

I. **Multiple Choice** (3 points each): Circle the *one* solution that correctly answers each question or completes each sentence.

1. Natural units of soil structure are technically called _____.
 - a. pods
 - b. peds
 - c. clods
 - d. clumps

2. In soil science, the term *loam* refers to a soil _____.
 - a. that is very healthy
 - b. that has well developed soil structure
 - c. that has equal percentages of sand, silt, and clay
 - d. that is equally influenced by sand, silt, and clay
 - e. that is high in organic matter

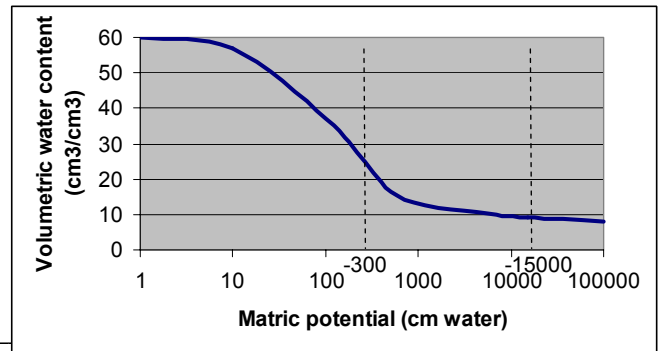
3. Soil physical properties that would likely change when a soil is disturbed include:
 - a. texture, porosity, and particle density
 - b. porosity and bulk density
 - c. texture and particle density
 - d. texture and bulk density
 - e. porosity and particle density

4. On average, a typical soil has about ____ % pore space.
 - a. 5%
 - b. 20%
 - c. 50%
 - d. 80%
 - e. 95%

5. According to the USDA definition, sand particles have a diameter between _____.
 - a. 2 mm and 0.05 mm
 - b. 2 mm and 5 mm
 - c. 0.05 mm and 0.002 mm
 - d. 0.02 mm and 0.002 mm
 - e. none of the above

6. Soil colors that form from the presence of reducing (low oxygen) conditions include pale colors that can include blue, green, and grey. The term used for these colors in a soil profile is ____ colors.
 - a. gley
 - b. weathered
 - c. mottled
 - d. hue

7. The field capacity water content for the soil in the graph at the right is _____
- 300 cm water
 - 15,000 cm water
 - $9 \text{ cm}^3/\text{cm}^3$
 - $25 \text{ cm}^3/\text{cm}^3$
 - $60 \text{ cm}^3/\text{cm}^3$



8. The available water content in this soil is about _____
- 300 cm water
 - $9 \text{ cm}^3/\text{cm}^3$
 - $16 \text{ cm}^3/\text{cm}^3$
 - $25 \text{ cm}^3/\text{cm}^3$
 - $60 \text{ cm}^3/\text{cm}^3$

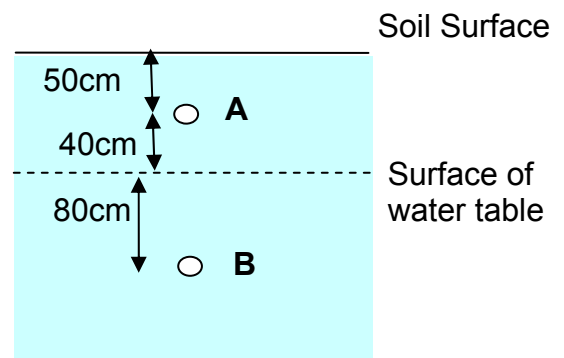
Short Answer

Fill in the blank or write a maximum of one or two sentence in answer to each of the following questions

9. [4 pts] Besides the difference in water potential between two locations, the other factor that governs the rate of water movement is _____. Define this term

Refer to the diagram at the right for the following questions

10. [2 pts] Which location has higher gravitational potential, A or B? _____
11. [2 pts] If the soil surface is set as the reference level, what is the gravitational potential at point A? (use units of cm water)



12. [2 pts] What is the matric potential at point B?

13. [2 pts] Is the matric potential at point A *positive* or *negative*?
14. [2 pts] If the water potential in the soil just outside a root is -300 cm water , and the osmotic potential within the root is -1000 cm water , will water move *into* or *out of* the root?
15. [6 pts] List three distinct functions that soil provides for our planet.

16. [3 points] Soil mineral particles are grouped into three size classes. List them.

17. [8 pts] List four types of soil structure, and make a sketch of each type

18. [6 pts] For each of the following, write in the appropriate horizon designation

_____ A mineral soil horizon of organic matter accumulation

_____ A subsurface horizon of accumulation (e.g. of clays, carbonates)

_____ Horizon designation for a horizon of relatively unweathered parent material (unconsolidated)

19. [2 pts] Does one gram of sand have *more*, *less*, or *the same* specific surface area (amount of surface area per unit mass) **compared to one gram of clay?**

21. [2 pts] What is the primary cause of the dark color of A horizons?

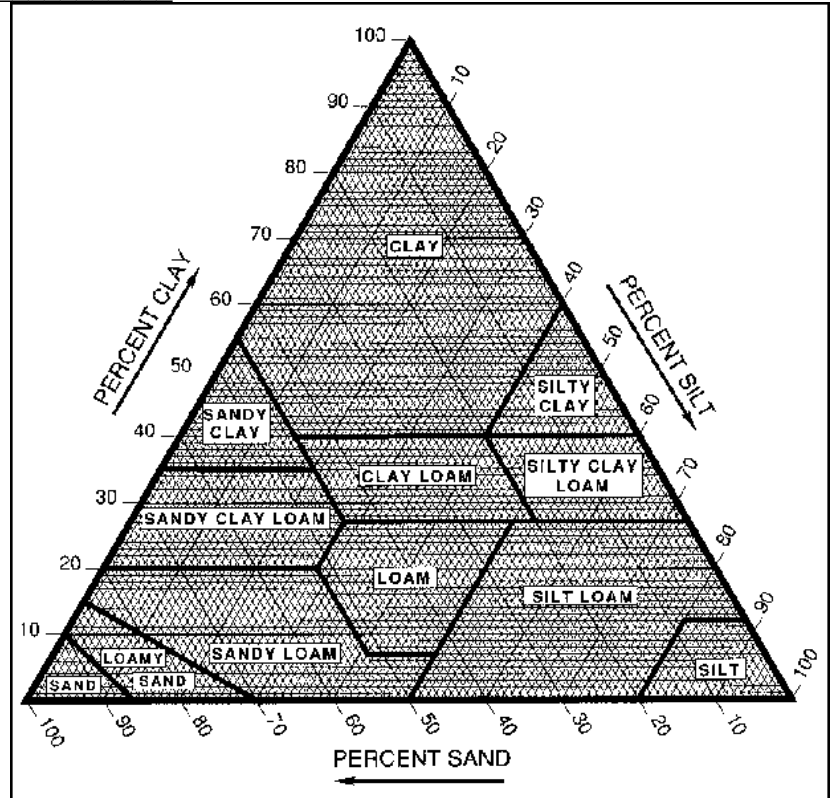
22. [4 pts] Explain why saturated soils have higher hydraulic conductivity than the same soil in unsaturated conditions..

Calculation Questions

Show all calculations

23. [6 pts] Using the following data and the texture triangle provided, determine the soil texture of the following samples. *Show your work on the texture triangle provided.*

Sample	% Sand	% silt	% clay	Texture class
a.	30	60	10	_____
b.	37	20	43	_____



24. You take a soil sample that has a volume of 100 cm³. You measure the mass of this sample while moist, using a tin that has a mass of 20g. The mass of the moist sample and the tin together is 150g. After oven drying at 105C, the mass of the sample plus tin is 130g.

- a) [3 pts] What is the gravimetric water content?
- b) [3 pts] What is the bulk density?
- c) [3 pts] What is the volumetric water content?

Extra credit

A. [4 pts] What is the porosity of the soil sampled in the previous question?