NITROGEN MODULE

FOR SOIL MACRONUTRIENTS KIT
COLOR CHART, 10-150 lb/acre

CODE 5930-01

QUANTITY	CONTENTS	CODE
120 mL	Universal Extracting Solution	5173PS-J
120 mL	Universal Extracting Solution	5173PT-J
30 mL	*Nitrate Reagent #1	*5146-G
30 g	*Nitrate Reagent #2 Powder	*5147-G
2	Spoon, 0.5 g, plastic	0698
1	Pipet, 1.0 mL, plastic	0354
1	Rod, plastic, stirring	0519
1	Spot Plate, double, plastic	0159
1	Funnel, plastic	0459
3	Test Tubes, 1-8 mL, plastic, w/cap	0755
1	Pipet, plain, plastic, w/cap	0392
1	Filter Paper, 50 pk	0465-H
1	Test Tube, filtrate, plastic	0749
1	Nitrate-Nitrogen Color Chart	1315

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Emergency information for all LaMotte reagents is available from Chem-Tel: (US, 1-800-255-3924) (International, call collect, 813-248-0585).

To order individual reagents or test kit components, use the specified code number.

For a discussion of the importance of Nitrate-Nitrogen, see of *A Study of Soil Science* (1530) by Dr. Henry D. Foth.

Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

PROCEDURE

1. Fill a test tube (0755) to line 7 with Universal Extracting Solution (5173).
2. Use 0.5 g spoon (0698) to add four level measures of soil. Cap and shake for one minute.

   NOTE: When adding samples with high concentrations of carbonates to Universal Extracting Solution (5173), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half. Fold in half again. Gently push corners together to form a cone. Place cone in funnel (0459).
4. Place funnel in clean filtrate tube (0749) and filter suspension through the filter paper. The clear solution is the soil extract.
5. Use the 1 mL pipet (0354) to transfer 1 mL of soil extract to one of the depressions on the spot plate (0159).
6. Use pipet (0392) to add 10 drops of *Nitrate Reagent #1 (5146).
7. Use the 0.5g spoon (0698) to add one measure of *Nitrate Reagent #2 Powder (5147). Stir thoroughly with plastic rod. Wait five minutes.
8. Match sample color to a color standard on Nitrate-Nitrogen Color Chart (1315). Record as lb/acre nitrate-nitrogen.

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65930-01 11.19

PHOSPHORUS MODULE

FOR SOIL MACRONUTRIENTS KIT · CODE 5928-01

COLOR CHART, 10-200 lb/a

CODE 5931-01

QUANTITY	CONTENTS	CODE
120 mL	Universal Extracting Solution	5173PS-J
120 mL	Universal Extracting Solution	5173PT-J
30 mL	*Phosphorus Reagent #2	*5156-G
50	Phosphorus Test Tablets	5706A-H
1	Pipet, plain, glass, w/cap	0341
1	Filter Paper, 50 pk	0465-H
1	Funnel, plastic	0459
1	Test Tube, 1-8 mL, plastic, w/cap	0755
2	Test Tubes, Phosphorus B, w/caps	0244
1	Test Tube, plastic, filtrate	0749
1	Spoon, 0.5 g	0698
1	Color Chart, Phosphorus	1312

*WARNING: Reagents marked with an * are considered to be potential health hazards. To view or print a Safety Data Sheet (SDS) for these reagents go to www.lamotte.com. Search for the four digit reagent code number listed on the reagent label, in the contents list or in the test procedures. Omit any letter that follows or precedes the four digit code number. For example, if the code is 4450WT-H, search 4450. To obtain a printed copy, contact LaMotte by email, phone or fax.

Emergency information for all LaMotte reagents is available from Chem-Tel (US, 1-800-255-3924) (International, call collect, 813-248-0585).

To order individual reagents or test kit components, use the specified code number.

For a discussion of the importance of phosphorus, read the handbook, *A Study of Soil Science* (Code 1530) by Dr. Henry D. Foth.

Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

PROCEDURE

NOTE: This reagent system is very sensitive to contamination. The work area, materials and hands should be clean. Avoid exposure to fertilizer dust.

1. Fill a test tube (0755) to line 7 with Universal Extracting Solution (5173).
2. Use the 0.5 g spoon (0698) to add four level measures of soil. Cap tube and shake for one minute.

   NOTE: When adding samples with high concentrations of carbonates to Universal Extracting Solution (5173), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half. Fold in half again. Gently push corners together to form a cone. Place cone in funnel (0459).
4. Place funnel in clean filtrate tube (0749) and filter suspension through the filter paper. The clear solution is the extract used in the test.
5. Fill the Phosphorus "B" Tube (0244) to the mark with the soil extract.
6. Add 6 drops of *Phosphorus Reagent #2 (5156). Swirl to mix.
7. Add one Phosphorus Test Tablet (5706A-H). Cap and swirl until the tablet disintegrates.
8. Remove cap. Hold tube ½" above the white area of the Phosphorus Color Chart (1312). Looking down through the solution, match sample color to a color standard. Record as lbs/acre phosphorus. The color comparison should be done in natural light.

   NOTE: Do not allow the solution to stand for more than 10 minutes before making the color comparison.

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POTASSIUM MODULE

FOR SOIL MACRONUTRIENTS KIT · CODE 5928-01
TURBIDITY TUBE, 100 - 400 lbl/acre

CODE 5932-01

QUANTITY	CONTENTS	CODE
120 mL	Universal Extracting Solution	5173PT-J
120 mL	Universal Extracting Solution	5173PS-J
50	*Potassium B Tablets	*5161A-H
120 mL	*Potassium Reagent C	*5162-J
1	Test Tube, Potash "B"	0246
4	Test Tubes, 1-8 mL, plastic, w/cap	0755
1	Funnel, plastic	0459
1	Filter Paper, 50 pk	0465-H
1	Pipet, plastic	0364
1	Spoon, 0.5 g	0698
1	Potash Reading Plate	1107
1	Test Tube, filtrate, plastic	0749
1	Dispenser Cap	0692

*WARNING: Reagents marked with an * are considered to be potential health hazards. To view or print a Safety Data Sheet (SDS) for these reagents go to www.lamotte.com. Search for the four digit reagent code number listed on the reagent label, in the contents list or in the test procedures. Omit any letter that follows or precedes the four digit code number. For example, if the code is 4450WT-H, search 4450. To obtain a printed copy, contact LaMotte by email, phone or fax.

Emergency information for all LaMotte reagents is available from Chem-Tel: (US, 1-800-255-3924) (International, call collect, 813-248-0585).

To order individual reagents or test kit components, use the specified code number. For a discussion of the importance of potassium, see A Study of Soil Science (Code 1530) by Dr. Henry D. Foth.

NOTE: It is important the temperature of the test sample and the *Potassium Reagent C be kept between of 20-27°C (68-80°F) during the test, in order to ensure complete precipitation of the potassium. On warm days the vial containing the test solution to which the *Potassium Reagent B Tablet has been added and the *Potassium Reagent C should be cooled by placing them in cool water before mixing.

Place dispenser cap (0692) on *Potassium Reagent C (5162). Save this cap for refill reagents.

Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

PROCEDURE

1. Fill a test tube (0755) to line 7 with Universal Extracting Solution (5173).
2. Use the 0.5 g spoon (0698) to add four level measures of soil. Cap tube and shake for one minute.

   NOTE: When adding samples with high concentrations of carbonates to Universal Extracting Solution (5173), swirl tube to mix for 30 seconds before capping to allow gases to escape.
3. Fold a piece of filter paper (0465) in half. Fold in half again. Gently push corners together to form a cone. Place cone in funnel (0459).
4. Place funnel in clean filtrate tube (0749) and filter suspension through the filter paper. The clear solution is the extract used in the test.
5. Fill a clean test tube (0755) to line 3 with soil extract.
6. Add one *Potassium B Tablet (5161A). Cap and shake until tablet disintegrates.
7. Add *Potassium Reagent C (5162) to line 7. Allow it to run slowly down the side of the tube. Cap and mix gently. A precipitate will form if potassium is present.
8. Place a Potash Tube “B” (0246) on the Potash Reading Plate (1107) directly over the black line.

   NOTE: Face a window or some other source of daylight.
9. Use a pipet (0364) to add the treated test sample slowly to Tube “B” allowing it to run down the sides of the tube while observing the black line through the solution. Continue until the line just disappears.
10. The height of the column of test sample is measured against the potassium scale on the tube. Record as pounds per acre potassium.

    NOTE: For extremely high readings, dilute the filtered extract and retest. Add the soil sample filtrate to line 3 of a clean test tube (0755). Dilute to line 6 with *Universal Extracting Solution (5173). Test following the procedure beginning with Step 5. Multiply final reading by 2.

PRECAUTION: Large amounts of ammonium salts will produce a precipitate similar to that obtained with potassium. If fertilizer containing ammonium salts has recently been added to the soil, or if the soil pH is low (pH 4.0-5.0), a test should be made for ammonium compounds. Equivalent quantities of ammonium salts will produce about one-fourth as much precipitate as obtained from potassium salts.

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pH MODULE

FOR SOIL MACRONUTRIENTS KIT · CODE 5928-01
OCTA-SLIDE 2, pH 4.0 - 9.0

CODE 5935-01

QUANTITY	CONTENTS	CODE
15 mL	*Tricon pH Indicator	*5937-E
120 mL	Tricon Flocculating Reagent	5941PS-J
120 mL	Tricon Flocculating Reagent	5941PT-J
2	Test Tubes, w/caps	0845
1	Spoon, 0.5g, plastic	0698
1	pH Soil Octa-Slide 2 Bar, 4.0-9.0	5936-01
1	Octa-Slide 2 Viewer	1101

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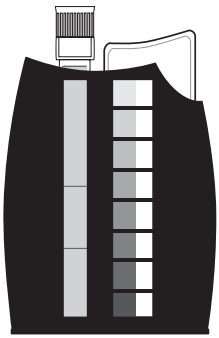
Emergency information for all LaMotte reagents is available from Chem-Tel:
(US, 1-800-255-3924) (International, call collect, 813-248-0585).

To order individual reagents or test kit components, use the specified code number.

Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

For the interpretation of the pH test and a discussion of its importance, see *A Study of Soil Science* (Code 1530) by Dr. Henry D. Foth.

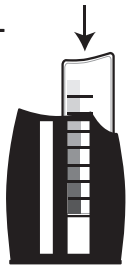
USE OF THE OCTA-SLIDE 2 VIEWER



The Octa-Slide 2 Viewer should be held so non-direct light enters through the back of the Viewer. Insert the Octa-Slide 2 Bar into the Viewer. Insert the reacted sample into the top of the Viewer. Match the color of the reaction to the color standards.

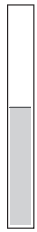
PROCEDURE

1



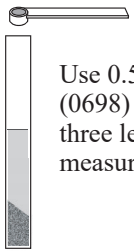
Insert pH Soil Octa-Slide 2 Bar 4.0-9.0 (5936-01) into the Octa-Slide 2 Viewer (1101)

2



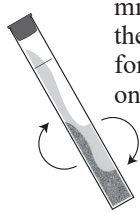
Fill a test tube (0845) to the line with Tricon Flocculating Reagent (5941).

3



Use 0.5g spoon (0698) to add three level measures of soil.

4

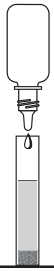


Cap and gently mix by inverting the tube back and forth slowly for one minute.

Allow soil particles to settle.

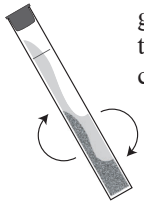
NOTE: The amount of time required for a soil to settle varies with texture; clay soils may require additional time, but in most instances the solution will be clear in several minutes.

5



Add 10 drops of *Tricon pH Indicator (5937).

6



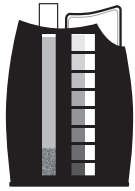
Cap and invert the test tube gently one time to mix the contents.

Allow soil to settle.

7

Insert test tube into Octa-Slide 2 Viewer (1101).

8



Match sample color to a color standard. Record as pH.

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SOIL SAMPLING TUBE

CODE 1055

The Soil Sampling Tube (Code 1055) is a hollow cylinder of galvanized steel with a handle at one end and a saw-toothed cutting edge at the other. One side of the cylinder is cut away to permit inspection of soil core stratification. The sampler is 12 inches in length and removes a soil core 1 inch in diameter. The cutaway "viewing window" begins 1 inch above the cutting edge and is 9.75 inches long.

PROCEDURE

1. Holding the tube in a vertical position, force it into the soil approximately 6 to 9 inches. Leave about 1 inch of the cutaway portion of the tube showing above the surface of the soil. Deeper penetration will compress the soil in the tube, making it difficult to remove.
2. Twist the tube back and forth to sever the core.
3. Continuing to twist the tube back and forth with a rapid motion, lean the tube toward you with the cutaway portion facing up and slowly withdraw the tube from the soil. The twisting motion will insure that the tube is withdrawn without breaking soil or turf, resulting in a perfect soil sample. The wetter the soil, the more carefully these instructions must be followed.
4. Remove the soil sample through the cutaway portion of the tube. When soil tests are to be performed on sample taken from a particular depth (e.g., 6 to 8 inches), simply measure downward from the top of the soil core to locate soil from the desired depth. Use a clean utensil to dislodge soil remaining in the tip of the sampler.

A detailed discussion of the proper technique for collection and preparation of soil samples may be found in any one of the publications available from LaMotte Company: ***The Garden Guide Manual*** (36250), ***A Study of Soil Science*** (1530), or ***The LaMotte Soil Handbook*** (1504). An abbreviated discussion of soil sample collection and preparation is printed on each LaMotte Soil Sample Bag (Code 0615). Achieving optimum results with LaMotte soil test equipment requires careful attention to the sampling process.

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SOIL TEXTURE KIT

CODE 1067

QUANTITY	CONTENTS	CODE
60 mL	Soil Flocculating Reagent	5643PS-H
60 mL	Texture Dispersing Reagent	5644PS-H
1	Soil Texture Stand	1053
3	Test Tubes, Soil Texture, 50 mL, w/caps	0760
2	Pipets, 1 mL, plastic, w/caps	0372
1	A Study of Soil Science	1530

*WARNING: Reagents marked with an * are considered to be potential health hazards. To view or print a Safety Data Sheet (SDS) for these reagents go to www.lamotte.com. Search for the four digit reagent code number listed on the reagent label, in the contents list or in the test procedures. Omit any letter that follows or precedes the four digit code number. For example, if the code is 4450WT-H, search 4450. To obtain a printed copy, contact LaMotte by email, phone or fax.

Emergency information for all LaMotte reagents is available from Chem-Tel: (US, 1-800-255-3924) (International, call collect, 813-248-0585)

To order refill reagents or test kit components, use the specified code number.

This test is designed to separate soil into its three basic mineral fractions: sand, silt, and clay. The amount of time required for the soil particles of various sizes to settle in the soil separation tubes forms the basis for this test. From the amount of material collected in each tube it is possible to determine the approximate percentage of each fraction as represented in the original soil sample.

The procedure for preparation of the soil sample for testing is described in the accompanying handbook, *A Study Of Soil Science*.

Warning! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

PROCEDURE

1. Label the Soil Texture Tubes (0760) as **A**, **B**, and **C**.
2. Place the three Soil Texture Tubes in the rack.
3. Add the soil sample to Soil Texture Tube **A** until it is even with line 15.
   NOTE: Gently tap the bottom of the tube on a firm surface to pack the soil and eliminate air spaces.
4. Use the pipet (0372) to add 1 mL of Texture Dispersing Reagent (5644PS) to the sample in Soil Texture Tube **A**. Dilute to line 45 with tap water.
5. Cap and gently shake for two minutes, making sure the soil sample and water are thoroughly mixed.

The sample is now ready for separation. The separation is accomplished by allowing a predetermined time for each fraction to settle out of the solution. Be sure that you continue to gently shake the separation tube up to the time of the first separation (Step 6).

6. Place Soil Texture Tube **A** in the rack. Allow to stand undisturbed for exactly 30 seconds.
7. Carefully pour off all the solution into Soil Texture Tube **B**. Return Tube **A** to the rack. Allow Tube **B** to stand undisturbed for 30 minutes.
8. Carefully pour off the solution from Soil Texture Tube **B** into Soil Texture Tube **C**. Return Tube **B** to the rack.
9. Add 1 mL of Soil Flocculation Reagent (5643PS) to Soil Texture Tube **C**. Cap and gently shake for one minute.
10. Place the Soil Texture Tube **C** in the rack and allow to stand until all the clay in suspension settles. This may require up to 24 hours.

    NOTE: Unless there is further use of the clay sample for air drying and study as described later, it is not necessary to wait for the suspension to settle.

Due to the colloidal nature of clay in solution and its tendency to swell and form a gel, the portion of clay remaining in Tube **C** is not used to determine the clay fraction present in the soil. The clay fraction is calculated by adding the sand and silt fractions and subtracting this total from the initial volume of soil used for the separation.

EXAMPLE:

Tube **A** Sand	2	Initial Volume	15
+ Tube **B** Silt	+8	– Total **A** & **B**	–10
Total **A** & **B**	10	Clay	5

11. Read Soil Texture Tube **A** at top of soil level. To calculate percentage sand in the soil, divide reading by 15. Multiply by 100. Record as % sand.
12. Read Soil Texture Tube **B** at top of soil level. To calculate percentage silt in the soil, divide reading by 15. Multiply by 100. Record as % silt.
13. Calculate volume of clay as shown above. To calculate percent clay in the soil, divide value by 15. Multiply by 100. Record as % clay.

CALCULATION

EXAMPLE:

Soil Texture Tube **A** reads 2.

Soil Texture Tube **B** reads 8.

$$\text{Percent Sand} = \frac{\text{Reading } \mathbf{A} \times 100}{\text{Total Volume}} = \frac{2 \times 100}{15} = 13\%$$

$$\text{Percent Silt} = \frac{\text{Reading } \mathbf{B} \times 100}{\text{Total Volume}} = \frac{8 \times 100}{15} = 53\%$$

$$\text{Percent Clay} = \frac{\text{Calculated Volume} \times 100}{\text{Total Volume}} = \frac{5 \times 100}{15} = 33\%$$

Since the scientific basis of the test is the particle size and its mass, as related to its settling time when dispersed in solution, the following table is included for reference.

SOIL PARTICLE	DIAMETER (mm)
Very Coarse Sand	2.0 – 1.0
Coarse Sand	1.0 – 0.5
Medium Sand	0.5 – 0.25
Fine Sand	0.25 – 0.10
Very Fine Sand	0.10 – 0.05
Silt	0.05 – 0.002
Clay	Less than 0.002

INTERPRETATION

Sandy soil is described as soil material that contains 85% or more sand. The percentage of silt plus 1.5 times the percentage of clay shall not exceed 15.

Silt soil is described as soil material that contains 80% or more silt and less than 12% clay.

Clay soil is described as soil material that contains 40% or more clay, less than 45% sand and less than 40% silt.

To further describe the various graduations possible under each general soil texture classification mentioned above, additional terms have been applied. Some examples of these are loamy sand, sandy loam, silty clay loam, sandy clay or a silty clay.

Once the three textural classes for a soil have been determined it may be of further interest to place the material from each Soil Texture Tube in individual piles on a piece of paper. Allow sufficient time for air drying. Now it is possible to determine the feel of the various textural classes. This experience will be helpful when the student is in the field.

The following statements give the more obvious characteristics of a textural class based on its feel when rubbed between the fingers.

Sand is loose and single grained and will fall apart after being squeezed when dry. When sand is wet it will form a cast that falls apart after being squeezed.

Sandy loam contains mostly sand, but also some silt and clay. Individual sand grains can be felt and seen.

Silt loam has a moderate amount of the very find grains of sand, is fine-textured and contains only a small amount of clay. A dry sample feels smooth and silky like flour or talcum powder.

Clay loam is a fine-textured soil that after working breaks up into clods or lumps that are hard to break when dry. A wet cast forms a smooth smear and is sticky when squeezed.

WATER SEDIMENTATION TEST

These tubes may also be used as sedimentation tubes for the study of turbid waters.

Fill tubes to the 50 mL line with sample water. Cap and place in the plastic rack. Leave undisturbed until all the solid material has settled.

CALCULATION

Each 0.5 mL of solid material collected is equivalent to 1% of the total volume.

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