

STP (off-line)

AP901 - ANALYTICAL PROCEDURE

Colorimetric Method DCA Reagent 1 (5/5/1) 2 to 15 mg/L as STP

Scope and Application


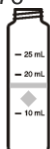
For water analysis.

Instrument Specific Information

Table 1 shows the sample cell and cell orientation requirements for the Veolia instruments that can use this Analytical Procedure (AP).

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

Table 1 - Instrument-specific information

Instrument	Sample cell orientation	Sample cell
DR 2800 DR 1900	The fill line is to the right.	L2793.0002 
DR 900	The fill lines and diamond mark are toward the display.	L1976 

Before Starting

A 1 mg/L STP error per 2.7 °C (5 °F) delta from 22 °C (72 °F) will occur if the sample temperature is not measured accurately immediately after the absorbance reading.
The measured temperature immediately after the absorbance reading should be 15.6–26.6 °C (60–80 °F).
The detection range of the test is 2 to 15 mg/L. If the result is more than 15 mg/L, dilute the sample to within the test range before running the test. If the result is less than 2 mg/L, report as < 2 mg/L STP.
The accuracy and precision of the test are both ± 1 mg/L.
For samples that have a turbidity of more than 65 NTU, highly colored samples or samples with unclarified makeup, filter through a 0.22- μ m membrane filter before running the test. Failure to filter will cause incorrect low results.
The accuracy of the test can be affected by a chlorine concentration greater than 1 mg/L chlorine. Refer to Table 3 for chlorine removal steps.
Store reagents at room temperature and away from direct exposure to sunlight. High temperature and strong light will degrade the DCA Reagent 1 dye.
Due to dye staining, the sample cell needs to be rinsed with methyl alcohol or isopropyl alcohol after each use, then thoroughly rinsed with deionized water.
Install the instrument cap on the DR 900 cell holder before ZERO or READ is pushed.
Refer to the instrument user manual for timer operation instructions.
Clean the external surface of the sample cells before insertion into the instrument cell holder. Use a damp towel and then a dry towel to remove fingerprints or other marks.
Highly buffered samples or extreme pH may exceed the buffering capacity of the reagent and require sample pre-treatment.
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.
Results that are not within the working range of this procedure are not valid.
To avoid reagent contamination, do not pipet directly from the reagent bottles. Keep all reagent bottles tightly capped when not in use.

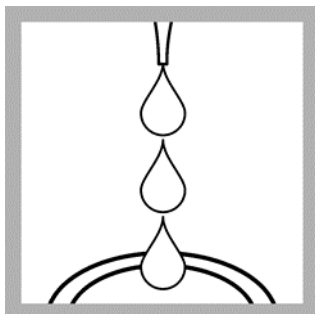
Procedure



1. Start program **803 STP (Abs)**. For information about sample cells, adapters or light shields, refer to Instrument specific information on page 1.

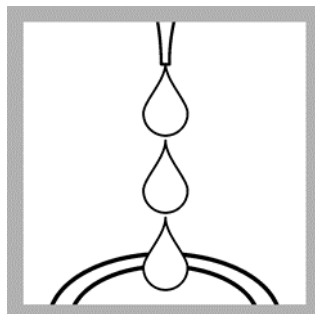
DR 2800 Only: Press single wavelength, options, λ button, enter 520 nm and press OK. DR 2800 does not contain program 803.

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

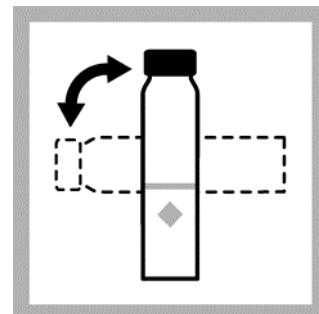


2. Use an adjustable volume pipetter to add **exactly 5 mL of sample** to a sample cell.

Note: Chlorine concentrations greater than 1 mg/L chlorine can affect the accuracy of the test method. Refer to Table 3 for chlorine removal steps.

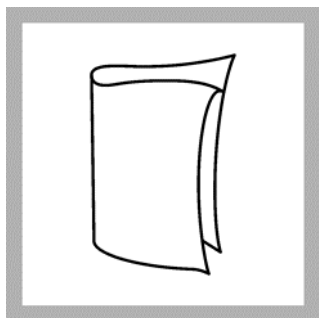


3. Use an adjustable volume pipetter to add **exactly 5 mL of Free Buffer, PCM II** to the sample cell.

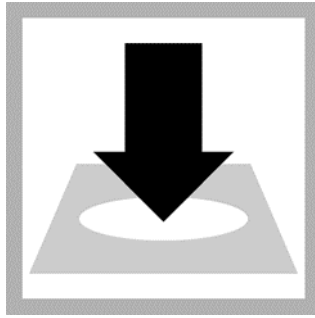


4. Close the sample cell. Slowly turn the sample cell 90 degrees for 5 turns. Do not shake the sample cell. Do not invert the sample cell completely.

Note: The DR 2800 and DR 1900 use the 1-inch square, 10-mL sample cell.



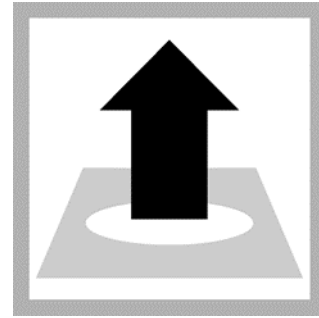
5. Clean the sample cell.



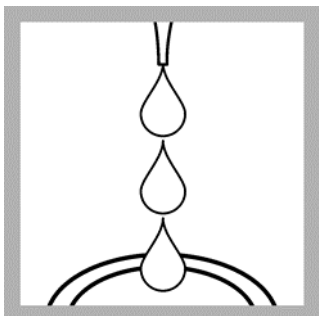
6. Insert the sample cell into the cell holder.



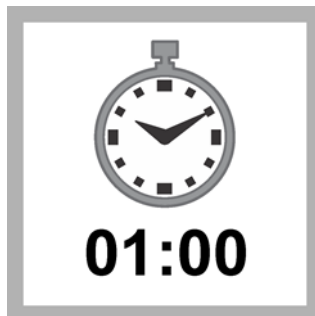
7. Push **ZERO**. The display shows 0.000 ABS.



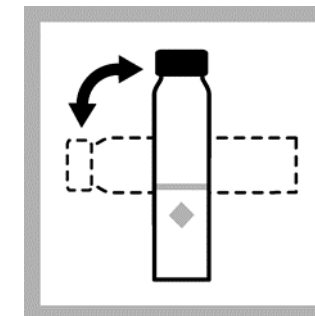
8. Remove the sample cell from the cell holder.



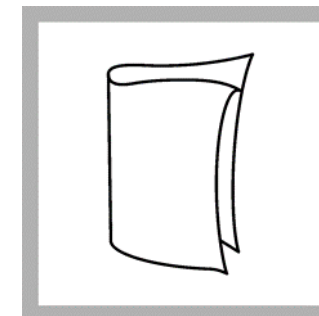
9. Use an adjustable volume pipetter to add **exactly 1 mL of DCA Reagent 1** to the cell. The amount of DCA Reagent 1 added to the sample in this test is critical.



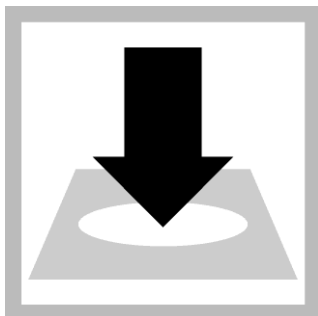
10. Immediately after adding the DCA Reagent 1, start the instrument timer and proceed directly to Step 11. A 1-minute reaction time starts.



11. Close the sample cell. Slowly turn the sample cell 90 degrees for 5 turns. Do not shake the sample cell. Do not invert the sample cell completely.



12. Clean the sample cell.



13. Insert the sample cell into the cell holder.



14. When the timer expires, push **READ**. Results show in absorbance units.



15. Immediately remove the sample cell from the instrument and measure the sample temperature with a digital thermometer. Do not let the thermometer touch the glass. Record the temperature.

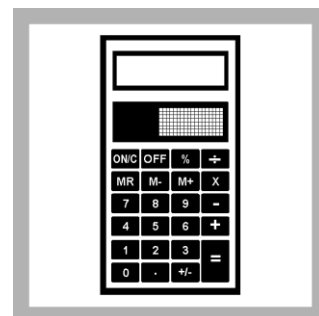
Note: A 1 mg/L STP error per 2.7 °C (5 °F) delta from 22 °C (72 °F) will occur if the sample temperature is not measured accurately immediately after the absorbance reading.

Note: The measured temperature must be between 15.6 °C and 26.6 °C (60–80 °F). If the temperature is not within this range, allow the sample to cool or warm and rerun the test.



16. After each sample test:

- Empty the sample cell and rinse with deionized water.
- Empty the sample cell and add ~ 1cm (1/2 inch) of methyl alcohol or isopropyl alcohol, cap and shake.
- Repeat Step b until the alcohol solution remains clear after shaking.
- Rinse the sample cell three times with deionized water.
- To determine the STP (Off-Line) concentration, go to Calculator.



Calculator

- Click on the STP (Off-Line) Calculator link below:
Internal link - web version (accessible using desktop computers and laptops):
[Click HERE](#)
Internal link - mobile version (accessible using iPhones and Android devices):
[Click HERE](#)
External link:
https://estore.watertechnologies.com/document/document/contentdownload/?document_name=STP_Off-Line_Calculator.htm&language=null&security=Customer
- Set the DR Unit to the correct instrument.
- Enter the temperature and absorbance values.
- Push calculate. The final test result is shown.

Interferences

This procedure should not be run on systems that contain Spectrus* BD1507 until 3 hours after Spectrus BD1507 treatment. Table 2 shows substances that do not interfere up to the specified concentrations. Table 3 shows substances that have a measurable effect on the test at the specified concentrations.

Table 2 - Non-interfering substances

Interfering substance	Concentration
AEC	15 mg/L
Ammonium	5 mg/L
Spectrus BD1501	25 mg/L
Conductivity	8150 μ S/cm
Hardness	220 to 2000 mg/L as CaCO_3 ¹
HEDP	5 mg/L
HRA	5 mg/L
M-alkalinity	57 to 400 ppm as CaCO_3 ¹
Spectrus NX1100	50 mg/L
Spectrus NX1102	25 mg/L
Spectrus NX1104	50 mg/L
Orthophosphate (Na_3PO_4)	25 mg/L
PEG2000	10 mg/L
pH	6.0 to 9.5 ¹
Pluronic L64 (non-ionic surfactant)	10 mg/L
Polyphosphate (TKPP)	25 mg/L
Silica	150 mg/L
Turbidity	65 NTU
Zinc	3 mg/L

¹ Values outside of this range may interfere.

Table 3 - Interfering substances

Interfering substance	Interference level	Type of interference
Anionic Polymer	Any	Positive
Cetyl Trimethyl Ammonium Bromide (CTAB)	10 mg/L	Negative
Chlorine	1.0 mg/L To remove the chlorine interference pipet 10 mL of sample into a clean glass sample cell, add the contents of one Dechlorinating Reagent Powder Pillow (L2043), swirl to mix, let stand for 1 -minute. Use 5 mL of the dechlorinated sample as the STP test sample.	Negative
Humic Acid	10 mg/L	Negative
M-alkalinity	400 to 720 mg/L as CaCO ₃	Positive
Tannic acid	5 mg/L	Negative

Summary of Method

A cationic dye is added to a buffered sample. The dye reacts with the polymer in the sample, resulting in a shift in the visible spectrum. The spectrum shift is measured at 520 nm.

Lab Supply Code Numbers

Required reagents²

Description	Quantity/test	Unit	Code
DCA Reagent 1	1 mL	120 mL	L1042.0120
Free Buffer, PCM II	5 mL	250 mL	L1043.0250
Methyl alcohol	varies	1000 mL	L322.1000
OR			
Isopropyl alcohol	varies	4000 mL	L221.4000
Water, deionized	varies	4000 mL	L243.4000

²Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use any recommended personal protective equipment.

Required apparatus

Description	Quantity/test	Unit	Code
Stopper, #1 silicone, for 1-inch cell	1	each	L2601A
Pipetter, adjustable volume, 1.00–10.00 mL	1	each	L1089
Tips for L1089 Pipetter, 10-mL	varies	200/pkg	L20002
Pipetter, Socorex Calibra 832.10, 1.0–10.0 mL (EMEA only)	1	each	L8035
Tips for L8035 Pipetter, Socorex 312.10, 10 mL (EMEA only)	varies	100/pkg	L8036
Thermometer, digital	1	each	L6914

Spectrophotometers and colorimeters (select one)

Description	Quantity/Test	Unit	Code
DR 1900 Spectrophotometer with accessories	1	each	L1901
Sample cells, 10-mL square, matched pair	2	2/pkg	L2793.0002
DR 900 Colorimeter with accessories	1	each	L901
Sample cells, 10-20-25-mL, with cap	2	6/pkg	L1976

Optional reagents and apparatus

Description	Unit	Code
Pipet, plastic graduated, 1/10, 5-mL	each	L380
Pipet, plastic graduated, 1/100, 1-mL	each	L371
Safety Bulb, silicone, 3-valve (for filling and discharge)	each	L1513
Holder, membrane filter, 25-mm	each	L773
Filter Membrane, 0.22-micron, 25-mm	100/pkg	L774
Syringe, plastic 50-mL	each	L775
Pipetter, Socorex Calibra 822.1000, 100–1000 µL (EMEA only)	each	L8034
Tips for L8034 Pipetter, Socorex 319.1000B, 1000-µL (EMEA only)	250/pkg	L8037