

APBI 200 - LAB 2 ASSIGNMENT

Section 1 – soil texture

Please answer the following questions:

1. 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 1 mm tall?
 - b. What is the weight of this cube? What is its volume (in m^3)?
 - c. Calculate the specific surface area - SSA ($\text{m}^2 \text{ kg}^{-1}$) for cubes of quartz 1 mm tall.
 - d. Calculate the specific surface area - SSA ($\text{m}^2 \text{ kg}^{-1}$) for cubes of quartz 1 μm (1 micrometer = 10^{-6}m) tall.
 - e. Compare the two specific surface areas and draw conclusions. What does this simple calculation tell you about the specific surface area of sand as compared to the one of clay?

[5 points]

2. Using the Canadian Soil Texture Triangle (Figure 2 in your lab manual),
 - a. Classify the soil texture of each soil in the following table based on their sand and clay contents (expressed as weight percent of the fine earth fraction):

Soil	% Sand	% Clay	Textural class
A	4	9	
B	25	20	
C	20	45	
D	84	10	

- b. What is the lowest clay percentage allowed for a texture to be included in the clay loam textural class? In the sandy clay textural class?

[3 points]

3. Give an example and a brief explanation of a situation in which (a) hand-texturing method is more appropriate than the hydrometer method, and (b) hand-texturing method is less appropriate than the hydrometer method.

[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. Don't forget to include a title and axes labels.
- Indicate the % sand, silt and clay and the soil textural class.

[2 points]

- The table regarding the soil texture of two “mystery” samples (determined by hand-texturing). Include a brief justification of your answer.

[3 points]

Section 2 - Soil bulk density

4. Which would be more likely to change as a result of soil compaction, bulk density or particle density? Briefly explain your answer.

[2 points]

5. Use the data given below to answer the following questions:

	Soil A	Soil B	Soil C
bulk density (g/cm ³)	1.5	1.4	1.6
particle density (g/cm ³)	2.79	2.84	2.65
gravimetric moisture (%)	30	40	18
textural class	Silt loam	Clay loam	Sandy loam

- Which of the three soils in this question would have the highest porosity (f)?
- What data did you use to make your decision?

[2 points]

6. A team of forestry students excavated a pit in a gravelly soil. They lined the pit with a plastic tarp and filled it with water. It took 24 L of water to fill the pit. They also oven-dried and weighed the excavated soil. The oven-dried soil weighed 31 kg.

- Calculate the bulk density of the soil. Express your result in metric tonne/m³.
- What would be the mass of 1 L of undisturbed dry soil? (Note that 1 L = 1 dm³ = 10⁻³ m³)
- What would be the volume of one kg of undisturbed dry soil?

[3 points]

7. A soil has a bulk density of 840 kg m⁻³ and the organic matter content of the soil is 0.13 kg of organic matter per kg of total solids. The average particle density of the organic matter is 1300 kg m⁻³, and the average particle density of the mineral (inorganic) solids is 2650 kg m⁻³.

- What is the volume occupied by organic solids, per m³ of total soil volume?
- What is the volume occupied by mineral solids, per m³ of total soil volume?
- What is the porosity of the soil (i.e. m³ of pores / m³ of total soil volume)?

[3 points]

Required attachments:

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

[2 points]

Total for lab 2 assignment

[30 points]