**Investigating the Physical Properties of Soil**

**Part 1: Sand, Silt, and Clay particles**

Take small pinches of sand, silt, and clay, and put them on separate microscope slides. Look at the particles under the microscope and draw what you see, indicating the color(s). Also, label each drawing with the magnification used.

Sand particles:

Silt particles:

Clay particles:

**Part 2: Soil samples**

In groups of 3, you will go outside and obtain two different soil samples using plastic cups and spoons (or shovels if needed). Choose soil samples from different locations and make sure to note where you obtained the sample, and what the vegetation looked like around the area. (Make sure to label your samples).

Sample #1

Approximate location (describe):

Summarize any observations you think may be relevant, such as what the surrounding vegetation looked like:

Look at this sample under a microscope and sketch what you see:

By looking at your sample under the microscope, estimate the proportions of sand to silt (might be difficult to see clay particles) that are present in your sample:

Sample #2

Approximate location (describe):

Summarize any observations you think may be relevant, such as what the surrounding vegetation looked like:

Look at this sample under a microscope and sketch what you see:

Estimate the proportions of sand to silt (might be difficult to see clay particles) that are present in your sample:

**Part 3: Testing soil composition**

Put a spoonful of your sample in a test tube (labeled with your sample number and initials). Fill the rest of the test tube with water, cover with your finger and shake mixture to homogenize. Set the test tube in the rack provided and let sit for at least 1 hour. (Come back to this part later).

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After a significant amount of time has passed, measure the height of the sand layer (at the bottom of the tube), the silt layer (settled on top of the sand), and the organic matter (floating on top of the water) for each sample.

The proportion of sand to silt can then be calculated by the height of each divided by the height of sand + the height of silt. What is the proportion of sand to silt for each of your soil samples?

How does this compare to your estimation from part 2?

**Part 4: Soil permeability lab**

**Background Information:**

A soil's permeability is a measure of the ability of air and water to move through it. Permeability is influenced by the size, shape, and continuity of the pore spaces, which in turn are dependent on the soil bulk density, structure and texture.

The rate of water flow through medium and fine textured soils such as loams, silts, and clays is usually less than that of coarse textured soils such as sands and gravel. Water and plant nutrient losses may be greater on coarse textured soils, so the timing and quantity of chemical and water applications is particularly critical on these soils.

**Materials:**

 Beaker

 Funnel

 Filter Paper

 2 Soil samples (that you collected)

 2 Soil samples provided- all-purpose potting mix and cactus potting mix

 50 mL graduated cylinder

**Procedure:**

1. Fold filter paper so that it fits into the funnel (see instructor for assistance if needed) or use a coffee filter.
2. Fill funnel containing the filter paper with one of your soil samples (about half-full). Pack it down lightly so that there are not large air spaces.
3. One of the lab partners will hold the funnel with the soil above a beaker so that they can catch the water as it drips through the soil.
4. Before beginning the experiment, saturate the soil with water first, then discard all water that has dripped through
5. Measure out 50 mL. of water and slowly pour it on top of the soil.
6. Time for 1 minute; after which the funnel with the soil will be set aside. (Be careful, it will still drip water, so put it in a sink or over a different cup or beaker).
7. Pour the water from the beaker into the graduated cylinder to see how much of the 50 mL came through.
8. Record the amount in the chart below and repeat the procedure for the remaining three soil samples.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Soil Sample #1 | Soil Sample #2 | Regular Potting Mix | Cactus Potting Mix |
| Volume of Water (mL.) |  |  |  |  |

**Analysis**

1. Why would a farmer need to know the soil permeability on his or her land?
2. Which of the soil samples you tested held the most water and why?
3. How was the cactus potting mix different from the regular potting mix?
4. Why do cacti have different soil requirements than the typical plants we put in a garden?