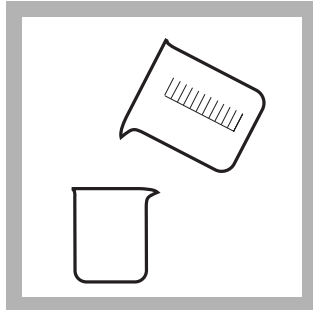




Scope and Application: For water, wastewater and seawater; equivalent to NCASI method 253 for pulp and paper effluent using 465 nm (requires pH adjustment). The estimated detection limit for program numbers 1670 and 1680 is 2 units Pt-Co.

* Adapted from *Standard Methods for the Examination of Water and Wastewater and NCASI, Technical Bulletin No. 253, Dec., 1971*

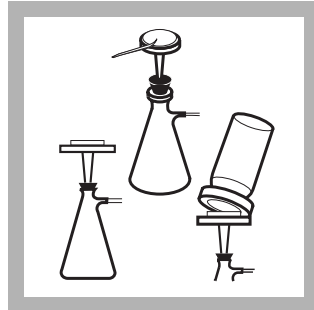
** Adapted from *Wat. Res. Vol. 30, No. 11, pp. 2771-2775. 1996*



1. Collect 200 mL of sample in a 400-mL beaker. If necessary, adjust the pH to 7.6 with 1.0 N HCl or 1.0 N NaOH.

Note: NCASI procedure requires pH adjustment.

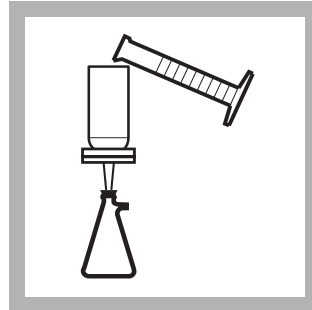
Note: When adjusting the pH, if overall volume change is greater than 1%, start over and use a stronger acid or base.



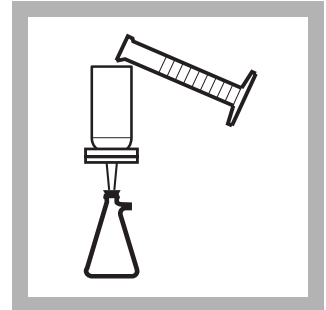
2. Assemble the filtering apparatus (0.45 micron membrane filter, filter holder, filter flask, and aspirator). NCASI prescribes a 0.8 micron filter.

Note: To test for apparent color, do not filter; omit Steps 2-4 and 8.

Note: If sample cannot be analyzed immediately, see *Sample Collection, Storage and Preservation*.

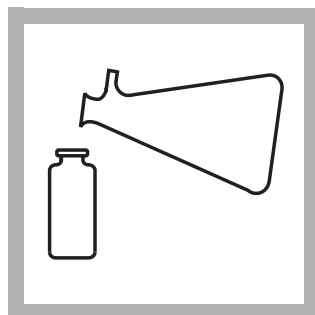


3. Rinse the filter by pouring about 50 mL of deionized water through the filter. Discard the rinse water.



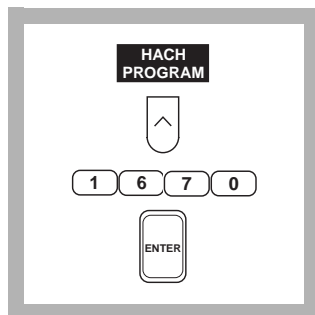
4. Pour another 50 mL of deionized water through the filter.

COLOR, True and Apparent, continued



5. Fill a sample cell (the blank) with 10 mL of filtered deionized water. Discard the excess water in the flask.

Note: For apparent color use unfiltered deionized water.



6. Press the soft key under **HACH PROGRAM**. Select the stored program for **Color** read at 455 nm by pressing **1670**

1 **6** **7** **0**

or

Color read at 465 nm by pressing **1680** with the numeric keys.

1 **6** **8** **0**

Press: **ENTER**

Note: The Flow Cell and Sipper Modules can be used for this procedure. Use minimum volumes of 20 and 10 mL respectively.



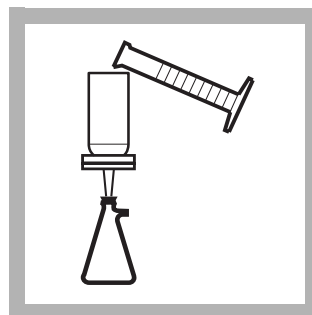
7. The display will show: **HACH PROGRAM: 1670 Color, 455 nm**

or

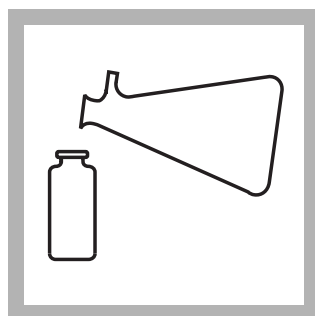
HACH PROGRAM: 1680 Color, 465 nm

HACH PROGRAM:1680 Color, 465 nm

The respective wavelength is automatically selected (**455** or **465 nm**).

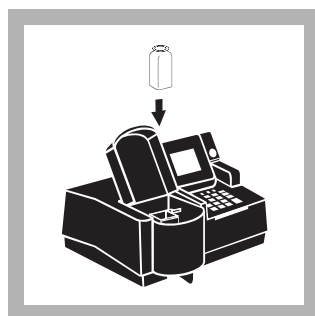


8. Pour about 50 mL of sample through the filter.

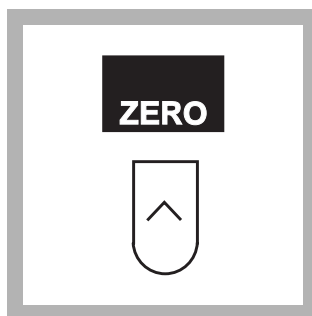


9. Fill a second sample cell (the prepared sample) with 10 mL of filtered sample.

Note: For proof of accuracy, use a 250-unit platinum-cobalt color standard solution (preparation given in the Accuracy Check section) in place of the filtered sample.



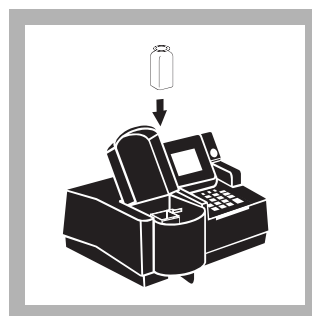
10. Place the blank into the cell holder and close the light shield.



11. Press the soft key under **ZERO**.

The display will show:

0 units Pt-Co



12. Place the prepared sample into the cell holder. Close the light shield. Results in platinum-cobalt units will be displayed.

Sample Collection, Storage and Preservation

Collect samples in clean plastic or glass bottles. Most reliable results are obtained when samples are analyzed as soon as possible after collection. If prompt analysis is impossible, fill bottles completely and cap tightly. Avoid excessive agitation or prolonged contact with air. Samples can be stored for 24 hours by cooling to 4 °C (39 °F). Warm to room temperature before analysis.

Accuracy Check

Standard Solution Method

Using Class A glassware, prepare a 250 platinum-cobalt units standard by pipetting 50.00 mL of a 500 Platinum-Cobalt Units Standard Solution into a 100-mL volumetric flask and diluting to 100 mL with deionized water.

To adjust the calibration curve using the reading obtained with the 250 Pt-Co units standard, press the soft keys under **OPTIONS, (MORE)** then **STD: (OFF)**. Press **ENTER** to accept the displayed concentration, the value of which depends on the selected units. If an alternate concentration is used, enter the actual concentration and press **ENTER** to return to the read screen. See Section 1.5.5 *Adjusting the Standard Curve* for more information.

Method Performance

Precision

Standard: 250 units Pt-Co

For more information on determining precision data and method detection limits, refer to Section 1.5.

Estimated Detection Limit

| Program | EDL |
|---------|---------------|
| 1670 | 2 units Pt-Co |
| 1680 | 2 units Pt-Co |

For more information on derivation and use of Hach’s estimated detection limit, see Section 1.5.2. To determine a method detection limit (MDL) as defined by the 40 CFR part 136, Appendix B, see Section 1.5.1.

Sensitivity

Program Number: 1670

| Portion of Curve | ΔAbs | ΔConcentration |
|------------------|-------|------------------|
| Entire Range | 0.010 | 15.7 Pt-Co Units |

Program Number: 1680

| Portion of Curve | ΔAbs | ΔConcentration |
|------------------|-------|------------------|
| Entire Range | 0.010 | 16.2 Pt-Co Units |

See Section 1.5.3 *Sensitivity Explained* for more information.

Calibration Standard Preparation

To perform a Color calibration using the platinum cobalt method, use a 500 Platinum Cobalt Units Standard Solution (Cat. No. 1414-53).

Prepare calibration standard containing 50, 100, 150, 250, 350, and 450 units Pt-Co as follows:

- a. Into six different 100-mL volumetric flasks, pipet 10.00, 20.00, 30.00, 50.00, 70.00, and 90.00 mL of the 500-units Color Standard Solution using Class A glassware. Also, use the undiluted 500-unit Pt-Co standard during calibration.
- b. Dilute to the mark with deionized water and mix thoroughly.
- c. Using the platinum-cobalt method and the calibration procedure described in the *User-Entered Programs* section of the *DR/4000 Spectrophotometer Instrument Manual*, generate a calibration curve from the standards prepared above.

Summary of Method

Color may be expressed as “apparent” or “true” color. The apparent color includes that from dissolved materials plus that from suspended matter. By filtering or centrifuging out the suspended materials, the true color can be determined. The procedure describes true color analysis. If apparent color is desired, it can be determined by measuring an unfiltered water sample. The stored program is used for both forms of 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.

Safety

Good safety habits and laboratory techniques should be used throughout the procedure. Consult the *Material Safety Data Sheet* for information specific to the reagents used. For additional information, refer to Section 1.

Pollution Prevention and Waste Management

For information on pollution prevention and waste management, refer to Section 1.

COLOR, True and Apparent, continued

REQUIRED REAGENTS AND STANDARDS

| Description | Quantity Required per test | Unit | Cat. No. |
|------------------------|-------------------------------|---------------|----------|
| Water, deionized | 50 mL | 4 liters..... | 272-56 |

REQUIRED EQUIPMENT AND SUPPLIES

| | | | |
|--|---------|--------------|----------|
| Aspirator, Nalgene vacuum pump | 1 | each..... | 2131-00 |
| DR/4000 1-Inch Cell Adapter | 1 | each..... | 48190-00 |
| Filter Holder, 47 mm, 300-mL graduated | 1 | each..... | 13529-00 |
| Filter, membrane, 47-mm, 0.8-microns..... | 1 | 100/pkg..... | 26408-00 |
| Filter, membrane, 47-mm, 0.45-microns..... | 1 | 100/pkg..... | 13530-00 |
| Flask, filtering, 500-mL | 1 | each..... | 546-49 |
| Stopper, rubber, one hole, No. 7..... | 1 | 6/pkg..... | 2119-07 |
| Tubing, rubber | 1 | 12 ft..... | 560-19 |

OPTIONAL REAGENTS AND STANDARDS

| | | |
|--|--------------|----------|
| Color Standard Solution, 15 platinum-cobalt units | 1 liter..... | 26028-53 |
| Color Standard Solution, 500 platinum-cobalt units | 1 liter..... | 1414-53 |
| Color Standard Solution, 500 platinum-cobalt units, 10-mL Voluette Ampules | 16/pkg..... | 1414-10 |
| Hydrochloric Acid Solution, 1.0 N | 1 liter..... | 23213-53 |
| Hydrochloric Acid, 6.0 N..... | 500 mL..... | 884-49 |
| Sodium Hydroxide, 1.00 N | 900 mL..... | 1045-53 |
| Sodium Hydroxide Standard Solution, 6 N..... | 1 liter..... | 23324-53 |

OPTIONAL EQUIPMENT AND SUPPLIES

| | | |
|---|-----------|----------|
| DR/4000 Carousel Module Kit | each..... | 48070-02 |
| DR/4000 Flow Cell Module Kit, 1-inch..... | each..... | 48070-04 |
| DR/4000 Flow Cell Module Kit, 1-cm..... | each..... | 48070-05 |
| DR/4000 Sipper Module Kit, 1-inch | each..... | 48090-03 |
| Flask, volumetric, Class A, 100-mL | each..... | 14574-42 |
| pH Meter, <i>sensio</i> TM 1, portable | each..... | 51700-00 |
| Pipet, volumetric, Class A, 10-mL..... | each..... | 14515-38 |
| Pipet, volumetric, Class A, 20-mL..... | each..... | 14515-20 |
| Pipet, volumetric, Class A, 50-mL..... | each..... | 14515-41 |



FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:

In the U.S.A. – Call toll-free 800-227-4224

Outside the U.S.A. – Contact the HACH office or distributor serving you.

On the Worldwide Web – www.hach.com; E-mail – techhelp@hach.com

HACH COMPANY
WORLD HEADQUARTERS
Telephone: (970) 669-3050
FAX: (970) 669-2932