SOIL ANALYSIS LAB

PART ONE: GENERAL OBSERVATIONS

Take your soil in the coffee can and carefully dump it onto your observation tray. Make sure that your soil does not spill onto the counter top or the floor. Now take a look at your soil. What do you see? Perhaps you will see some organic matter, worms, or insects. Probably you will see some rocks and roots. Observe the various particle sizes in your soil. Are most of the particles large or small? Now take a hand magnifier and look more closely. What do you see now that you did not see before? When you are done with the hand magnifier, take a petri dish and put some soil in it. Observe this soil under a stereomicroscope. What can you see now that you couldn't see before?

General observations of your soil sample:

_____

_____

_____

Abiotic components of your soil:

_____

_____

_____

Biotic components of your soil:

_____

_____

_____

PART TWO: ORGANIC MATTER

This test is conducted by using the color of the material.

Color of the sample tells us:

_____

_____

_____

PART THREE: SOIL CONSISTENCE

Determine which of the following is closest to your soil and circle the number.

1. Loose --- soil flows easily through one's hand like sand
2. Friable --- soil does not flow, but it does crumble easily between one's fingers
3. Firm---soil resists crumbling and it takes effort to brake it into pieces
4. Extremely firm ---soil is cement-like and feels like it might need a hammer to break it into pieces

PART FOUR: SOIL FERTILITY ANALYSIS

Pass two big handfuls of soil through the gray sieves. You will use the soil from this for the next two tests.

Four important components determine the fertility of the soil: pH, and the levels of nitrogen, phosphorous, and potassium. Nitrogen, phosphorus, and potassium are the three most important elemental nutrients needed by plants. Each of these four factors can serve as limiting factors for plants.

Using the soil test kit, test your soil for all four factors and record your results below.

pH: Nitrogen level: Phosphorus level: Potassium level:

What are the optimum levels for each of these, and what suggestions do you have to help the consumer get to the optimal levels?

_____

_____

_____

_____

PART FIVE: SOIL PARTICLE SIZE

Soil is made of mineral particles belonging to three size categories: clay, silt, and sand. A qualitative analysis to determine which of these three is the major component of your soil, can be done by taking a small, moist wad of your soil and squeezing it between your fingers and thumb. If it feels gritty, then you have mostly sand. If it feels sticky, you have mostly clay. If it feels neither sticky nor gritty, it is mostly silt.

Follow the attached Soil Identification Flow Chart. Using this qualitative technique, what kind of soil is it?
Circle one: clay clay-loam silt sandy-loam sandy

Now determine the percent of clay, silt, and sand that your soil contains by using the soil texture kits.
Percent clay: Percent silt: Percent sand:

Now, using the soil triangle and the percentages you calculated, determine what type of soil you have.

_____

Does this soil look and feel similar to the calibrated soil that you said it was?

_____

Suggestions to the consumer to help them get optimal soil texture:

_____

_____

_____

PART SIX: DRY PERCOLATION RATE (INFILTRATION)

The dry percolation rate is the rate at which water will flow down through dry soil. Obtain a percolation tube, rubber band some screen around the end of the tube, and then fill it up to the 10cm mark with dry soil. Use the wooden dowel to tamp down the soil in the tube a bit but not too hard. Then get a beaker of water and pour the water down the tube. Time the water from when you first pour it down the tube until the first drop comes out the bottom. Divide the number of seconds it took for the water to percolate 10cm by 10 to determine the percolation rate per centimeter.

Percolation rate per centimeter for your soil = _____seconds

Why is this important for the consumer?

_____

_____

_____

PART SEVEN: PERMEABILITY RATE

Permeability is the rate at which water will flow through already saturated soil. For this part, use the same tube and soil that you used for part six. Once again, place the percolation tube with soil into an empty 100ml graduated cylinder. Pour water down the tube again, but this time determine how long it take for 100ml of water to flow through the tube starting with the first drop out the bottom. If the water drips out the bottom of the tube very slowly, you don't have to wait for a full 100ml to go into the beaker. Instead, time how long it takes to produce 10ml and then multiply the time by 10.

The soil surface area inside your plastic tube is _____ which means that you have to divide the time that you got by the surface area to determine how long it would take for just one square centimeter of soil to pass 100ml of water.

100ml permeability rate per cm^2 of your soil = _____minutes _____seconds

Why is this important for the consumer?

_____

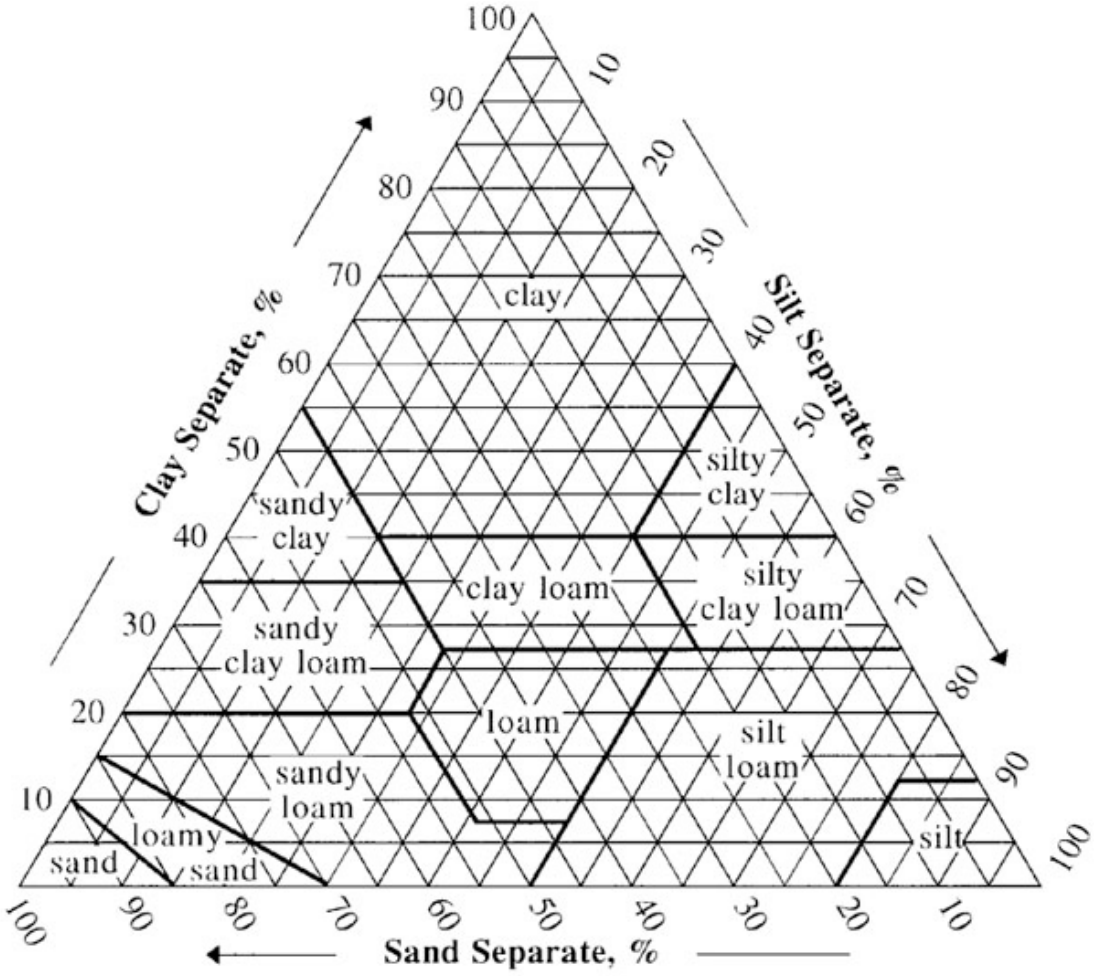
_____

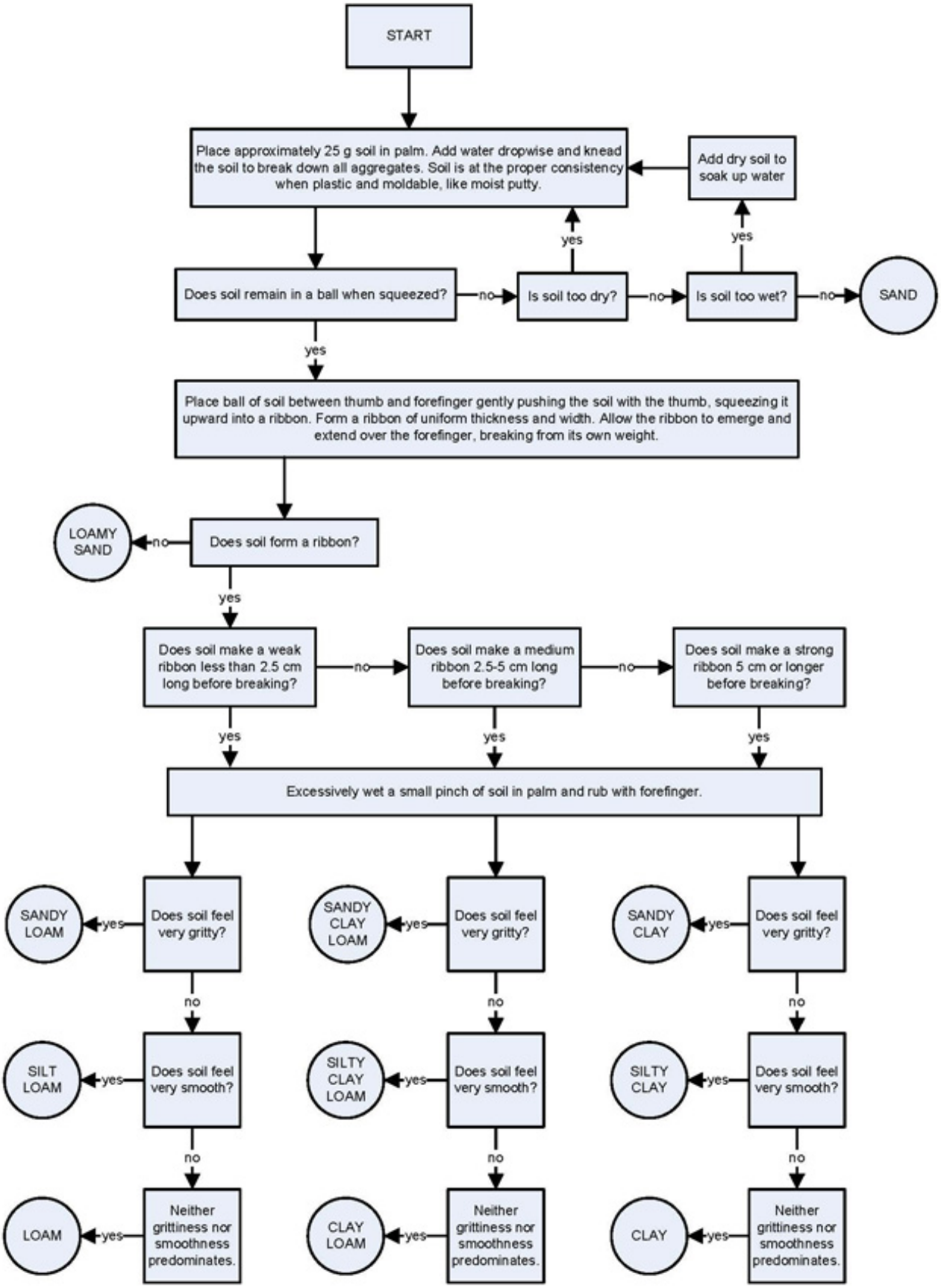
PART EIGHT: SOIL POROSITY

Porosity is the amount of air space in your soil. Porosity is important because germinating seeds and roots need oxygen. The creation of aquifers is dependent upon the pore spaces in soil and rocks.

To determine the porosity of your soil, take a 250ml beaker and fill it to the 200ml mark with your dry soil. Now take a 100ml graduate cylinder and fill it exactly to the 100ml mark. Gently pour water from the graduated cylinder into the beaker until the soil in the beaker is completely saturated and the water just starts to pool on top of the soil. By noticing how much water is left in the graduated cylinder, you can determine the amount of air space in your soil sample. If the soil is extremely porous, you may need to refill the graduate cylinder. Remember that one ml is equal to one cm^3.

$$\frac{\text{Amount of water added (mL)}}{200\text{ml}} \times 100 = \text{Percent of air space (porosity)} \_\_\_\_\_ \%$$




START
Place approximately 25 g soil in palm. Add water dropwise and knead the soil to break down all aggregates. Soil is at the proper consistency when plastic and moldable, like moist putty.
Add dry soil to soak up water
yes
yes
Does soil remain in a ball when squeezed?
no
Is soil too dry?
no
Is soil too wet?
no
SAND
yes
Place ball of soil between thumb and forefinger gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger, breaking from its own weight.
LOAMY SAND
no
Does soil form a ribbon?
yes
Does soil make a weak ribbon less than 2.5 cm long before breaking?
no
Does soil make a medium ribbon 2.5-5 cm long before breaking?
no
Does soil make a strong ribbon 5 cm or longer before breaking?
yes
yes
yes
Excessively wet a small pinch of soil in palm and rub with forefinger.
SANDY LOAM
yes
Does soil feel very gritty?
SANDY CLAY LOAM
yes
Does soil feel very gritty?
SANDY CLAY
yes
Does soil feel very gritty?
no
no
no
SILT LOAM
yes
Does soil feel very smooth?
SILTY CLAY LOAM
yes
Does soil feel very smooth?
SILTY CLAY
yes
Does soil feel very smooth?
no
no
no
LOAM
yes
Neither grittiness nor smoothness predominates.
CLAY LOAM
yes
Neither grittiness nor smoothness predominates.
CLAY
yes
Neither grittiness nor smoothness predominates.

SOIL ANALYSIS LAB PART TWO:

LETTER TO A CONSUMER

Now that you have completed Soil Analysis Lab, it is time to begin the second part of this assignment. You are to write a report for this consumer in the form of a letter explaining the results that you got from your testing and recommendations on how he or she may improve their soil.

For example, if you found that the soil was deficient in potassium, you would recommend adding potash to their soil. Remember that good soil should have a pH close to 7, an ample supply of the basic mineral nutrients, and should not contain excessive amounts of carbonates or salts.

In addition, there should be a wide range of particle sizes in the soil so that it retains an adequate supply of water and makes mineral nutrients available to root hairs while at the same time allowing for air and drainage.

If the soil's percolation or permeability rates are too slow or too fast, it would be prudent to recommend the addition of clay or sand depending on the situation. If there was little or no organic matter in the soil, it would also be advisable to add humus to the soil or suggest that the consumer begin a composting operation.

If you observed a special problem with the soil such as an excessive amount of rocks, a severe insect infestation, or a hardpan (hard soil layer that is difficult to break up into pieces) situation, you will want to recommend a mitigation.

If you find that your consumer has excellent soil, then you should explain to him or her in detail why their soil is so terrific.

This letter must be typed. It should be at least two pages, double spaced. The first page is a summary of all the tests you did, and the second page is all the recommendations you have for your consumer. This paper is due by December 20th.

Due Date: December 20th
Length: 2 pages, double spaced
Special Directions: Two copies of recommendation, one for Faxon, one for your customer. After turning in copy to Faxon, deliver to your customer.

Major lab for 1st Semester -- do your highest quality work!