NCF-Envirothon
Soils and Land Use Sample Test Questions

Soil Pit Questions (#1-10, 3 points each)

1. (3 pts) What subordinate horizons are present?

p, t, r

2. (3 pts) What is the color at 52cm depth?

2.5YR 4/8

3. (3 pts) What is the hydraulic conductivity of this soil?

A. High
B. Moderate
C. Low

4. (3 pts) What is the available water in this soil?

A. Very Low < 7.5 cm
B. Low > 7.5 and < 15.0 cm
C. Moderate > 15.0 and < 22.5 cm
D. High > 22.5 cm

5. (3 pts) Rate this soil for Onsite Sewage Treatment and Dispersal Systems:

A. Slight Limitations
B. Moderate Limitations
C. Severe Limitations

6. (3 pts) Rate this soil for Dwellings with Basements:

A. Slight Limitations
B. Moderate Limitations
C. Severe Limitations

7. (3 pts) What is the slope position?

A. Depression
B. Flood Plain
C. Toe slope
D. Foot slope
E. Back or side slope
F. Shoulder
G. Stream Terrace
H. Summit

8. (3 pts) What is the surface runoff potential?

A. Ponded
B. Very Slow
C. Slow
D. Medium
E. Rapid
F. Very Rapid

9. (3 pts) What is the erosion potential?

A. Very Low
B. Low
C. Medium
D. High
E. Very High

10. (3 pts) What is the land capability class?

2e

Multiple Choice

USE THE FOLLOWING SOIL PROFILE DESCRIPTION TO ANSWER QUESTIONS 11-12

Horizon (inches)	Depth	Texture	Organic Matter%	Color	Effervescence
A	0-7	Loam	5	10YR 2/1	None
Bt	7-14	Clay Loam	3	10YR 3/3	None
B?	14-60	Sandy Loam	1	10YR 5/2	Strong

11. (1 pt) The B horizon is further characterized by the materials that make up the accumulation. Which of the following materials accumulate in a Bt horizon?

A. calcium carbonate
B. sodium
C. clay
D. silt

12. (1 pt) Look at the effervescence class (reaction to dilute HCL) and determine the proper subscript for the third horizon.

A. t
B. k
C. g
D. w

13. (2 pts) A soil is described as follows: 0-20 cm 10YR 2/1 muck; 20-40 cm 10YR 4/1 mucky loam. It is most likely a(n)…

A. Upland soil
B. Organic soil
C. Prime farm land soil
D. Hydric soil
E. Wetland

14. (3 pts) The formation of a redox depletion requires these 2 processes:

A. Addition & Transformation
B. Loss & Transformation
C. Transformation & Leaching
D. Translocation & Transformation
E. Addition & Translocation
F. Addition & Loss
G. Loss & Translocation

15. (3 pts) Which of the following trees is likely to be observed on the soil described above.

A. White Oak
B. Shagbark Hickory
C. Red Maple
D. Sugar Maple
E. Loblolly Pine

16. (3 pts) Which soil texture is likely to have the highest bulk density?

A. Loamy sand
B. Sandy loam
C. Clay loam
D. Silt loam
E. Clay

17. (3 pts) Which soil texture is likely to have the highest porosity?

A. Loamy sand
B. Sandy loam
C. Clay loam
D. Silt loam
E. Clay

18. (3 pts) Nutrient status in the soil can be assessed by soil testing or by the visual condition of a plant's growth or nutrient deficiency symptoms. If a plant develops a purple coloration in its leaves this indicates a deficiency in which nutrient?

A. Nitrogen
B. Phosphorous
C. Potassium
D. Calcium
E. Magnesium
F. Sulfur
G. Iron

19. (3 pts) Plants cannot take up nutrients directly from organic matter. Nutrients from organic matter are released by microbial activity through a process called _____.

A. Assimilation
B. Chelation
C. Immobilization
D. Fixation
E. Mineralization
F. Mobilization

Short Answer

20. (4 pts) One of the Agricultural BMPs is the 4Rs for nutrient management. What are the 4Rs?

Right Source
Right Amount (Rate)
Right Placement
Right Timing

21. (2 pt) Give two examples of how organic matter has a positive effect on soil properties.

Encourages granulation and good tilth, increases porosity and lowers bulk density, promotes water infiltration, reduces plasticity and cohesion, increases available water holding capacity.

(1 point awarded for each correct answer, total of 2 points)

22. (2 pts) What is the soil texture and percent of clay content of the Ap horizon? (See sample labelled #22)

Silt loam, 16% (1 point for texture, 1 point for percent within the range of 15-17%)

23. (15 pts) You don't need much experience in arboriculture or landscape design to notice that planting trees in developed areas is often different from planting trees in natural environments. There are many reasons for this, but perhaps the biggest is the difference in composition of the soil. Soil has six basic properties that are important to plant growth. These all influence its fertility as a growing medium, and are subject to degradation and complications in urban areas. Look at the 5 soil properties listed below and explain how each may be affected in urban areas and how it affects tree growth.

Structure - **Soil structure influences plant growth, because it affects moisture, aeration, heat transfer, and the mechanical resistance to root growth. Open spaces in soil, called pores, are equally important. The size and distribution of soil pores affect the movement and availability of moisture and air through the soil.**

Texture - **Soil texture and other soil properties vary significantly within short distances on urban or natural landscapes. This variation is caused by the movement and mixing of soil materials during construction activities or changes in any of the soil-forming Root limiting bulk density depends on soil texture.**

pH - **Soil pH influences nutrient uptake and tree growth. The availability of many plant nutrients in the soil changes as a result of reactions in the soil, which are largely controlled by soil pH. Trees may or may not be able to use nutrients because of these**

reactions.

Bulk density - **When a soil is compacted, soil aeration and permeability are decreased, and it becomes more difficult for roots to penetrate the soil. As compaction increases, root growth first becomes stunted, and as it continues to increase, it eventually completely limits root growth. As would be expected, when soils become more compacted and pore space decreases, bulk density (dry weight of soil divided by its volume) increases**

Organic Matter – **In developed areas, organic matter is dependent on whether top soil was protected during construction activities. The major role of organic matter in soil are adding nutrients and improving the soil's structure and water-holding capacity. Soils with low organic matter have 'poor' structure, hold little water, and erode or leach nutrients easily. Soils with high organic matter levels have 'good' structure, good water-holding capacity, and reduced erosion and nutrient leaching.**

(3 points for each correct answer, total of 15 points)

24. (3 pts) Identify and list three (3) major sources of organic material for soil at this site.

Litterfall, downed trees and branches, root decomposition, input from rainfall, fauna inputs

(1 point per correct answer, only mark first 3 answers)

25. (3 pts) Name three (3) factors that influence soil cation exchange capacity.

Texture, type of clay, amount of OM, pH

(**1 point per correct answer. Only mark first 3 answers provided)**

26. (4 pts) Why do forest soils from recently glaciated regions like Canada and the northern United States have greater fertility than tropical forest soils? Explain your answer.

Tropical soils are older – therefore there is a greater degree of weathering and nutrient leaching due to longer existence of tropical soils and due to high rainfall; warmer temperatures facilitate faster organic matter cycling of forest floors with little incorporation into the mineral layers.

(**1 point for age of soils, 2 points for impact of age on weathering and leaching, 1 point for organic matter cycling)**

27. (2 pts) Specify the difference between a biological crust and a physical or chemical crust.

Biological crust is made of living organisms and their byproducts. Physical crust or chemical crusts are formed from inorganic features such as salt crust or platy surface from compaction.

(1 point for definition of biological crusts including organic features, 1 point for physical and chemical crusts with inorganic features)

28. (8 pts) If range or agricultural land has a history of poor management (i.e. overstocking, over tillage, etc.), resulting in soil health degradation and substantial soil loss to erosion, how can this trend be reversed? List four main categories of soil health that you would want to address and list a best management practice for each category that would help accomplish your goal.

a. **Prevent further erosion**
    i. **Plantings**
    ii. **Conservation measures**
b. **Increase plant diversity**
    iii. **Seedings**
    iv. **Controlling noxious and invasive weeds**
c. **Add organic matter to the system**
    v. **Cover crops**
    vi. **Managed grazing**
d. **Break up compactions**
    vii. **Cover crops**
    viii. **Disking**
    ix. **Planting**

(1 point for each correct category, and 1 point for each correct corresponding BMP, for a total of 8 points)

29. (5 pts) An area in a cropped field has no plants growing in it. A field inspection of the site found that the soil had a pH of 9.2. The soil also had an Electrical Conductivity (EC) of 2.5 dS/m. What is the problem with the soil, what physical characteristics might the soil have and what are some possible solutions to the soil problem?

Problem—the soil is sodic, or the soil has a high concentration of sodium salts
Physical characteristics—degraded soil structure, crusting, salt crusts
Solutions—replace the sodium on the exchange sites by treating with $CaSO_4$ (gypsum) or other sulfur compound and leaching (deep irrigation)

(1 point for problem, 1 point for physical characteristics, 2 points for solution)