I. Title: Soil Lab: Physical and Chemical Analysis
A.P. Environmental Science

II. Purpose: This laboratory experience will provide you with an opportunity to examine both the chemical and physical qualities of soils.

III. Hypothesis: Describe which soils you believe will have the best qualities for growth of plants.

IV. Materials:

Nitty Gritty Soil Kit (NPK)
Soil Augers
Plastic Collection Bags
Metric Ruler / Meterstick
Settling Tube- Cylinder

PART 1: Sample Collection: You will be assigned one soil sample to collect. Carefully use a soil auger to extract your sample. Place it in a Ziploc baggie. Try to obtain about two handfuls of soil. Label it according to the location from which it was obtained. Clearly mark your sample for soil testing back in the classroom.

A. Biological Characteristics: CLASS DATA LINK (copy and paste grids once filled)

Describe any evidence of living organisms in your soil sample.

Sample- Location	Evidence of Life
1-Flower Bed in front of School	
2-grass area by the road in the upper parking lot entrance	
3- weeded area near softball field	
4-marshy part of the Cougar Trail	

5- grassy area of practice field	

A. Physical Characteristics

1. Determine the **Texture**- Use the Soil Pyramid to determine the texture.You may find a copy in your textbook or on the internet. To determine the texture, break up large clods, fill a clear tube half-full with your soil. Label the group # on the outside of the container. Add tap water to just below the rim of the jar and tighten the lid or cap or cover with a paper towel. Shake the jar for 30 seconds. Allow the sample to sit overnight. The next day, measure the layers (in cm) and record the data. You will find layers of gravel, sand, silt and clay (from coarsest to finest). Determine the percentage of each layer. Use the soil pyramid to determine the Soil Type, record below in Table 2. Keep remaining soil moist, enclosed in a Ziploc baggie. Record Soil Type in Table 3.

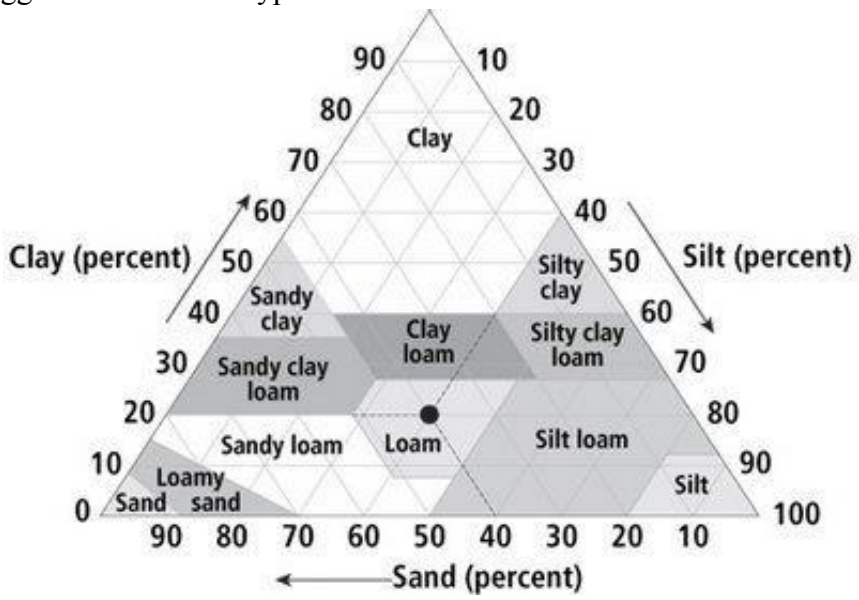

Table 2: Particle Size Distribution/Soil Texture

Sample #	Depth of Clay	Depth of Silt	Depth of Sand	Total Depth	% Clay	% Silt	% Sand

Soil Type: _____

2. Determine the **Structure**- Primary soil particles are arranged into secondary units called peds. The shape of the peds and the way in which they aggregate in a soil is referred to as soil structure. ***Granular*** soils separate easily into rounded peds. They have high permeability and do not pack tightly. Usually found near the surface where organic matter is abundant. They permit air, water, and plant roots to easily penetrate the soil. Clay and loamy soils often have blocky peds, which are angular and somewhat irregular in shape. This ensures that soils composed of ***blocky*** peds contain pores that permit passage of air and water. Soils with ***platy*** peds, which can resemble stacked sheets of ice, are tightly packed and difficult for air and water to penetrate. ***Platy*** soils usually have a high clay content and tend to be found in frequently flooded areas. ***Sandy,*** or sand itself is a structure less soil, the primary particles do not aggregate, but instead fall apart. Record in Table 3.

3. Determine the **Water Content or Consistence**- The degree to which soil resists pressure is referred to as its consistence. Use "sticky, plastic, loose, friable, soft, firm, very firm or hard". This is important where determining how well the soil resists effects of wind, water, and machinery. Hold and squeeze the soil in between your thumb and forefinger until it breaks apart. When dry, is it loose? Or is it soft or hard? Moisten the soil with the spray bottle. Is it loose, the structure falls apart easily and peds are not defined? Is it friable, breakable once a small amount of pressure is applied? Is it firm, requires significant pressure to break.

Table 2: Physical Characteristics CLASS DATA LINK

Sample- Location	**Texture (ie: silty clay loam)**	**Structure (granular, blocky, platy)**	**Water Consistence (plastic, loose, friable, soft, firm, very firm)**
1-Flower Bed in front of School			
2-grass area by the road in the upper parking lot entrance			
3- weeded area near softball field			
4-marshy part of the Cougar Trail			

5- grassy area of practice field			

C. Chemical Characteristics of Soil CLASS DATA LINK

A. Determine the chemical characteristics of your soil by testing your sample for the following. Take your sample to each of the four stations to complete the tests. Two groups may complete the tests simultaneously in order to speed the process. Record your data and be prepared to share it with the class. Nitrogen, Phosphorus and Potassium are three plant macronutrients in soil. They are measured by testing for ions of these substances. PH will indicate the acidity or basicity of the soil.

Table 4: Chemical Characteristics Class Data

Sample	pH	Nitrogen (N)	Phosphorus (P)	Potassium (K)
1-Flower Bed in front of School				
2-grass area by the road in the upper parking lot entrance				
3- weeded area near softball field				
4-marshy part of the Cougar Trail				

5- grassy area of practice field				

PART 2: Soil Horizons

A. **Horizons**
Using the Popsicle stick markers, label the horizons visible within the strata you can see. Describe each layer as best you can. Discuss color, depth of layer in cm, and the comparative amount of organic material and depth. O Horizon is the top organic layer called Humus. It is usually dark in color. The A Horizon is the first layer of mostly organic material- which we call top soil. Layers E and B are both sub-soils of the parent-materials. Layer C is the parent material, it contains some bedrock that is being broken down. A Soil Profile identifies each horizon, it's thickness, and any individual properties.

1. Sketch a profile of the cut or pit you are observing. Use appropriate colored pencils to show coloring of each horizon. Sketch carefully and neatly. ***(If you don't go to a pit, insert a real image of a soil pit- then label the layers to the right of the image. Include O,A,E,B,C,R)***

SOIL PROFILE of Stream Bank **Description of layers**

PART III. <u>Analysis Questions</u> Please respond in bold and color.

1. Rank the samples according to how well they would provide for plant growth. Describe your ranking. Support your analysis by using your results.

2. Which sample would be most porous and allow the greatest permeability of water? Is there a relationship between particle size and percolation rate? Why do you think this?

3. Why is the ability of water and air to permeate the soil an important quality of good soil?

Claim Evidence and Reasoning

Claim Make a brief claim about the quality of your sample in comparison to the other samples collect in your class.	
Evidence Cite specific evidence about your particular soil sample.	
Reasoning Discuss why your soil would be appropriate for agriculture or not. Use evidence from the lab to support your response.	