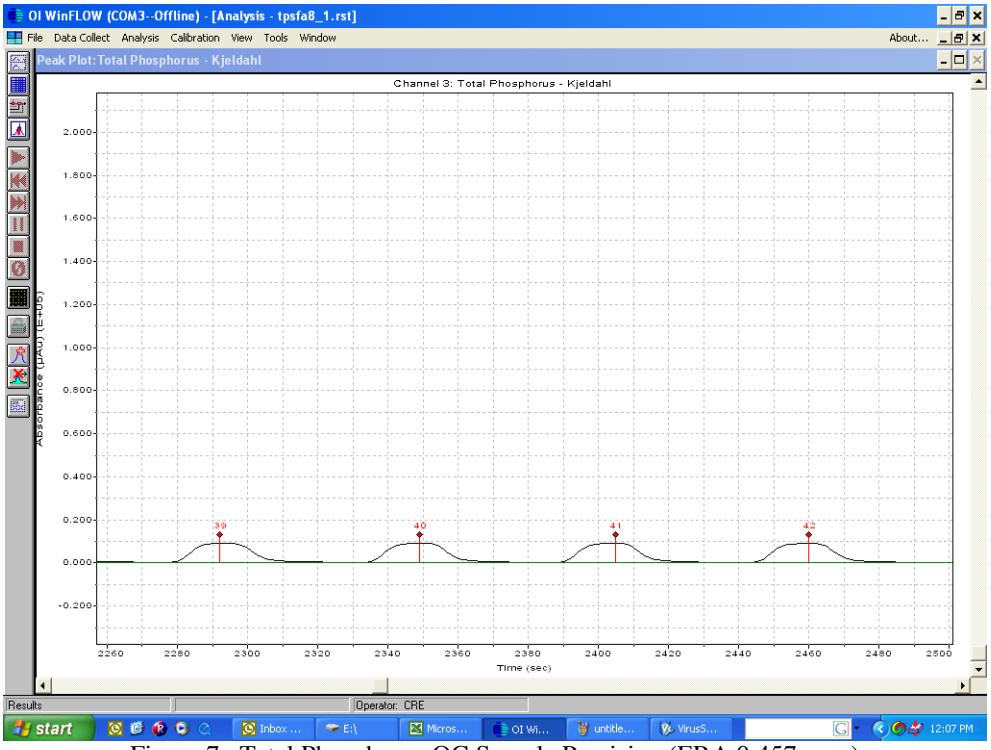


Figure 7. Total Phosphorus QC Sample Precision (ERA 0.457 ppm)

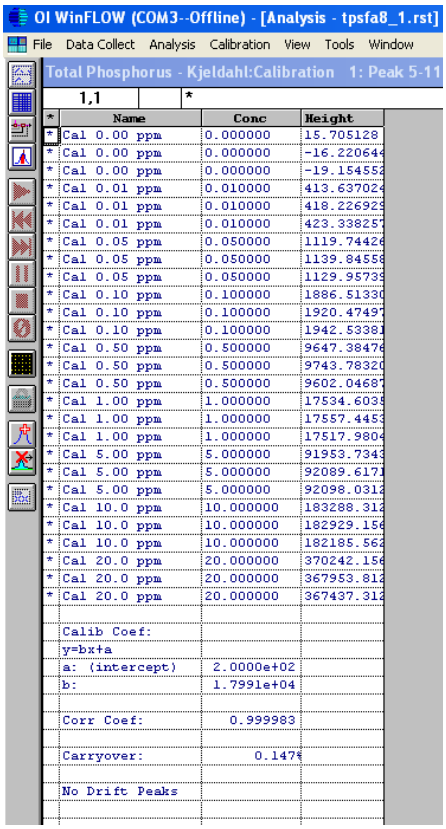


Figure 8. Total Phosphorus Calibration Results (0.01–20 ppm)

Table 1. Total Phosphorus Method Data

Parameter	Calibrant 0.01 mg/L	Calibrant 0.1 mg/L	Calibrant 1.0 mg/L	Calibrant 10.0 mg/L	ERA QC Standard 0.457 mg/L
Rep 1	0.0171	0.1010	0.9580	10.13	0.4824
Rep 2	0.0151	0.1021	0.9678	10.15	0.4733
Rep 3	0.0168	0.1035	0.9737	10.10	0.4760
Rep 4	0.0159	0.1023	0.9702	10.17	0.4809
Rep 5	0.0158	0.1031	0.9713	10.14	—
Rep 6	0.0153	0.1022	0.9685	10.18	—
Rep 7	0.0165	0.1015	0.9664	10.16	—
Rep 8	—	0.1019	0.9686	10.17	—
Rep 9	—	0.1014	0.9634	10.13	—
Rep 10	—	0.1001	0.9694	10.17	—
Average	0.0162	0.1019	0.9677	10.15	0.4781
Standard Deviation	0.0008	0.0010	0.0044	0.0251	0.0298
% RSD	4.90	0.98	0.45	0.25	6.22

Parameter	Calibrant 0.01 mg/L	Calibrant 0.1 mg/L	Calibrant 1.0 mg/L	Calibrant 10.0 mg/L	ERA QC Standard 0.457 mg/L
MDL	0.00249	—	—	—	—
% Accuracy	—	—	—	—	107.6%

(800) 653-1711
(979) 690-1711
www.oico.com
oimail@oico.com