

Instructional Objectives for Topic 5 (Ion Exchange)

After we conclude Topic 5 in the notes you should be able to do the following:

1. Explain in your own words the following: CEC, AEC, isomorphous substitution, permanent charge, pH dependent or variable charge.
2. List and explain the general characteristics of ion exchange.
3. Identify important practical applications for double layer theory.
4. Describe the components of the Electrical double layer.
5. Distinguish between Gouy-Chapman and Stern models for EDL.
6. Based on double layer theory, describe ways to increase/decrease double layer thickness.
7. List problems and practical applications associated with EDL theory.
8. Explain in your own words the concept of base saturation.
9. Calculate CEC and base saturation given the mass of a solid, the volume of the extracting solution, and the solution concentration of cation(s).
10. Describe the origin and magnitude of charge in the various phyllosilicate minerals.
11. Distinguish between PZC, PZSE, PZNC, PZNPC, and ISE.
12. Identify the origin of pH dependent charge in clay minerals.
13. Identify soil solids that contribute to AEC.
14. Briefly explain the development of equations to describe cation exchange reactions on minerals surfaces. Identify some of the difficulties in applying these equations to soils.
15. List the selectivity of cations for mineral surfaces and explain some of the reasons for this selectivity.
16. Explain what a distribution coefficient is and how it is used to describe ion movement in soils.