APBI 200 - **LAB # 2**

Section 1 – soil texture

Please answer the following questions:

1. Which of the following is included when determining the soil texture class?
   a) % sand
   b) % organic matter
   c) % gravel
   d) % silt
   e) % water
   f) % clay

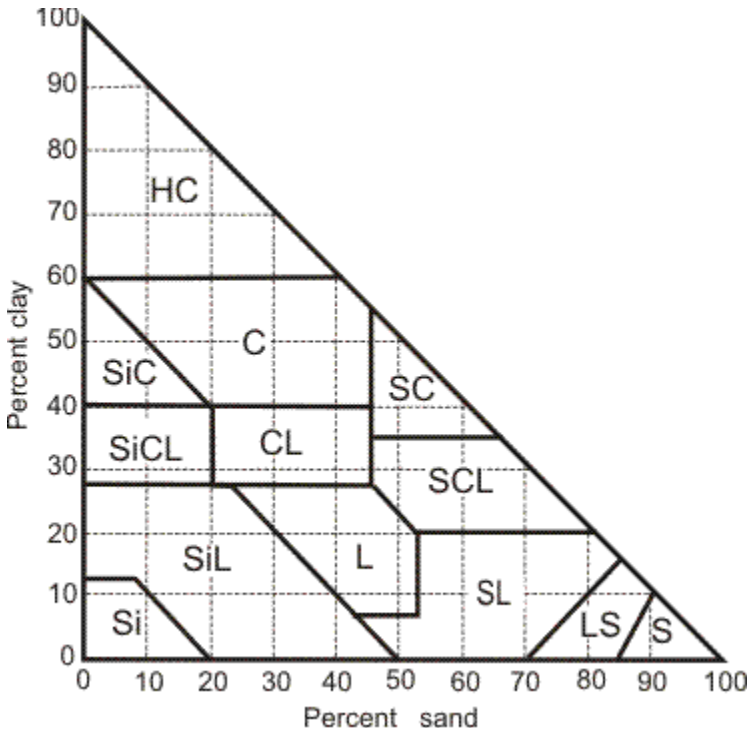
[1 point]

2. Using the Canadian Soil Texture Triangle (Figure 2 in your lab manual) and information in the table below:

a) Fill in all missing information in the table below.

Soil	% Sand	% Silt	% Clay	Textural class
A	33		33	
B		17	18	
C	10	48		
D		40	20	

b) Plot each of the 4 soils on the soil texture triangle given below, using information about their relative percentages of sand, silt, and clay.



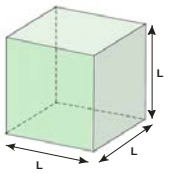
c) Why do we consider a loam soil ideal?

[4 points]

3. Specific surface area of soil mineral particles is an important property to understand. Remember the diameters of mineral soil particles, as mentioned in the lectures, are:

Coarse fragments	**Fine earth fraction**		
	Sand	**Silt**	**Clay**
>2mm	0.05 – 2 mm	0.002 – 0.05 mm	<0.002 mm

Assume that the density of quartz is 2650 kg m^{-3}.
Showing all calculations determine:



a) What is the surface area - SA (in m^2) of a cube of quartz 0.1 mm tall?

b) What is its volume (in m^3)? What is the weight of this cube (in kg)?

c) Calculate the specific surface area - SSA (m^2 kg^{-1}) for cubes of quartz 0.1 mm tall.

d) Calculate the specific surface area - SSA (m^2 kg^{-1}) for cubes of quartz 1 μm (1 micrometer = 10^{-6}m) tall.

e) Compare the two specific surface areas. What does this simple calculation tell you about the specific surface area of sand as compared to clay? Why is this important?

[5 points]

4. You get a summer job working in the field for a forestry company. One of your tasks is to determine soil texture. Your supervisor tells you to do hand-texturing. What are the advantages and challenges with this method? Briefly explain.

[2 points]

Required attachments:

- Your hydrometer data sheet with sample calculations written out for at least one line.

[3 points]

- The particle-size distribution curve. Please do not forget to include a title and axes labels.

[2 points]

- Your answers regarding the soil texture of two "mystery" samples (determined by hand-texturing). Include a brief justification of your answer.

[4 points]

Section 2 - Soil bulk density

Please answer the following questions:

5. The bulk density of a soil is the:
   a) mass of solids / volume of solids
   b) mass of solids / total soil volume
   c) volume of voids / total soil volume
   d) 1 - volume of voids / total soil volume

[1 point]

6. Which would be more likely to change as a result of soil compaction:
   a) bulk density, or
   b) particle density?

   Briefly explain your answer.

[2 points]

7. A mineral soil has a bulk density of 1.54 g/cm^3. Showing all calculations answer the following:
   a) What would you assume particle density to be equal to in this soil?
   b) Calculate the porosity (f) in %.
   c) What would be the volume of pores (Vf) in 1 m^3 of this undisturbed soil? Give the formula you use to determine the pore volume (Vf) and show your calculation.

[3 points]

8. Consider the following soil characteristics:

volume	154 cm^3
organic matter content	7 %
mineral content (dry)	180 g
mineral particle density	2.65 g/cm^3
Organic particle density	1.30 g/cm^3

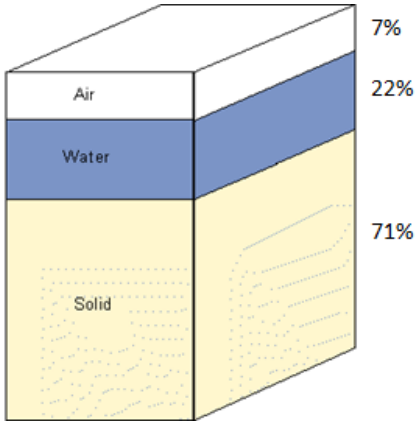
What is the bulk density of this soil in g/cm^3?

[2 points]

9. Consider the following mineral soil as shown on a diagram:

   a) What is the porosity (in %) of this soil?

   b) Assuming a particle density of 2.65 g cm^{-3}, what is the bulk density of this soil in g cm^{-3}?
   Give the equation you use, show your full calculation and units.



[2 points]

Required attachments:

- The bulk density calculation table with all calculations written out. Include all the units.

Depth of sampling	Core height (cm)	Core diameter (cm)	Volume of core (cm^3)	Oven-dried wt. of soil (g)	Bulk density (g/cm^3)
0 – 7.5 cm	h = 7.5 cm	d = 7.3 cm		Ms = 456.7g	

[2 points]

Total for lab 2 assignment [33 points]