Soils – Practice Questions and Answers

Revised September 2007

1. Which of the following are variables controlling soil development? (select one or more)
    a. composition of parent
    b. climate
    c. topography
    d. biological activity
    e. time

2. If the parental material is rock characteristic of a given region, then the resulting soil is referred to as
    a. transported
    b. elevated
    c. superposed
    d. residual
    e. thick

3. If the parental material was brought into a given region by wind, glaciers, or water, then the resulting soil is referred to as
    a. transported
    b. thin
    c. superposed
    d. residual
    e. thick

4. What does the term topography refer to?

5. Soils that develop on steep slopes are subjected to greater erosional stresses than soils developed on gentler slopes. True or false

6. Soils developed in flat lying regions are typically _____ than those developed in slopping regions.

7. Two important variables of climate are _____ and _____.

8. In the conterminous United States average annual temperature generally increases from
    a. north to south
    b. south to north
    c. west to east
    d. ease to west
    e. none of the above

9. Which of the following areas within the conterminous United States has the largest average annual precipitation
    a. SE
    b. SW
    c. NE
    d. mid-continent
    e. south

10. In general, calcite and halite (salt) will not be found in soils located in the _____ United States because of the relatively _____ annual precipitation.

11. The climatic conditions that are most conducive for the formation of calcite and/or halite in a soil are
    a. high precipitation – low temperature
    b. high precipitation – high temperature
    c. high precipitation – moderate temperature
    d. low precipitation – high temperature
    e. none of the above

12. In the continental United States where would you most expect to find calcite and/or salts in a soil? Why?

13. Increasing temperature increases the rate of _____ reactions in a soil.

14. Based on the statements in question #13, would you expect soils developed in the tropics to be more highly weathered and developed than those developed in say Idaho? Why?

15. What kinds of elemental nutrients do plants and animals extract from the soil and atmosphere?

16. Provide below a succinct statement of the salient aspects of the nutrient cycle.

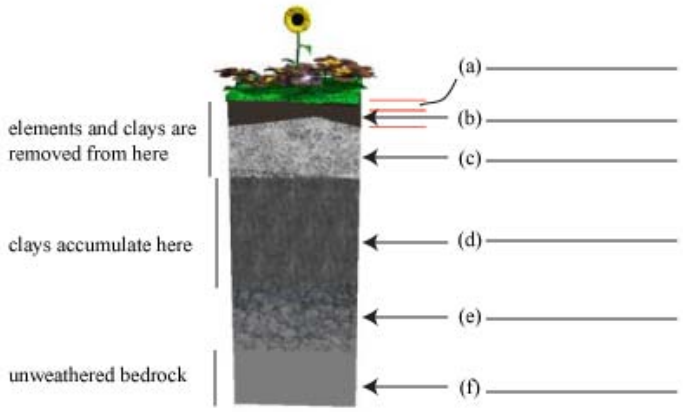
17. Layers that appear within a soil are referred to as _____ _____.

18. A vertical section exposing a soil represents its _____.

19. Removal of soil material in suspension or solution from one master horizon to another is referred to as _____.

20. Deposition or precipitation of clay-sized particles or minerals, respectively, within a master horizon is referred to as _____.

21. In the following illustration please fill in the missing names of the master horizons in the blanks labeled (a) through (f)



22. What master horizon is characterized by organic debris in various stages of decay?

23. What master horizon is characterized by humus mixed with mineral and rock fragments?

24. What master horizon is characterized by abundant silt-sized quartz and other insoluble minerals, and the extensive removal by dissolution and suspension of soluble minerals and clay-sized particles respectively? It may or may not be present dependent upon a variety of factors.

25. What master horizon is characterized by the accumulation of clay-sized particles?

26. What master horizon is characterized by recognizable pieces of bed rock in various stages of weathering?

27. What master horizon is characterized by unweathered bedrock?

28. What are the names of the 12 major soil orders of Soil Taxonomy?

29. Of the 12 major soil orders, two are characterized by minor development of master horizons? What are these two soil orders?

30. Of the two orders referred to in question #29, which is characteristically a very young soil lacking horizon development with the exception of an A horizon?

31. What soil order underlies vast farmlands in the mid-continent region of the United States?

32. What soil order characteristically has calcite and/or halite in the B horizon and is common throughout the arid SW United States?

33. What soil order would you expect to be prevalent in the Hawaiian Islands, Washington, Oregon, and northern California?

34. How do Gelisols differ from all other soil orders?

35. What are Histosols?

36. How would you characterize Oxisols?

37. What are Spodosols and where would you expect to find this soil order?

38. In the conterminous United States where would you expect to find Ultisols and how would they be characterized?

39. What is the state soil of Texas and how is it characterized?

40. Alfisols are common throughout the conterminous United States. How would they be distinguished from Entisols and Inceptisols?

Answers

1. a, b, c, d, and e
2. d. residual
3. a. transported
4. Topography refers to the way that the elevation of the Earth's surface varies as well as the various geometric forms that Earth's surface takes on. Common topographic terms include hill, valley, mountain, slope, etc.
5. true
6. thicker
7. precipitation, temperature
8. a. north to south
9. SE
10. southeastern, high
11. d. low precipitation – high temperatures
12. Warm and dry climatic conditions like those typical of the SW United States. Wetter conditions under a similar temperature regime would result in dissolution and removal of both calcite and halite from the soil.
13. biochemical
14. Yes, because the tropics are generally hotter and wetter than Idaho, soils are likely to be more highly developed and weathered.
15. C, H, Ni, O, P, K, Ca, Mg, and S
16. Water, plant, and animal matter accumulate in the soil. Decomposers of organic matter such as bacteria break it down, while chemical reactions between soil solutions and rock and minerals release elemental nutrients to the soil. Roots and animals living in the soil extract the needed nutrients renewing the cycle.
17. master horizons
18. profile
19. eluviation
20. illuviation
21. (a) = O, (b) = A, (c) = E, (d) = B, (e) = C, and (f) = R
22. The O horizon is characterized by a layer of organic litter.
23. The A horizon differs from the O horizon by being composed of a mixture of organic matter, rock fragments, and minerals. It is typically darker in color than the underlying horizons, and is coarser due to eluviation of finer grained material. It and the underlying E master horizon are sometimes referred to as the zone of leaching.
24. The E horizon is not always present. However, when present it consists of a white layer composed of abundant sand and silt-sized particles of quartz and other insoluble minerals. The finer grained clay-sized constituents have all been removed to lower parts of the soil profile by eluviation. E horizons are common in soil developed within forest landscapes.
25. Lying below the A and/or E horizons is a layer composed of illuviated clays and elements (held in minerals precipitated from solutions) derived from the overlying layers. This layer is the B master horizon which is sometimes referred to as the zone of accumulation.
26. Unconsolidated weathered material underlying the A, E, and B horizons makes up the C horizon. Material in the C horizon ofter retains some textural features of the parental material.
27. Unweathered material makes up the R horizon.

28. Alfisols, Andisols, Aridisols, Entisols, Gelisols, Histosols, Mollisols, Inceptisols, Oxisols, Spodosols, Ultisols, Vertisols
29. Entisols and Inceptisols.
30. Entisols
31. Mollisols
32. Aridisols
33. These are all areas that are dominated by lava and/or pyroclastic material. Hence, the soil order Andisols should dominate.
34. They contain permafrost in the upper 2 meters of the soil profile. For permafrost to exist in the soil and associated materials must remain below 0^{o} C for at least 2 years. Hence, Gelisols only occur in very cold high northern and southern latitudes.
35. Histosols are organic soils composed only of an O master horizon. They commonly make up bogs, moors, peats, and mucks.
36. Oxisols are the most extensively weathered and leached soils. They are commonly enriched in Fe and Al oxides, and frequently display little horizonation, and a deep red color.
37. Spodosols are characterized by a subsurface accumulation of humus overlying an eluviated E master horizon which in turn overlies an illuviated B horizon. They are common in coniferous forest landscapes in cool moist climates.
38. Ultisols are strongly leached acid soils underlying forrested regions with relatively high annual precipitation and relatively high annual temperatures. They are characterized by an eluviated A horizon overlying an illuviated B horizon where significant clay has accumulated. These conditions are prevalent in the SE United States where Ultisols prevail.
39. Vertisols represent the state soil of Texas. This soil order is characterized by abundant clays that shrink and swell when dry and wet. As a result Vertisols commonly are characterized by abundant cracks as the volume of soil expands when wetted and then shrinks when dried.
40. Alfisols commonly exhibit well developed A and B master horizons. In Entisols and Inceptisols well developed A and B master horizons do not occur.