

Study Questions Exam 2

1. The height of capillary rise in a tube of radius X is Y . What is the rise in a tube of radius $0.1X$?
2. What are the components of soil water potential under saturated conditions? Under unsaturated conditions?
3. In the absence of a semipermeable membrane, does osmotic potential affect water flow in soil?
4. What two soil water variables are related in a soil moisture characteristic curve?
5. Given a soil moisture characteristic curve for a clay and a sand, distinguish between the two soils. Which has the higher water content at saturation? Which shows the steeper decrease in water content with decreasing (more and more negative) matric potential? How is this behavior related to pore size distribution?
6. What effect does structure have on the soil moisture characteristic curve? Distinguish between a curve for a structured and compacted soil.
7. The soil moisture characteristic curve shows different branches depending on whether the soil is absorbing water or draining. What is the phenomenon called? Distinguish which branch is for absorption and which for drainage. Give a reason for this behavior.
8. A 50 cm^3 core sample of moist soil weighed 68 g. After drying at 105 C for 24 h it weighed 60 g. What was the gravimetric water content of moist soil? The volumetric water content?
9. Water flow, whether saturated, unsaturated or vapor phase, is always from higher to lower potential (True / False)?
10. Work a simple saturated flow problem, like from lab.
11. What effect does texture have on the saturated hydraulic conductivity? What effect does structure have? Explain in terms of pore sizes.
12. Is matric potential more important than gravitational potential in causing unsaturated water flow?
13. Why does the unsaturated hydraulic conductivity decrease with decreasing water content?
14. The direction of vapor phase water movement in soil is from

Lower to higher vapor pressure True or False
Cold soil to warm soil
Saline to nonsaline soil
Low to higher matric potential

15. What effect does a layer of clay under coarser texture soil have on water movement? Conversely, what effect does a layer of sand under finer texture soil have on water movement?
16. What is *field capacity*? Since water in soil is always moving, what is really meant by this term?
17. Define *wilting point*, *hygroscopic coefficient*, and *plant-available water*.
18. What is *gravitational water* and why isn't it also considered *plant-available*?
19. What are *capillary water* and *hygroscopic water*?
20. Explain the effect of soil texture on plant-available water. What effect does organic matter have on plant-available water?
21. Draw a diagram that shows the water movement processes that comprise the field water cycle.
22. Explain why all rainfall at an intensity greater than the saturated hydraulic conductivity of a soil may, for some period of time, infiltrate the soil but with continued rainfall, infiltration slows and surface ponding develops.
23. What effect does the soil surface hydraulic conductivity have on infiltration? How does formation of a surface crust affect infiltration?
24. What effect does soil water content at the onset of infiltration have on infiltration?
25. What meteorological factors influence combined evaporation and transpiration (evapotranspiration)?
26. Evaporation from soil may proceed at a constant rate that is determined by environmental conditions and meet demands set by external evaporativity. But after the soil sufficiently dries, the rate of evaporation tapers off. Explain why.
27. How do mulches (including crop residue left on the surface by conservation tillage) reduce evaporative losses of soil water?
28. What effect does shading the soil surface by a plant canopy have on the relative contribution of transpiration and evaporation to overall evapotranspiration?

29. Is percolation more common when infiltration exceeds evapotranspiration?
30. What is the potential effect of macropore flow on ground water quality?
31. What is a *capillary fringe* and why does it exist?
32. Is the *vadose zone* saturated or unsaturated?
33. What is the purpose of surface drainage? Subsurface drainage?
34. What is the importance of drainage with irrigation?
35. Name the three general types of irrigation systems. List principal advantages and limitations of each.
36. Compare the composition of soil air to that of the atmosphere.
37. Why is gas diffusion much smaller in soil than in air? What effect does high soil moisture have on gas diffusion in soil?
38. What happens to the redox potential when the oxygen content of soil decreases?
39. Under anaerobic conditions, the activity of aerobic microbes drops off and the activity and populations of anaerobic microbes greatly increases. What do anaerobic microbes use as terminal electron acceptors in respiration? Give a couple of example. Arrange in approximate order of decreasing redox potential.
40. What effect does soil organic matter have on the tendency of water-logged soils to become strongly anaerobic?
41. List two ill-effects of anaerobic conditions on plant growth.
42. List a few benefits of wetland soils.
43. On what three general criteria are wetland soils delineated and boundaries drawn with respect to adjacent non-wetland soils?
44. Roughly define *hydric soils*.
45. What are the usual colors expected for a well-drained soil? A poorly-drained soil?
46. List and briefly discuss three redoximorphic (colors associated with presence, absences or distribution of oxidized and reduced iron) features of hydric soils.
47. Although dark colored soils absorb more solar radiation than light colored soils, warming may be slower. Why?

48. How do slope and aspect affect soil temperature?
49. In what three ways does soil water affect soil temperature?
50. Which conducts heat more readily, a dry soil or a wet soil?
51. Two soils are identical in all respects except that soil A has a volumetric water content of 0.2 whereas soil B has a water content of 0.4. Which soil warms faster?
52. Compare the daily temperature variation at a depth of 2 cm to the daily temperature variation at a depth of 30 cm in soil.
53. Compare the season temperature variation at a depth of 2 cm to that at a depth of 30 cm in soil.
54. What is the effect of a surface mulch (including crop residues in conservation tillage) on soil temperature?