



TURF LAB SOIL TEST KIT

MODEL TL-2 • CODE 5414

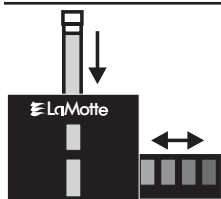
QUANTITY	CONTENTS	CODE
250 mL	*Acid Extracting Solution	*6361-K
2 x 60 mL	Charcoal Suspension	5638-H
30 mL	*Sodium Hydroxide, 15%	*7886WT-G
500 mL	Tricon Flocculating Solution	5941-L
30 mL	*Wide Range Indicator	*2218-G
250 mL	*Mixed Acid Reagent	*V-6278-K
10g	*Nitrate Reducing Reagent	*V-6279-D
60 mL	*VM Phosphate	*4410-H
15 mL	*Reducing Reagent	*6405-E
60 mL	*Special NF Phosphorus Extracting Solution	*6362-H
120 mL	*Potassium TPB Solution	*3825-J
15 mL	*Iron Reagent #1	*4450-E
4.5g	*Iron Reagent #2 Powder	*4451-S
15 mL	*CM Indicator Reagent	*6522-E1
2 x 60 mL	Standard EDTA Reagent	5254-H
30 mL	Calcium Magnesium Inhibitor Reagent	3922-G
15 mL	*TEA Reagent	*3921-E
15 mL	*Inhibitor Solution	*9258-E
15 mL	*Sodium Hydroxide Reagent	*4259-E
100	Calcium Indicator Tablets	T-5250-J
60 mL	Texture Flocculating Reagent	5643PS-H
60 mL	*Texture Dispersing Reagent	*5644PS-H
4	Test Tubes, 5-10-15 mL, plastic, w/cap	0701
8	Test Tubes, plastic, w/caps	0106
1	Test Tube, 5-10-15 mL, glass, w/cap	0778
1	Direct Reading Titrator	0384

3	Soil Separation Tube	0760
1	Double Tube, Potassium	0796
1	Test Tube Brush	0514
1	Pipet, transfer, plastic	0364
2	Pipets, 0.5 mL, plastic	0353
1	Pipet, plain, plastic	0352
5	Pipets, 1.0 mL, plastic	0354
2	Pipets, 1.0 mL, plastic w/cap	0372
1	Spoon, 0.1g, plastic	0699
1	Spoon, 1.0g, plastic	0697
1	Spoon, 0.5g, plastic	0698
1	Spoon, 0.05g, plastic	0696
1	Demineralizer Bottle	1155
2	Amber Bottles	0990
1	Funnel, plastic	0459
1	Filter Paper, 9 cm, 100/pk	0465
1	Test Paper, pH, 4.5-7.5	2953
1	Beaker, 50 mL, plastic	0944
1	Plastic Stand	1053
1	Graduated Cylinder, 25 mL	0417
1	Graduated Cylinder, glass, 100 mL	0419
1	Soil Measure, 15g	1165
1	pH Wide Range Octa-Slide Bar, 4.5-8.0	3424
1	Nitrate Nitrogen Octa-Slide Bar, 2.5-100 ppm	3422
1	Iron Octa-Slide Bar, 2.5-50 ppm	3479
1	Phosphorus Octa-Slide Bar, 15-150 ppm	3423
1	Octa-Slide Viewer	1100
1	Greenskeeper Soil Sampler	1159
1	Dial Thermometer	1116

***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-5414. To order individual reagents or test components, use the specified code number.

USE OF THE OCTA-SLIDE VIEWER



The Octa-Slide Viewer should be held so non-direct light enters through the back of the viewer. With sample tube inserted at top, slide the Octa-Slide bar through the viewer and match with color standard.

USE OF THE GREENSKEEPER SOIL SAMPLER

Pass the solid brass rod through the holes in the hollow brass tube to form a handle. Brush away grass or leaves from the area to be sampled. Holding the handle, push the hollow tube firmly, with a twisting motion, into the soil to the desired depth. Pull the tube straight up to remove it from the soil. Remove the solid rod from the sampler. Insert the solid rod into the tube and firmly push out of the soil sample.

TEMPERATURE

1. Remove the dial thermometer from the protective plastic sheath.
2. Firmly push the thermometer into the soil to a depth of 2 to 3 inches.
3. Read the temperature from the scale when it stabilizes.

EXTRACTION

The following method of extraction is used for obtaining the soil filtrate for the tests for nitrogen, phosphorus, potassium, calcium, magnesium and iron. A separate extraction is required for pH. Consult the *LaMotte Soil Handbook* for information on sampling and preparation of the soil for testing.

Read the Demineralizer Bottle Instructions before proceeding.

NOTE: The Single Test Procedure will give an adequate amount of soil extract to do one test. The extraction procedure using 15 grams of soil should be used when testing for more than one factor.

MULTIPLE TEST PROCEDURE

1. Use the 1 mL pipet (0354) to add 5 mL (5 x 1 mL) of the *Acid Extracting Solution (6361) to the 100 mL graduated cylinder (0419). Dilute to 75 mL with deionized water.
2. Pour this solution into the 100 mL bottle (0990).
3. Measure 15 g of the soil sample and add to the solution in the bottle. (Use the plastic soil measure (1165) which is filled level full with the soil sample.) Add 2 mL of Charcoal Suspension (5638). Cap and shake to mix for 5 minutes.
4. Use the funnel (0465) and filter paper (0465) to filter solution. Collect the soil filtrate in a 100 mL bottle. The soil filtrate is used for all of the tests, except pH.

SINGLE TEST PROCEDURE

1. Use the 1 mL pipet (0354) to add 1 mL of the *Acid Extracting Solution (6361) to the test tube (0701). Dilute to 15 mL line with deionized water.
2. Use the 1.0 g spoon (0697) to add 3 measures of soil.
3. Add 0.5 mL of Charcoal Suspension (5638). Cap and shake for 5 minutes.
4. Use the funnel (0465) and filter paper (0465) to filter solution. Collect the soil filtrate in a 100 mL bottle. The soil filtrate is used for all of the tests, except pH.

pH

1. Fill a test tube (0106) to the 5 mL line with Tricon Flocculating Solution (5941).
 2. Use the 0.5 g spoon (0698) to add 3 measures of the soil sample. Stopper the tube and gently mix by inverting the tube back and forth slowly for one minute. Allow the soil particles to settle.
 3. Use the pipet (0364) to transfer the clear solution above the soil to another tube (0106). Fill second tube to the 25 mL line.
 4. Add 6 drops of *Wide Range Indicator (2218). Cap and mix.
 5. Insert test tube into the Octa-Slide Viewer (1100). Slide the pH Wide Range Octa-Slide Bar (3424) into the Viewer. Match the sample color to a color standard. Record as pH. If the sample color falls between two standards, take the midpoint between the two standard values as the result.
- NOTE:** Liming Tables are found on page 23 of the *LaMotte Soil Handbook*.

NITRATE NITROGEN

1. Fill test tube (0106) to the 5 mL line with the soil filtrate.
2. Dilute to 10 mL line with *Mixed Acid Reagent (V-6278).
3. Use the 0.1 g spoon (0699) to add 2 level measures of *Nitrate Reducing Reagent (V-6279). Cap and mix by inverting 50 - 60 times in one minute. Wait 10 minutes for maximum color development.

NOTE: At the end of the waiting period, an undissolved portion of the *Nitrate Reducing Reagent may remain in the bottom of the tube without affecting the results.

4. Mix the sample one time and insert the tube into the top hole of the Octa-Slide Viewer (1100). Slide the Nitrate Nitrogen Octa-Slide Bar (3422) into the Viewer. Match sample color to a color standard. Record as lb/acre nitrate nitrogen. If the sample color falls between two standards, take the midpoint between the two standard values as the result.

NOTE: Values above the highest standard may be determined by diluting the filtrate and multiplying the results by a dilution factor.

PHOSPHORUS

1. Use the 1 mL pipet (0354) to add 1 mL of the soil filtrate to the tube (0106).
2. Dilute to the 5 mL line with deionized water.
3. Use the 0.5 mL pipet (0353) to add 0.5 mL of *VM Phosphate (4410). Cap and mix by inverting 3 times. Wait 5 minutes.
4. Use the plain pipet (0352) to add 2 drops of *Reducing Reagent (6405). Cap and mix. Solution will turn blue.
5. Insert test tube into the Octa-Slide Viewer (1100). Slide the Phosphorus Octa-Slide Bar (3423) into the Viewer. Match sample color to a color standard. Record as lb/acre phosphorus. If the sample color falls between two standards, take the midpoint between the two standard values as the result.

NOTE: Values above the highest standard may be determined by diluting the filtrate and multiplying the results by a dilution factor.

PHOSPHORUS IN ALKALINE SOILS

A special extraction procedure is used for determining the available phosphorus content of Western U.S. soils where the pH value is above 7.0.

EXTRACTION PROCEDURE

1. Use the 1 mL pipet (0354) to add 1 mL of the *Special NF Extracting Solution (6362) to the test tube (0701). Dilute to 15 mL line with deionized water.
2. Use the 1 g spoon (0697) to add 3 measures of soil.
3. Add 0.5 mL of Charcoal Suspension (5638). Cap and mix for 5 minutes.
4. Use the funnel (0459) and filter paper (0465) to filter solution. Collect the soil filtrate in a vial (0989).
5. Perform the Phosphorus test according to the procedure above.

POTASSIUM

1. Use the 1 mL pipet (0354) to add 2 mL of soil filtrate to the round tube.
2. Use a second 1 mL pipet (0354) to add 2 mL of *Potassium TPB Solution (3825). Wait 5 minutes.
3. Dilute to top line with deionized water. Cap and shake to mix.
4. Remove the cap and slowly insert the square tube with the collar. The square tube will slide up and down through the collar and will fill with liquid.
5. Viewing from above, adjust the square tube in the turbid solution until the black dot on its base is obscured. Hold the round tube at the top to avoid blocking the light.
6. Note the height of the liquid in the square tube. Record as lb/acre potassium. To convert the results to potash (K_2O), multiply the result by 1.2. Record as lb/acre potash.

NOTE: Brush tubes thoroughly after each use.

NEUTRALIZATION OF SOIL FILTRATE

In the Iron, Calcium and Magnesium tests, the acidity of the soil filtrate must be neutralized before testing. This is done by adding Sodium Hydroxide, 15% (7886) to the soil filtrate, one drop at a time, until the pH test paper (2953) indicates that the pH is between 6.0 and 7.0.

IRON

1. Fill test tube (0106) to the 5 mL line with soil filtrate.
2. Neutralize according to Neutralization of Soil Filtrate Instructions.
3. Add 5 drops of *Iron Reagent #1 (4450).
4. Use the 0.05 g spoon (0696) to add one measure of *Iron Reagent #2 Powder (V-4451). Cap and mix until the powder has dissolved. Wait 3 minutes for maximum color development.
5. Mix once and insert test tube into the Octa-Slide Viewer (1100). Slide the Iron Octa-Slide Bar (3479) into the Viewer. Match sample color to a color standard. Record as ppm iron. If the sample color falls between two standards, take the midpoint between the two standard values as the result.

CALCIUM AND MAGNESIUM

The Schwarzenbach EDTA titration method, used to determine calcium and magnesium, involves two titrations. The first titration gives the combined calcium and magnesium content and the second gives the calcium content. Magnesium is calculated from the difference between the titration values.

Read LaMotte's Direct Reading Titrator Manual before proceeding.

DILUTION OF SOIL EXTRACT

Using the 25 mL graduated cylinder (0417), measure 10 mL of the soil filtrate and transfer it to a 50 mL beaker (0944). Add 10 mL of deionized water, mix and neutralize according to the procedure previously described.

TITRATION A, CALCIUM & MAGNESIUM

1. Fill the test tube (0778) to the 5 mL line with diluted soil filtrate. Dilute to the 10 mL line with deionized water.
2. Add 5 drops of Calcium Magnesium Inhibitor Reagent (3922). Wait 5 minutes. Swirl to mix.
3. Add 5 drops of *Calcium-Magnesium Buffer (5126). Swirl to mix.
4. Add 10 drops of *CM Indicator (6522). Swirl to mix. Solution will turn red.
5. Fill the Direct Reading Titrator (0384) with Standard EDTA Reagent (5254). Insert Titrator tip into the center hole of the test tube cap.
6. While gently swirling the tube, slowly press the plunger to titrate until red color changes to blue.
7. Read the Titration scale at the tip of the plunger. Multiply by 5.16. Record as Titration Value A.

TITRATION B, CALCIUM

1. Fill test tube (0778) to the 5 mL line with diluted soil filtrate. Dilute to 10 mL line with deionized water.
2. Add 2 drops of *Inhibitor Solution (9258). Swirl to mix.
3. Add 2 drops of *TEA Reagent (3921). Swirl to mix.
4. Add 8 drops of *Sodium Hydroxide Reagent (4259). Swirl to mix.
5. Add one Calcium Indicator Tablet (T-5250) to the test sample. Cap and mix until tablet disintegrates. Solution will turn red.
6. Fill the Titrator with Standard EDTA Reagent (5254). Insert Titrator tip into the center hole of the test tube cap.
7. While gently swirling the tube, slowly press the plunger to titrate until the red color changes to a clear blue, and does not revert to red upon standing 1 - 2 minutes.
8. Read the Titrator scale at the tip of the plunger. Multiply by 5.16. Record as Titration Value B.

FINAL RESULTS

Calcium Content = $0.4 \times$ Titration Value B = ppm Ca

Magnesium Content = 0.24 (Value A – Value B) = ppm Mg

Multiply the results by 2 to obtain the content in pounds per acre

EXAMPLE:

Titration Value A is 640 ppm CaCO_3

Titration Value B is 520 ppm CaCO_3

Calcium = $0.4 \times 520 = 208$ ppm Ca

$208 \times 2 = 416$ lb/acre Ca

Magnesium = 0.24 (640 – 520)

$0.24 \times 120 = 29$ ppm Mg

$29 \times 2 = 58$ lb/acre Mg

LaMOTTE COMPANY

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