Phosphonate Test Kit

PN-10 (2113300, 2113301 and 2113302) DOC326.98.00038

Test preparation

WARNING: ⚠ Ultraviolet (UV) light exposure hazard. Exposure to UV light can cause eye and skin damage. Protect eyes and skin from direct exposure to UV light.

WARNING: ⚠ Electrical shock hazard. Always unplug the unit when disconnecting or connecting the lamp.

CAUTION: ⚠ Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes and bottles with sample before the test. Rinse the tubes and bottles with deionized water after the test.
- Do not use a detergent that contains phosphate to clean the glassware. The phosphate in the detergent will contaminate the sample.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- Undissolved reagent does not have an effect on test accuracy.
- If the sample temperature is less than 15 °C (59 °F), wait 4 minutes, then start the test procedure.
- The UV digestion in this procedure is usually complete in less than 10 minutes. Samples that contain high levels of organic compounds or a weak lamp can prevent the complete digestion. To make sure that the digestion is complete, use a longer digestion time, then make sure that the test result does not increase.
- Do not touch the UV lamp surface with bare fingers. Fingerprints can damage the glass. Rinse the lamp and wipe with a soft, clean tissue between tests.
- Use tap water to dilute the sample if deionized water is not available. A small quantity of orthophosphate in the tap water is subtracted during the procedure and does not have an effect on the results.

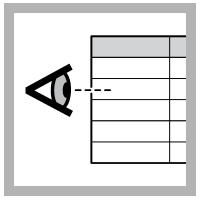
Replacement items

Description	Unit	Item no.
PhosVer 3 Phosphate Reagent Powder Pillows, 5 mL	100/pkg	220999
Potassium Persulfate Powder Pillows, phosphonate	100/pkg	2084769
Bottle, square, glass, 29 mL	6/pkg	43906
Bottle holder	each	1143322
Color comparator box	each	173200
Color disc, phosphate, 0–40 mg/L	each	9262100
Flask, volumetric, 50 mL, polypropylene	each	1406041
Graduated cylinder, 5 mL	each	50837
Plastic viewing tubes, 18 mm, with caps	4/pkg	4660004
Power supply for UV lamp, 115 V	each	2670700
Power supply for UV lamp, 220 V	each	2670702
UV lamp, shortwave, pencil type	each	2671000
UV lamp kit, 115 VAC, includes lamp, power supply, goggles	each	2082800
UV lamp kit, 220 VAC, includes lamp, power supply, goggles	each	2082802
UV safety goggles	each	2113400

Optional items

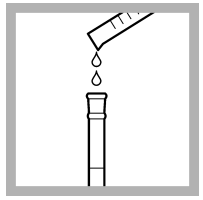
Description	Unit	Item no.
Caps for plastic viewing tubes (4660004)	4/pkg	4660014
Glass viewing tubes, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106
Water, deionized	500 mL	27249

Test procedure—Phosphonate (0–100 mg/L as PO_4)

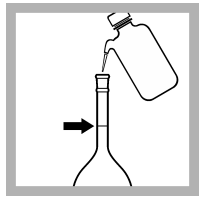


1. Select a sample volume from Table 1 on page 2.

2. If the sample volume is less than 50 mL, use the graduated cylinder to measure the sample.



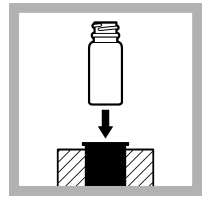
3. Add the sample to the volumetric flask.



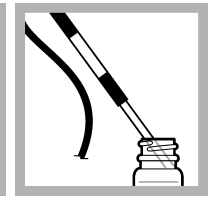
4. Dilute to the mark with deionized water. Add the stopper and invert to mix.

5. Fill the bottle to the shoulder with the sample (or the diluted sample).

6. Add one Potassium Persulfate Powder Pillow. Swirl to mix.

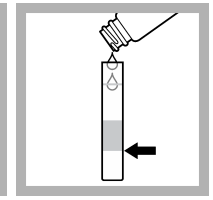


7. Put the bottle in the bottle holder. Keep the bottle holder in the storage case.

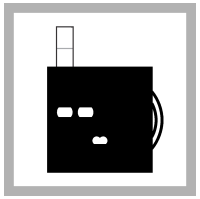


8. Put on UV safety goggles. Put the UV lamp in the bottle. Set the UV lamp to ON.

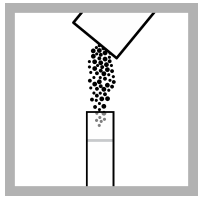
9. Wait 10 to 15 minutes for sample digestion. Set the UV lamp to OFF. The bottle gets hot.



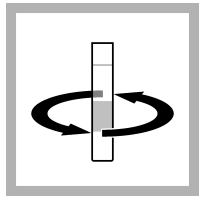
10. Fill two tubes to the first line (5 mL) with the digested sample.



11. Put one tube into the left opening of the color comparator box.

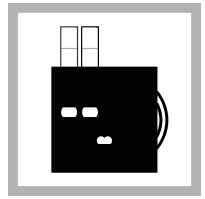


12. Add one PhosVer 3 Phosphate Reagent Powder Pillow to the second tube.

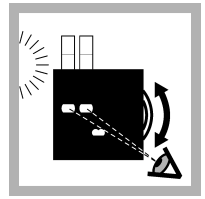


13. Swirl to mix. A blue color develops.

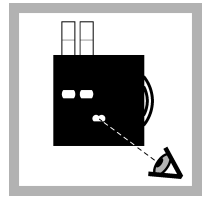
14. Wait 2 minutes. Read the result within 5 minutes.



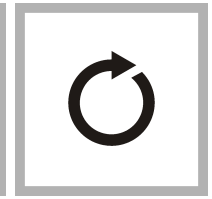
15. Put the second tube into the color comparator box.



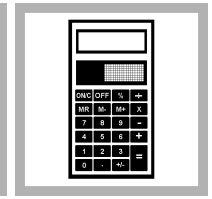
16. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



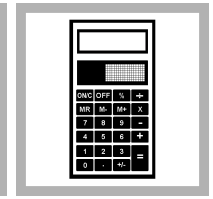
17. Read the value in the scale window.



18. Do steps 10 to 17 with the remaining undigested sample.



19. Subtract the undigested value from the digested value. The difference is the phosphonate value.



20. Multiply the value by the multiplier in Table 1 on page 2 to get the result as mg/L PO_4.

Sample volumes and multipliers

Use an approximate phosphonate concentration (as PO_4) to find the sample volume for the test procedure in Table 1. Use the multiplier from Table 1 at the end of the test procedure to get the phosphonate result as mg/L PO_4.

Table 1 Sample volumes and multipliers

Concentration (as PO_4)	Sample volume	Multiplier
0–4 mg/L	50 mL	0.08
0–20 mg/L	10 mL	0.4
0–40 mg/L	5 mL	0.8
0–100 mg/L	2 mL	2.0

Conversion to phosphonates

The test procedure measures the phosphonate concentration as mg/L PO_4. Multiply the test result as mg/L PO_4 by the applicable conversion factor in Table 2 to get the result as mg/L of the active phosphonate in the sample.

Table 2 Phosphonate conversion factors

Acronym	Chemical name	MW g/mol	P/mol	PO_4 factor
PBTC (Bayhibit AM)	Phosphonobutane tricarboxylic acid	270.1	1	2.84
NTP, AMP (Dequest 2000, Wayplex)	Nitrilotrimethylphosphonic acid	299.05	3	1.05
HEDPA (Dequest 2010, Wayplex)	Hydroxyethylene diphosphonic acid	206.02	2	1.085
EDTMPA (Dequest 2041)	Ethylene diamine tetra (methylene phosphonic acid)	436.13	4	1.148
HMDTMPA (Dequest 2051)	Hexamethylene diamine tetra (methylene phosphonic acid)	492.23	4	1.295
DETPMPA (Dequest 2060)	Diethylene triamine penta (methylene phosphonic acid)	573.2	5	1.207
HPA (Belcor 575)	Hydroxyphosphono acetic acid	156.03	1	1.64

Interferences

Interference levels for a 5-mL sample are shown in Table 3. To determine the interference level for other sample volumes, multiply the interference level by the multiplier in Table 1 on page 2.

Table 3 Interferences

Interfering substance	Interference level (5-mL sample)
Aluminum	100 mg/L
Arsenate	Interferes at all levels
Benzotriazole	10 mg/L
Bicarbonate	1000 mg/L
Bromide	100 mg/L
Calcium	5000 mg/L
CDTA	100 mg/L
Chloride	5000 mg/L
Chromate	100 mg/L
Copper	100 mg/L
Cyanide	100 mg/L (Increase the UV digestion to 30 minutes.)
Diethanoldithiocarbamate	50 mg/L
EDTA	100 mg/L
Iron	200 mg/L
Nitrate	200 mg/L
NTA	250 mg/L
Orthophosphate	15 mg/L
Phosphites and organophosphorus compounds	Reacts quantitatively. Metaphosphates and polyphosphates do not interfere.
Silica	500 mg/L
Silicate	100 mg/L
Sulfate	2000 mg/L
Sulfide	Interferes at all levels
Sulfite	100 mg/L
Thiourea	10 mg/L

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