

## Soils 201 - Study Questions: Physical Properties II - Soil density and porosity

*Note: This list is meant to help you learn the main points. They are not necessarily the exact topics or questions that will be asked on exams. You'll see that there are more topics here than could possibly be on a single quiz. But, by learning/understanding the answers to the questions posed here, you should be a long way toward doing well on the exams and final.*

### Bulk Density and Porosity

- 1) An undisturbed soil sample is taken from Lane Rawlin's back yard. The core was 7.5 cm long, 5 cm diameter, and the dried soil had a mass of 190g. The volume of the soil solids (minerals and organic matter) alone was found to be 73 cm<sup>3</sup>. From this information calculate:
  - a) average particle density
  - b) the soil bulk density
  - c) the total porosity
  - d) If the soil texture is a sandy loam, do you think the soil has been subject to compaction?
  
- 2) a) What is the general range of bulk density in soils (uncompacted)?
  - b) What is the general range of mineral particle density?
  - c) What are values for particle density of oxide clays? Of volcanic-derived soil minerals (non-repeating pattern silicates)?
  - d) What is the general range of organic matter density? (*note: Organic matter is made up of complex molecules. We don't usually think of these complex molecules as particles, so it makes more sense to say 'organic matter density' than 'organic matter particle density'. 'Organic matter density' = (mass of organic matter)/(volume organic matter) It's the same concept as particle density for minerals.*)
  
- 3) Explain why *undisturbed* samples are necessary to determine the bulk density of a field soil.
  
- 4) Explain, in terms of soil porosity, why having good soil structure (especially granular and blocky structure) is beneficial for plant growth.
  
- 5) Compare and contrast the properties of macro- and micro-aggregates. Explain the importance of each to plant growth.
  
- 6) Compare and contrast the properties of soil micropores and macropores.