Carbon Dioxide

DOC316.53.01152

Sodium Hydroxide Method **Method 8223**

0 to 250 mg/L CO_2 **Buret Titration**

Scope and application: For water and seawater.

Test preparation

Before starting

To prevent agitation of the sample, pour the sample directly into the Erlenmeyer flask. As a reference, fill a graduated cylinder with the sample volume of deionized water or sample. Pour the water into the Erlenmeyer flask. Make a mark on the Erlenmeyer flask at the water level to identify the sample volume level.
As an alternative to the Phenolphthalein Indicator Powder Pillow, use 4 drops of Phenolphthalein Indicator Solution.
Color or turbidity in the sample can make it difficult to see the color change at the endpoint. For these samples, use a pH meter to determine the titration endpoint. The endpoint for phenolphthalein acidity is pH 8.3.
The optional TitraStir Titration Stand can hold the buret and stir the sample.
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

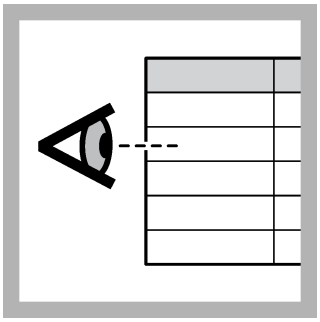
Description	Quantity
Phenolphthalein Indicator Powder Pillow	1
Sodium Hydroxide Standard Solution, 0.0227 N	varies
pH meter and probe (for samples that have a lot of color or turbidity)	1
Buret, Class A, 25 mL	1
Graduated cylinder (use a size that is applicable to the selected sample volume), or TenSette pipet with tips	1
Erlenmeyer flask, 250 mL	1
Funnel, micro	1
Support stand with buret clamp	1
Water, deionized	varies

Refer to Consumables and replacement items on page 3 for order information.

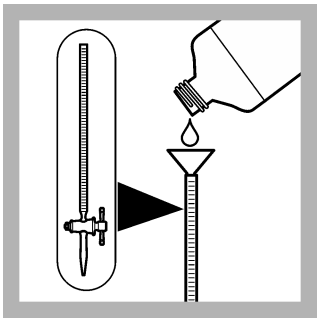
Sample collection

- Collect samples in clean glass or plastic bottles with tight-fitting caps. Completely fill the bottle and immediately tighten the cap.
- Prevent agitation of the sample and exposure to air.
- Analyze the samples as soon as possible for best results.
- If immediate analysis is not possible, keep the samples at or below 6 °C (43 °F) for a maximum of 24 hours.
- Let the sample temperature increase to room temperature before analysis.

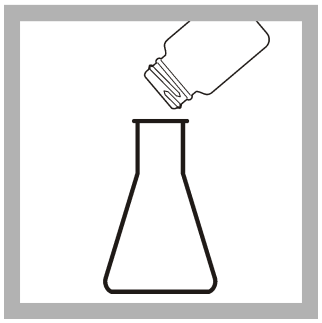
Test procedure



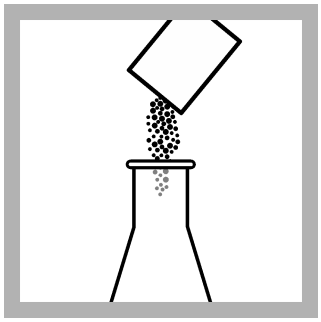
1. Select a sample volume, titrant and flask from Table 1 on page 2.



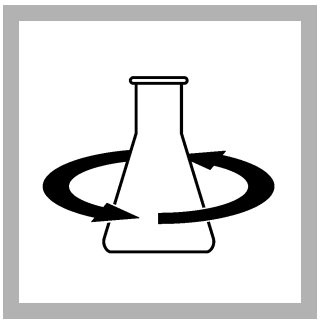
2. Fill a 25-mL buret to the zero mark with the titrant.



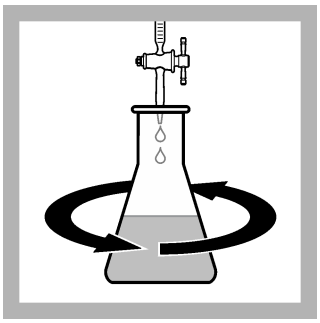
3. Pour the sample volume in Table 1 on page 2 in the Erlenmeyer flask. When possible, collect the sample directly in the Erlenmeyer flask to prevent agitation of the sample.



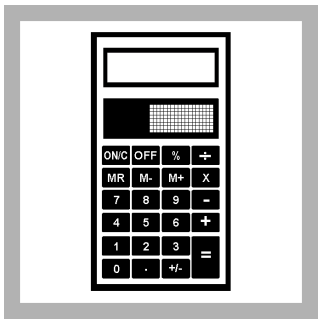
4. Add the contents of one Phenolphthalein Indicator Powder Pillow. The indicator is not necessary if a pH meter is used.



5. Swirl to mix. If a pink color forms, no carbon dioxide is in the sample.



6. Put the flask under the buret. Swirl the flask. Add titrant until the color changes from colorless to a light pink color for a minimum of 30 seconds (pH 8.3).



7. Use the multiplier in Table 1 on page 2 to calculate the concentration. mL of titrant × multiplier = mg/L CO_2.

Sample volumes and multipliers

Select a range in Table 1, then read across the table row to find the applicable information for this test. Use the multiplier to calculate the concentration in the test procedure.

Example: A 100-mL sample was titrated with 0.0227 N titrant and 12 mL of titrant was used at the endpoint. The concentration is 12 mL × 10 = 120 mg/L CO_2.

Table 1 Sample volumes and multipliers

Range (mg/L)	Sample volume (mL)	Titrant—sodium hydroxide	Flask size	Multiplier
0–125	200	0.0227 N	250 mL	5
100–250	100	0.0227 N	125 mL	10

Interferences

Interfering substance	Interference level
Other acids	Interferes directly and is included in the test result.
Color and turbidity	Color or turbidity in the sample can make it difficult to see the color change at the endpoint. For these samples, use a pH meter to determine the titration endpoint. The endpoint is pH 8.3.

Summary of method

A phenolphthalein indicator is added to the sample. Carbonic acid formed by carbon dioxide in the sample is titrated with a sodium hydroxide standard solution until the indicator changes color at the endpoint pH of 8.3. Strong acids cannot be in the sample at concentration levels that will have an effect on the results.

Consumables and replacement items

Required reagents

Description	Quantity/Test	Unit	Item no.
Phenolphthalein Indicator Powder Pillows	1 pillow	100/pkg	94299
Sodium Hydroxide Standard Solution, 0.0227 N	varies	1 L	19253

Required apparatus

Description	Quantity/test	Unit	Item no.
Buret clamp, double	1	each	32800
Buret, Class A, 25 mL	1	each	2636540
Support stand	1	each	56300
Funnel, micro	1	each	2584335
Flask, Erlenmeyer, 125 mL	1	each	50543
Flask, Erlenmeyer, 250 mL	1	each	50546

Optional reagents and apparatus

Description	Unit	Item no.
Phenolphthalein Indicator Solution, 5-g/L	100 mL MDB	16232
Ampule Breaker, 10-mL Voluette® Ampules	each	2196800
Bottle, sampling, with cap, low density polyethylene, 250 mL	12/pkg	2087076
Clippers	each	96800
Water, deionized	500 mL	27249
Stir bar, octagonal	each	2095352
TitraStir® Titration Stand, 115 VAC	each	1940000
TitraStir® Titration Stand, 230 VAC	each	1940010

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