Color, True and Apparent

DOC316.53.01037

Platinum-Cobalt Standard Method[1, 2, 3]

Method 8025

15 to 500 color units

5 to 500 color units (low range technique)

Scope and application: For water, wastewater and seawater; equivalent to NCASI method 253 and NCASI Method Color 71.01 for pulp and paper effluent using 465 nm (requires pH adjustment).

[1] Adapted from Standard Methods for the Examination of Water and Wastewater and National Council for Air and Stream Improvement (NCASI) Methods Manual.
[2] Adapted from Wat. Res. Vol. 30, No. 11, pp. 2771–2775, 1996.
[3] NCASI Method 253 approved at 40 CFR part 136.

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.
The NCASI procedure is available only for spectrophotometers and requires pH adjustment to pH 7.6 with 1.0 N HCl or 1.0 N NaOH. If the overall volume change during the adjustment is more than 1%, start over and use a stronger acid or base. Use program 125 for the NCASI procedure.
One pH 8 buffer powder pillow (sodium phosphate/potassium phosphate) can be added to 50 mL of sample before the final pH adjustment to minimize the volume change from the dilution. Mix thoroughly to dissolve before the final pH adjustment.
To test for apparent color, do not filter the sample or the deionized water blank.
For very low levels, use the Pour-Thru Cell (for applicable instruments) for the best results.
For measurements below 15 color units without the Pour-Thru Cell, refer to Low range color technique on page 4.

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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
Buffer, pH 8.0 (program 125)	1
Hydrochloric Acid Solution, 1.0 N (program 125)	varies
Sodium Hydroxide, 1.00 N (program 125)	varies
Water, deionized	100 mL
Filter apparatus: membrane filter, filter holder, filter flask and aspirator	1
Stopper, rubber, one hole number 7	1
Tubing, rubber	1
Sample cells (For information about sample cells, adapters or light shields, refer to Instrument-specific information on page 1.)	2

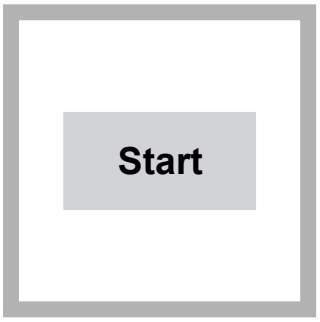
Refer to Consumables and replacement items on page 5 for order information.

Sample collection and storage

- Collect samples in clean glass or plastic bottles.
- Analyze the samples as soon as possible for best results.
- If prompt analysis is not possible, fill the bottle completely full, then tighten the cap on the bottle. Avoid excessive agitation or prolonged contact with air.
- To preserve samples for later analysis, keep the samples at or below 6 °C (43 °F) for up to 48 hours.
- Let the sample temperature increase to room temperature before analysis.

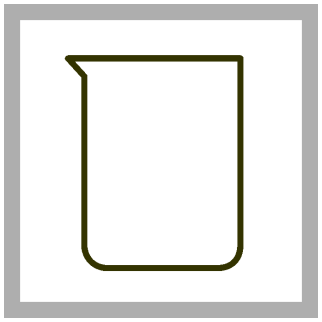
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Platinum-Cobalt procedure

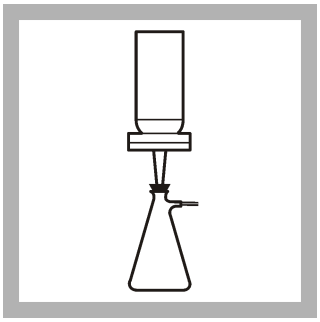


1. Start program **120 Color, 455 nm** or program **125 Color, 465 nm** for the NCASI test. Colorimeters use program **122 Color, 420 nm**. For information about sample cells, adapters or light shields, refer to Instrument-specific information on page 1.

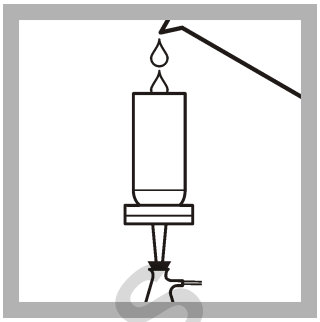
Note: *Although the program name can be different between instruments, the program number does not change.*



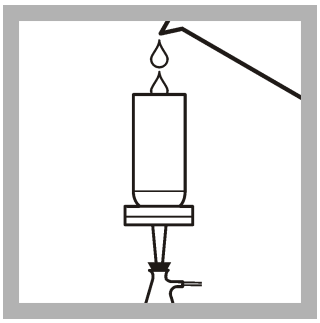
2. Collect **200 mL** of sample in a 400-mL beaker. **NCASI:** Adjust the pH as described in Before starting on page 1.



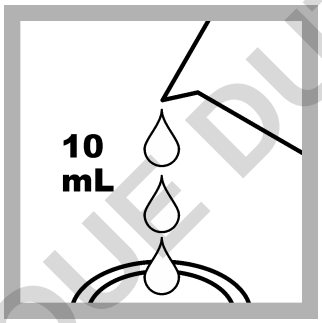
3. Assemble the 0.45 micron filter apparatus. **NCASI:** The NCASI test uses a 0.8-micron filter. A 1.0 micron prefilter can be used first for samples that are difficult to filter.



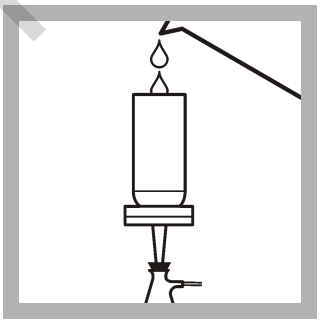
4. Pour approximately 50 mL of deionized water through the filter to rinse the filter. Discard the rinse water.



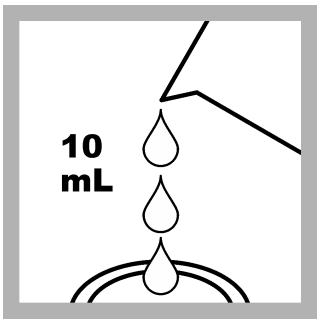
5. Pour another 50 mL of deionized water through the filter.



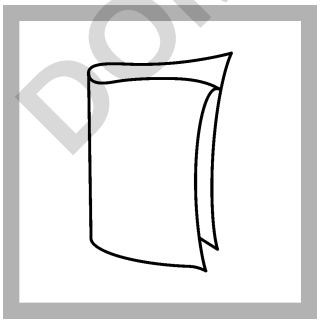
6. Prepare the blank: Fill the sample cell with 10 mL of filtered deionized water from the previous step. Discard the excess water in the flask.



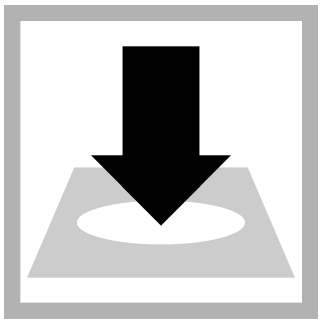
7. Pour approximately 50 mL of sample through the filter.



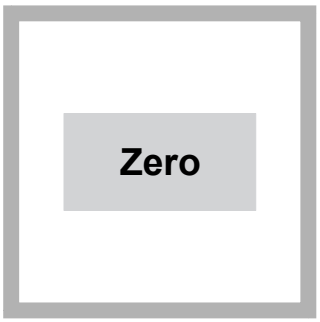
8. Prepare the sample: Fill a second sample cell with 10 mL of filtered sample.



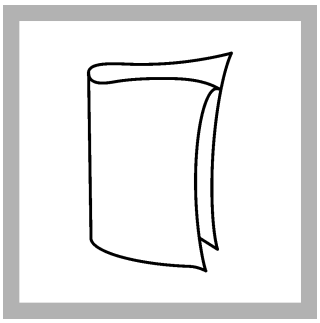
9. Clean the blank sample cell.



10. Insert the blank into the cell holder.

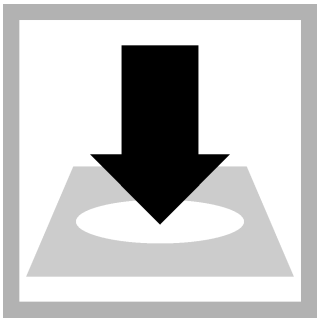


11. Push **ZERO**. The display shows 0 units Pt-Co.



12. Clean the prepared sample cell.

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13. Insert the prepared sample into the cell holder.



14. Push **READ**. Results show in units Pt-Co.

Low range color technique

For measurements below 15 color units, use the same sample cell to set the instrument to zero and read the sample as follows:

1. Prepare the blank and set the instrument to Zero, refer to the method procedure.
2. Discard the contents of the blank sample cell.
3. Fully rinse the blank sample cell 2 or 3 times with the sample. Make sure that no blank water stays in the sample cell.
4. Refer to the method procedure to prepare and read the sample.

   Note: *If a matched set of sample cells is used for the low range measurement, make sure that the two sample cells are a matched pair. Also make sure that there are no scratches or others imperfections on the sample cells, because this will have an effect on the low range measurement. For the best results, use the same sample cell for the blank and the sample.*

Accuracy check

Standard solution method

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

Items to collect:

- 500 Platinum-Cobalt Units Standard Solution
- 100-mL volumetric flask, Class A
- 50-mL volumetric pipet, Class A and pipet filler
- Deionized water

1. Prepare a 250 platinum-cobalt units standard solution as follows:
   a. Use a pipet to add 50.00 mL of 500 platinum-cobalt units standard solution into the volumetric flask.
   b. Dilute to the mark with deionized water. Mix well. Prepare this solution daily.
2. Use the test procedure to measure the concentration of the prepared standard solution.
3. 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.*

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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
120/125	10 units Pt-Co	7.2-12.8 units Pt-Co	16 units Pt-Co
120/125	250 units Pt-Co	245–255 units Pt-Co	16 units Pt-Co

Summary of method

Color may be expressed as “apparent” or “true” color. The apparent color includes color from dissolved materials plus color from suspended matter. The true color is determined by removal of the suspended materials with a filter or a centrifuge. This procedure uses 0.45-micron filtration for true color analysis. To measure apparent color, do not filter the sample or the deionized water blank. The same instrument program is used for both true and apparent color. The stored program is calibrated in color units based on the APHA-recommended standard of 1 color unit being equal to 1 mg/L platinum as chloroplatinate ion. Test results for Programs 120 and 125 are measured at 455 and 465 nm, respectively in spectrophotometers. Test results for Program 122 are measured at 420 nm in colorimeters.

Consumables and replacement items

Required reagents

Description	Quantity/test	Unit	Item no.
Hydrochloric Acid Solution, 1.0 N	varies	1 L	2321353
Sodium Hydroxide, 1.00 N	varies	1 L	104553
Water, deionized	varies	4 L	27256

Required apparatus

Description	Quantity/test	Unit	Item no.
Aspirator, vacuum pump	1	each	213100
Beaker, 400-mL	1	each	50048
Filter, membrane, 47-mm, 0.8-microns, Program 125	1	100/pkg	2640800
Filter holder, 47-mm, magnetic base	1	each	1352900
Filter, membrane, 47-mm, 0.45-microns, Program 120	1	100/pkg	1353000
Flask, filtering, 500-mL	1	each	54649
Stopper, poly, hollow	1	6/pkg	211907
Tubing, rubber, 7.9 mm x 2.4 mm	varies	12 ft	56019

Recommended standards and apparatus

Description	Unit	Item no.
Buffer, pH 8.0	15/pkg	1407995
Color Standard Solution, 500 platinum-cobalt units	1 L	141453
Color Standard Solution, 15 platinum-cobalt units	1 L	2602853
Color Standard Solution, 500 platinum-cobalt units, 10-mL Voluette® Ampules	16/pkg	141410
Filter, glass microfiber, 1.0-micron 47-mm	100/pk	2551400

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Recommended standards and apparatus (continued)

Description	Unit	Item no.
Flask, volumetric, Class A, 100-mL glass	each	1457442
Pipet, volumetric, Class A, 50-mL	each	1451541
Pipet filler, safety bulb	each	1465100

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