NEO/SCI STUDENT'S GUIDE

NAME

TEACHER/SECTION

DATE

New ideas for teaching 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.

ACTIVITY 1

Physical Characteristics of Soil

Soil texture is determined by the relative proportion of sand, silt and clay present in a given sample. Sand is the largest particle in the soil. Its size varies from 0.05 to 2mm. It feels rough to the touch, because it has rough, angular edges and does not "hold" any nutrients. Silt is a soil particle that's size is between that of sand and clay. Silt has a smooth texture. Clay is the smallest of the soil particles, measuring less than 0.002 mm in size. It is smooth when dry and sticky when wet. It has the ability to hold a lot of nutrients, but because it is very compact, it does not allow air or water to pass through it. Any particles that are greater than 2 mm do not contribute to the soil's texture and are considered "gravel".

What you Need

Per Student

Apron
Gloves
Goggles

Per Team

1	Dish, plastic
1	Magnifier (shared)
3	Soil samples, collected
	Water

What to Do...

Prior to the laboratory activity, collect various soil types from diversified locations such as a garden, a marsh, non-vegetative areas, the side of a road, a pond shore, near a creek or at any other areas of interest near your home or school.

Step 1

The composition of soil determines the kind of plants and animals that can exist within it. Take a small amount of your collected Soil Sample #1 and spread it into a plastic dish to observe its color, texture, and size of its particles.

Step 2

Using a magnifying glass, try to find clay particles, silt, sand, gravel and organic matter in your soil sample. Describe the appearance of each type of particle.

Step 3

To determine the proportion of the various soil particles present in your soil samples, fill a vial halfway with one of your soil samples. Add water until it reaches approximately 2 cm from the top of the vial.

Step 4

Securely place the cap over the vial and shake the jar vigorously for several minutes, or until all of the large particles break apart. Allow the soil mixture to settle for at least 1 hour and preferably overnight.

Step 5

After the settling period, you will observe that the soil has separated into layers of floating organic matter, water, settled organic matter, clay, silt, fine sand, coarse sand and gravel. Make an illustration and identify the various layers observed.

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Step 6

Using a ruler, measure the depth of each layer and record your results in Data Table 1. Compare your results with those of the other teams in your class.

Recording Observations

Data Table 1

Depth of Each Soil Particle Type (in mm)					
Soil Sample	Gravel	Coarse Sand	Fine Sand	Silt	Clay

Questions

1. Which soil particle made up the greatest portion in your soil sample?

2. Which soil particle contained in your soil sample affects water drainage the most?

3. How does the soil's particle type affect plant growth and the types of organisms that live within it?

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ACTIVITY 2

Testing soil for Acidity, Nitrogen, Potassium and Phosphate

What you Need

Per Student

- Apron
- Gloves
- Goggles

Per Team

4mL	Nitrate, potassium, phosphate and pH test reagent solutions
2	Pipets, plastic
2	Soil samples, collected
1	Test tube
1	Test reagent color chart (shared)

Safety

Put on your safety goggles, gloves and apron or as directed by your teacher.

What to Do...

Prior to the laboratory activity, collect soil types from various habitats such as the surface of leaf litter, surface soil to a depth of 15 cm, soil 30 cm deep, dry soil, boggy soil, moist soil, garden soil, fertilized or non-fertilized lawn, soil along a lake or pond shore or organic material such as dead leaves, moss, humus, mulch or compost pile.

Step 1

Fill a cup or a 250 mL beaker one-quarter full with one of the soil samples collected. Fill the rest of the beaker with distilled or tap water.

Step 2

Thoroughly stir the soil and water together for several minutes, then allow the mixture to stand undisturbed until the soil settles (i.e. approximately 30 minutes) and the water starts to clarify. To hasten this process, the soil water may also be filtered using a medium grade filter to remove soil particles.

Step 3

Label four test tubes "pH," "Nitrate," "Phosphate," and "Potassium." Using a pipet, add 2 mL of the clarified soil water to each of the four test tubes.

Step 4

Add 2mL of the pH test reagent solution to the corresponding test tube. Carefully swirl to mix the test mixture and observe it for any color change. Compare your results after 3-4 minutes to the pH Color Chart provided. Record your results in Data Table 2.

Step 5

Repeat Step 4 to test for nitrate, phosphate and potassium content by adding the appropriate test reagent solutions in the corresponding test tubes. Record your results in Data Table 2.

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Step 6

Repeat Steps 1 through 5 to test additional soil samples.
Record your results in Data Table 2.

Recording Observations

Data Table 2

Soil Sample	pH	Nitrate	Phosphate	Potassium

Questions

1. Why is it necessary to test the soil for pH, nitrate, phosphate and potassium content?

2. Correlate the pH and nutrient content of your soil samples with their location.