

1. Name the five factors affecting soil formation. Of the five factors, choose two that have had the dominant influence on developing soil properties characterizing each of the following soil orders: Vertisols, Mollisols, Spodosols, and Oxisols. (10%)
2. Two different timber-harvest methods are being tested on adjacent forest plots with clay loam surface soils. Initially, the bulk density of the surface soil in both plots was 1.1 Mg/m^3 . One year after the harvest operations, plot A soil had a bulk density of 1.48 Mg/m^3 , while that in plot B was 1.29 Mg/m^3 . What was the change in percent pore space of the surface soils caused by timber harvest? Would you expect that most of this change was in the micropores or in the macropores? Interpret these values with regard to the relative merits of system A and B. (10%)
3. Distinguish between "soil water potential" and "soil water content". Name one method and briefly describe the procedure used for measuring "soil water potential" and "soil water content" respectively. (10%)
4. Contrast the difference in crystalline structure and associated properties among kaolinite, smectites, vermiculites, and chlorites. (10%)
5. Distinguish between "total" and "available" amounts of heavy metal in the heavy-metal contaminated soils and explain their significance on the risk assessment. For Cr-contaminated soils, compare the risk for Cr existing in Cr(III) forms with that in Cr(VI) forms. (10%)
6. Distinguish between or among
 - (a) exchangeable acidity, nonexchangeable acidity, titratable acidity, and total acidity of a soil.
 - (b) soil fertility and soil productivity(10%)
7. What is meant by buffering? Why is it so important in soils and what are the mechanisms by which it occurs? Will the application of chemical fertilizers surely accelerate soil acidification? (10%)
8. The C/N ratio remains rather constant in most agricultural soils. Give the typical value of the C/N ratio in soils and discuss the reason of the constancy of C/N ratio in soils and the significance of this constancy to soil management. (10%)
9. Draw and describe the characteristics of the typical profile of a paddy soil. What are the possible mechanisms for the increased availability of phosphorus in paddy soils? What soil problems may arise when a rice paddy soil is converted to upland field crops? (10%)
10. Define the following terms and describe the methods commonly used for their quantifications.
 - (a) soil organic matter, (b) cation exchange capacity, (c) soil salinity.(10%)