

Tyrosine Method¹

Method 8193
0.1 to 9.0 mg/L Tannins (as Tannic Acid)
Reagent Solution

Scope and application: For water, wastewater and boiler water.

¹ Adapted from Kloster, M.B., Journal American Water Works Association, Vol. 66, No. 1, p. 44 (1974).





Test preparation

Instrument-specific information

Table 1 shows all of the instruments that have the program for this test. The table also shows sample cell and orientation requirements for reagent addition tests, such as powder pillow or bulk reagent tests.

To use the table, select an instrument, then read across to find the applicable information for this test.

Table 1 Instrument-specific information

Instrument	Sample cell orientation	Sample cell
DR 6000 DR 3800 DR 2800 DR 2700 DR 1900	The fill line is to the right.	2495402 
DR 5000 DR 3900	The fill line is toward the user.	
DR 900	The orientation mark is toward the user.	2401906 

Before starting

Install the instrument cap on the DR 900 cell holder before ZERO or READ is pushed.

Measure the volume of the reagent accurately. Use a volumetric or high precision pipet if possible.

Filter samples that are turbid with filter paper and a funnel. The test results are then mg/L soluble tannic acid.

The Pour-Thru Cell can be used (for applicable instruments) if rinsed well with deionized water between the blank and the prepared samples.

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

Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information.

Items to collect

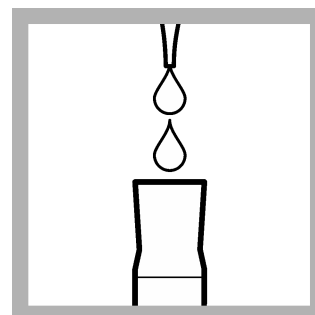
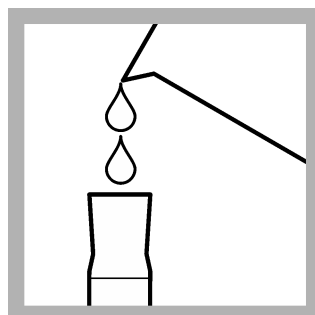
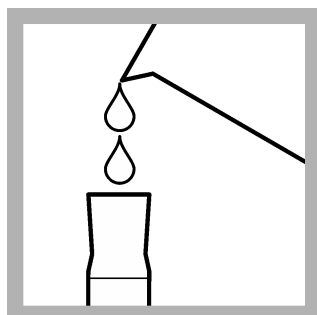
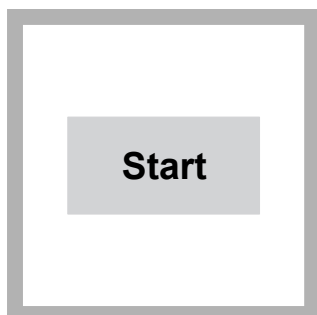
Description	Quantity
Tannin and Lignin Reagent Set:	
Sodium Carbonate Solution	10 mL
TanniVer™ 3 Tannin-Lignin Reagent	1 mL
Cylinder, graduated mixing, 25-mL	2
Pipet Filler	1
Pipet, volumetric Class A, 5.0-mL	1
Pipet, volumetric Class A, 0.5-mL	1
Sample cells (For information about sample cells, adapters or light shields, refer to Instrument-specific information on page 1.)	2
Water, deionized	25 mL

Refer to [Consumables and replacement items](#) on page 4 for order information.

Sample collection

- Collect samples in clean glass or plastic bottles.

Tyrosine procedure



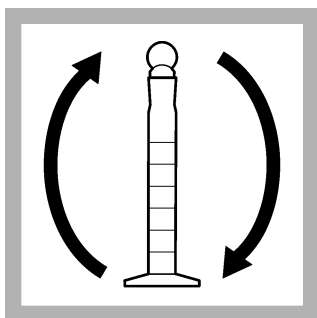
1. Start program 720 Tannin & Lignin. For information about sample cells, adapters or light shields, refer to [Instrument-specific information](#) on page 1.

Note: Although the program name can be different between instruments, the program number does not change.

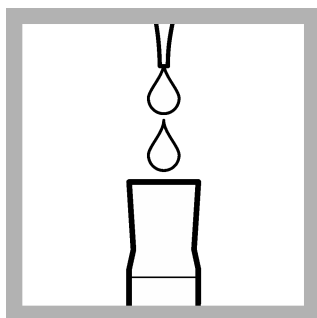
2. Prepare the blank: Fill a 25-mL mixing cylinder to the 25-mL mark with deionized water.

3. Prepare the sample: Fill a second 25-mL mixing cylinder to the 25-mL mark with sample.

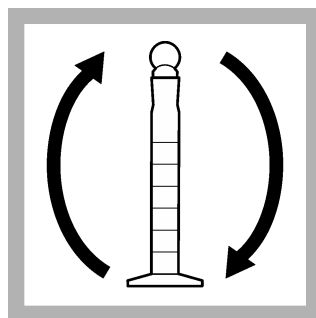
4. Pipet 0.5 mL of TanniVer™ 3 Tannin-Lignin Reagent into each cylinder.



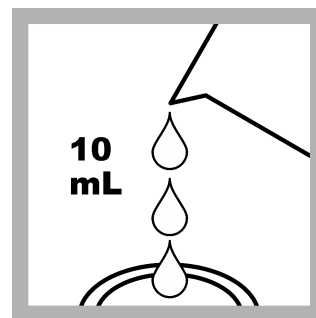
5. Close the two cylinders. Invert both cylinders several times to mix.



6. Add 5.0 mL of Sodium Carbonate Solution into each cylinder.



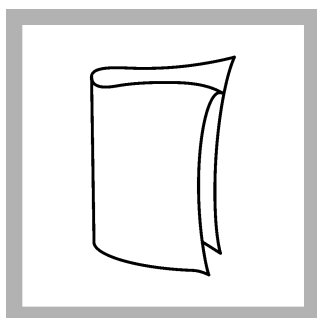
7. Close the two cylinders. Invert both cylinders several times to mix. A blue color will develop if tannins and/or lignins are present.



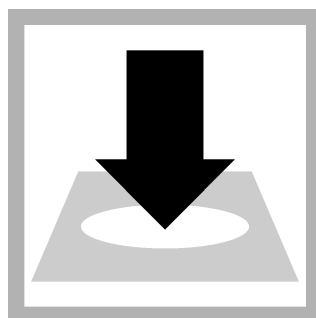
8. Pour 10 mL of each solution into two sample cells.



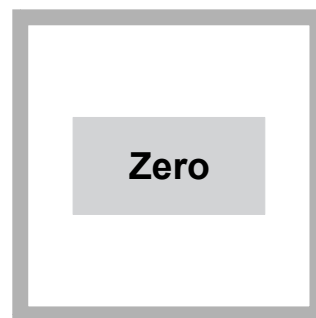
9. Start the instrument timer. A 25-minute reaction time starts.



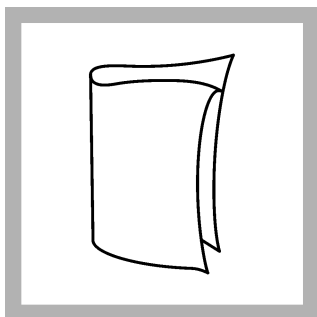
10. When the timer expires, clean the blank sample cell.



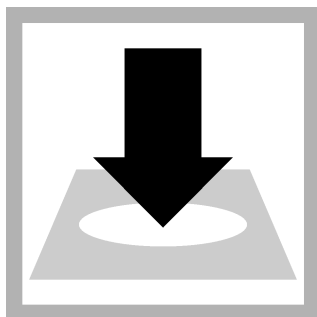
11. Insert the blank into the cell holder.



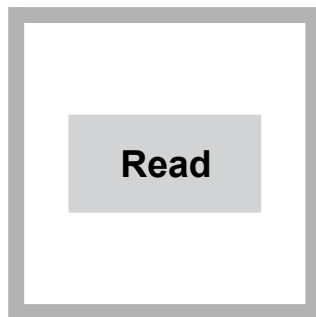
12. Push **ZERO**. The display shows 0.0 mg/L Tannins (as Tannic Acid).



13. Clean the prepared sample cell.



14. Insert the prepared sample into the cell holder.



15. Push **READ**. Results show in mg/L Tannins (as Tannic Acid).

Interferences

Interfering substance	Interference level
Ferrous iron	Causes a positive interference. (2 mg/L of ferrous iron produces a color equivalent to about 1 mg/L of tannic acid.) To remove interference of ferrous iron up to 20 mg/L, add one 0.2 g scoop of Sodium Pyrophosphate to the sample before the test.
Sulfite	To remove sulfite interference, add 1 mL of formaldehyde ¹ to the sample before the sample test.

¹ Refer to [Consumables and replacement items](#) on page 4 for order information.

Accuracy check

Standard solution method

Use the standard solution method to validate the test procedure, the reagents and the instrument.

Items to collect:

- 0.200 g tannic acid, analytical grade
 - 1-L volumetric flask, Class A
 - 500-mL volumetric flask, Class A
 - 15-mL volumetric pipet, Class A and pipet filler safety bulb
 - Deionized water
1. Prepare a 200-mg/L tannic acid stock solution as follows:
 - a. Add 0.200 g of tannic acid into a 1-L volumetric flask.
 - b. Dilute to the mark with deionized water. Mix well. Prepare the stock solution each month.
 2. Prepare a 6.0 mg/L tannic acid standard solution as follows:
 - a. Use a pipet to add 15.00 mL of the 200-mg/L tannic acid stock solution into a 500-mL volumetric flask.
 - b. Dilute to the mark with deionized water. Mix well. Prepare the standard solution each day.
 3. Use the test procedure to measure the concentration of the prepared standard solution.
 4. Compare the expected result to the actual result.

Note: The factory calibration can be adjusted slightly with the standard adjust option so that the instrument shows the expected value of the standard solution. The adjusted calibration is then used for all test results. This adjustment can increase the test accuracy when there are slight variations in the reagents or instruments.

Method performance

The method performance data that follows was derived from laboratory tests that were measured on a spectrophotometer during ideal test conditions. Users can get different results under different test conditions.

Program	Standard	Precision (95% confidence interval)	Sensitivity Concentration change per 0.010 Abs change
720	6.0 mg/L tannic acid	5.8–6.2 mg/L tannic acid	0.1 mg/L tannic acid

Summary of method

This test measures all hydroxylated aromatic compounds, including tannin, lignin, phenol and cresol. This method produces a blue color proportional to the amount of these compounds in the sample. The results are reported as total tannin and lignin and expressed as mg/L tannic acid. The measurement wavelength is 700 nm for spectrophotometers or 610 nm for colorimeters.

Consumables and replacement items

Required reagents

Description	Quantity/test	Unit	Item no.
Water, deionized	varies	4 L	27256
Tannin and Lignin Reagent Set	1	Up to 100 tests	2244600

Consumables and replacement items (continued)

Description	Quantity/test	Unit	Item no.
Includes:			
Sodium Carbonate Solution	10 mL	500 mL	67549
TanniVer™ 3 Tannin-Lignin Reagent	1 mL	100 mL	256032

Required apparatus

Description	Quantity/test	Unit	Item no.
Mixing cylinder, graduated, 25-mL with stopper	2	each	2088640
Pipet filler, safety bulb	1	each	1465100
Pipet, volumetric, Class A, 5.00-mL	1	each	1451537
Pipet, volumetric, Class A, 0.5-mL	1	each	1451534

Recommended standards

Description	Unit	Item no.
Tannic Acid, Analytical Grade	113 g	79114

Optional reagents and apparatus

Description	Unit	Item no.
Flask, volumetric, Class A, 1000-mL glass	each	1457453
Flask, volumetric, Class A, 500-mL glass	each	1457449
Formaldehyde, ACS	100 mL MDB	205932
Pipet, volumetric Class A, 15-mL	each	1451539
Sodium Pyrophosphate	50 g	1429525
Pipet, TenSette®, 0.1–1.0 mL	each	1970001
Pipet tips for TenSette® Pipet, 0.1–1.0 mL	1000/pkg	2185628
Balance, analytical, 80 g x 0.1 mg 100–240 VAC	each	2936701
Paper, for weighing, 100 x 100 mm	500/pkg	1473885
Spatula, micro	each	1225600



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