

**APBI 200 LAB # 3**

**Please answer the following questions:**

1. A soil with a high specific surface area has: [select all that apply]
  - a) a high soil water retention
  - b) a low reactivity
  - c) a fine texture
  - d) a coarse texture
  - e) rapid soil water drainage

[1 point]
  
2. Water moves in soil: [select all that apply]
  - a) due to differences in total energy potential
  - b) from area of low total potential energy to area of high total potential energy
  - c) from area of high total potential energy to area of low total potential energy
  - d) due to tortuosity

[1 point]
  
3. Define the paired terms shown below. Identify important distinctions between the paired terms. Explain how they differently affect what goes on in the soil and/or how plants grow on that soil.
 

Field capacity & permanent wilting point

[6 points]
  
4. For good plant growth, it is important to know what portion of total soil volume is occupied by air, or in other words it is important to know aeration porosity ( $V_a / V_t$ ).
  - a. Calculate aeration porosity at a tension of 60 cm for the two soil samples analyzed during the lab #3 (i.e., medium sand and fine sand). Show complete calculations. Note that you will have collected data for one sample; data for the 2<sup>nd</sup> sample is provided in the appendix of the lab manual.
  - b. Compare aeration porosity values for the medium and fine sand samples, comment on these two calculated values; do you find this result surprising? Why or why not?

[4 points]
  
5. Consider the data collected during the lab #3 and also the data shown in the appendix of the lab manual:
  - a. How would you determine the largest pore size in the sample? Which of the two samples (i.e. medium or fine sand) has the largest pore size? Briefly explain your answer.
  - b. How do you determine the dominant pore size?  
From the data, which of the two samples has the smaller dominant pore size? Briefly explain your answer. Provide the values for the medium and fine sand.

c. Show how you worked out **all the units** in the capillary rise equation you used to calculate the pore radius in lines j and k of the data collection sheet.

[3 points]

6. The partial water retention curves obtained in lab #3 are representative of sand fractions, with uniform particle sizes. How would you expect the partial water retention characteristics of a silt loam soil (with 8% soil organic matter) to differ and why? Hint: First discuss how texture and organic matter would affect structure and the relative proportions of macro and micro pores in this soil. Then consider the influence of structure and pore size on the water retention curve.

[2 points]

**Required attachments:**

- Your data collection sheet with calculations written out for both samples parameters (lines a through k), and for the first 2 tension values. Be sure to include units when you enter your data and to keep track of units when making your calculations.

[7 points]

- The water retention curves for medium and fine sand samples indicating air entry value (AEV) and air intrusion value (AIV) on the graph. Hint: don't forget to include a title, axis labels, and label your curves indicating which curve is for fine sand and which curve is for medium sand. Clearly indicate on your graph the tensions which correspond to AEV and AIV.

[3 points]

**Total for lab 3 assignment**

**[27 points]**