



ALKALINITY

MODEL DR-A • CODE 3467

QUANTITY	CONTENTS	CODE
15 mL	*Alkalinity Indicator #1, pH 8.3	*3870-E
15 mL	Alkalinity Indicator #2, pH 4.5	3869-E
60 mL	*Alkalinity Titration Reagent B	*4493DR-H
1	Test Tube, 5-10-15 mL, glass, w/cap	0778
1	Direct Reading Titrator, 0-200 Range	0382

***WARNING:** Reagents marked with a * are considered hazardous substances. Material Safety Data Sheets (MSDS) are supplied for these reagents. For your safety read label and accompanying MSDS before using.

To order a complete set of refill reagents, order as R-3467. To order individual reagents or test kit components, use the specified code number.

NOTE: Carefully read the instruction manual for the LaMotte Direct Reading Titrator before performing the titration described below. The Titrator is calibrated in terms of alkalinity expressed as parts per million (ppm) calcium carbonate (CaCO_3). Each minor division on the Titrator scale equals 4 ppm CaCO_3 .

NOTE: To qualify as an EPA accepted test and to achieve greatest accuracy, the normality of the *Alkalinity Reagent B should be checked periodically. Standardize *Alkalinity Reagent B by titrating against 0.05N Na_2CO_3 ; 1 mL = 1.00 mg CaCO_3 . Should a variance of greater than 0.3 mL of *Alkalinity Reagent B occur, discard *Alkalinity Reagent B and order LaMotte *Alkalinity Reagent B (4493). A CaCO_3 equivalent standard of 100 ppm is also available (6199). Refer to *Standard Methods*, 16th edition, 403, 1985.

PHENOLPHTHALEIN (P) ALKALINITY PROCEDURE

1. Fill test tube (0778) to 5 mL line with sample water.
2. Add two drops of *Alkalinity Indicator # 1 (3870). Cap and mix. If no red color develops, P alkalinity is zero. If red, proceed to Step 3.
3. Fill Direct Reading Titrator with *Alkalinity Reagent B (4493). Insert Titrator in center hole of test tube cap.
4. While gently swirling tube, slowly depress plunger until red color disappears. Record test result where plunger tip meets titrator scale. Record as P Alkalinity in ppm CaCO_3 .
EXAMPLE: Plunger tip is 3 minor divisions below 80 line. The test result is $80 + (3 \times 4) = 92$ ppm, since each division is equal to 4 ppm.
5. If plunger tip reaches the bottom line on the titrator scale (200 ppm) before the endpoint color change occurs, refill Titrator and continue titration. When recording test result, include original amount of reagent titrated (200 ppm).

NOTE: Do not move the titrator plunger after P Alkalinity endpoint has been obtained.

TOTAL (T) ALKALINITY PROCEDURE

6. Without moving plunger, remove Titrator and test tube cap from test tube containing sample from Step 4.
7. Add two drops Alkalinity Indicator #2. Cap and swirl to mix. A blue color will appear. Insert Titrator in center hole of test tube cap.
8. While gently swirling tube, slowly depress plunger until blue color changes to green. Record test result as T Alkalinity in ppm CaCO_3 . Include total amount of titration reagent added. (See Step 5).
9. If only Total Alkalinity is to be tested, perform Steps 1, 7, and 8 only, using a full titrator for Step 8.

CALCULATION OF ALKALINITY RELATIONSHIPS

Results obtained from Phenolphthalein and Total Alkalinity determinations offer a means for the stoichiometric classification of three principal forms of Alkalinity present in many water supplies. Classification attributes the entire alkalinity to bicarbonate, silica, phosphoric and boric acids. This classification system further assumes incompatibility of Hydroxide and Bicarbonate Alkalinities in the same sample. Since calculations are on a stoichiometric basis, ion concentrations in the strictest sense are not represented in the results.

According to this scheme:

- A.** Carbonate Alkalinity is present when Phenolphthalein is not zero but is less than the Total Alkalinity.
- B.** Hydroxide Alkalinity is present if Phenolphthalein Alkalinity is more than one-half the Total Alkalinity.
- C.** Bicarbonate Alkalinity is present if Phenolphthalein Alkalinity is less than one-half the Total Alkalinity.

Mathematical conversion of the result is shown in the following table:

**Relationships Between Phenolphthalein,
Total, Carbonate, Bicarbonate and Hydroxide Alkalinity**

Result of Titration	Hydroxide Alkalinity as CaCO_3	Carbonate Alkalinity as CaCO_3	Bicarbonate Alkalinity as CaCO_3
$P = 0$	0	0	T
$P < 1/2 T$	0	2P	$T - 2P$
$P = 1/2 T$	0	2P	0
$P > 1/2 T$	$2P - T$	$2(T - P)$	0
$P = T$	T	0	0

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