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Chapter 1. The Soils Around Us

Multiple Choice Questions

(Circle the single best answer for each question.)

1. Most of the different nutrients essential for growth are supplied to plants directly from the _____.
   A. rain water B. soil solution C. atmosphere
   D. cosmic radiation E. humus

2. In a load of 10 cubic meters of topsoil, approximately how cubic meters of the volume would be solid material?
   A. 1 B. 2.5 C. 4 D. 5 E. 7.5

3. Which of the following is (are) essential plant nutrients?
   A. Cu B. Al C. Sr D. Pb E. all of the above

4. Which of the following is considered to be a plant macronutrient?
   A. N B. P C. S D. Ca E. all of the above

5. Soil occupies the _____part of the regolith.
   A. upper B. lower C. younger D. both B and C

6. The lithosphere is made up of _____.
   A. air B. rock C. water
   D. plants and animals E. all of the above

7. The layers of contrasting material found when one digs a hole in the ground are called _____.
   A. pseudoliths B. regoliths C. pedons
   D. horizons E. soil structure

8. A soil profile consists of _____.
   A. the sum of chemical and physical data known about a soil
   B. the way a soil "feels"
   C. the spatial boundaries of a particular soil
   D. the set of layers seen in a vertical cross Section of a soil
   E. the general outline of a soil or group of soils when viewed from the side

9. "Topsoil" is generally equivalent to which soil horizon?
   A. A B. B C. C D. D E. E

10. "Subsoil" is generally equivalent to which soil horizon?
   A. A B. B C. C D. D E. E

11. In a typical mineral soil in optimal condition for plant growth, approximately what percentage of the pore space would be filled with water and what percentage filled with air?
    A. 10% water and 90% air
    B. 90% water and 10% air
    C. 25% water and 25% air
    D. 50% water and 50% air
    E. 25% water and 75% air

12. The amount of different sizes of mineral particles in a soil defines the soil _____.
    A. structure
    B. texture
    C. pore space
    D. solution
    E. profile

13. The water in the soil typically differs from pure water because the soil water _____.

A. contains organic compounds
B. contains mineral nutrients
C. is restrained in its flow by attraction to particle surfaces
D. all of the above
E. none of the above

14. Compared to silt, clay-sized soil particles are characterized by _____.
A. greater attraction for water
B. greater proportion of primary minerals
C. less tendency to form hard clods when dry
D. less capacity to hold nutrients in plant-available forms

15. Which of the following pH values represents a neutral condition?
A. 1.0 B. 5.0 C. 6.0 D. 7.0 E. 10

16. Which of the following pH values represents the most acid condition?
A. 1.0 B. 10.0 C. 7.0 D. 100 E. 5.55

17. Most (usually 80% or more) of soil potassium and calcium can be found in the form of _____.
A. dissolved substances
B. structural components of minerals
C. exchangeable ions
D. organic compounds

18. Increasing the organic matter content of a soil is likely to _____.
A. have no effect on water holding capacity
B. increase the soil's water holding capacity
C. decrease the soil's water holding capacity

19. Hydroxyl ion concentrations are greatest in a soil solution with a pH value of _____.
A. 0.1 B. 4.0 C. 5.0 D. 6.5

20. In a given soil, the horizon with the highest organic matter content is generally the _____ horizon.
A. E B. C C. D D. B E. A

21. Information about conditions at 2 to 4 meters deep in a soil is usually most helpful for understanding___.
A. how best to design a building foundation
B. the diversity of animal life in the soil.
C. the proper classification of the soil.
D. fertility requirements of most crops

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True or False Questions

(Write T or F after each question.)

22. Except for some kinds of foods, modern industry has made human dependence on soils a thing of the past.

23. Most of the water in our rivers and lakes has come in contact with and has been affected by soils.

24. Soil air usually has a higher carbon dioxide content than the air in the atmosphere.

25. Plants can be grown without any soil.

26. Hydroponics will likely be a key element in enabling the world to feed and clothe its increasing human population in the next few decades.

27. Practices that tend to increase the amount of organic matter in soils would be expected to reduce the global greenhouse effect.

28. Soil, like concrete and steel, is a standard construction material. Its properties are well characterized and predictable so that standard building foundation designs can be used uniformly at all building sites of a given topography.

29. Although subsoil is more difficult to obtain, it is generally equally as good as topsoil for landscaping purposes.

30. Subsoil is typically equivalent to the O horizon.

31. The mineral particles in soil consist of sand, silt, and clay.

32. Where organic matter constitutes only 1 or 2 percent of the soil by weight, it has only negligible influence on soil properties.

33. The dark brown and black humus found in many soils does not mix well with clay minerals so there is very little contact between these two soil components.

34. Soil horizons, like alluvial sediments, generally have a horizontal orientation, regardless of the slope of the land.

35. A, B, C, and E horizons can be found in any true soil.

36. For any soil in which it is present, the C horizon is the parent material for the B horizon.

37. While many organisms depend on the soil for nutrients and water, only a few very specialized organisms live in the soil itself.

38. If supplied with a suitable nutrient solution, plants can grow normally without any soil at all.

39. Natural soils (as opposed to modern farm soils) can recycle organic compounds, but not inorganic elements.

40. Most of the water flowing in rivers passed through a soil profile or over soil surfaces before reaching the river.

41. Most, if not all, of the nutrient supply stored in a fertile soil is in forms readily available to plants.

42. In humid regions most rainwater that soaks into the soil and is not used by plants eventually flows into rivers and streams.

Chapter 1 Answers

1. A
2. D
3. A
4. E
5. A
6. B
7. D
8. D
9. A
10. B
11. D
12. B
13. D
14. A
15. D
16. A
17. B
18. B
19. D
20. E
21. A
22. F
23. T
24. T
25. T
26. F
27. T
28. F
29. F
30. F
31. T
32. F
33. F
34. F
35. F
36. F
37. F
38. T
39. F
40. T
41. F
42. T

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Chapter 2. Formation of Soils from Parent Materials

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Multiple Choice Questions

(Circle the single best answer for each question.)

1. Igneous rocks can best be characterized as:
   A. rocks formed when molten magma solidifies
   B. rocks containing both feldspars and micas
   C. rocks formed from the recrystallization of sedimentary material
   D. rocks containing a mixture of primary and secondary minerals
   E. rocks found primarily near volcanoes.

2. Which mineral is most resistant to weathering under humid temperate conditions?
   A. dolomite B. muscovite C. gypsum D. gibbsite E. biotite.

3. Which of the following is not a secondary mineral?
   A. silicate clay B. microcline C. calcite D. hematite E. gypsum.

4. Mechanical weathering processes result in:
   A. the decomposition of primary minerals
   B. the hydrolysis of minerals through frost action
   C. the disintegration of rocks due to differential expansion of minerals
   D. the oxidation of iron and manganese compounds

5. Which of the following is not considered one of the five major factors influencing soil formation?
   A. native parent materials B. living organisms C. climate
   D. valence state E. topography

6. Residual parent materials are best described as _____.
   A. materials formed under organic residues.
   B. materials formed by weathering of rocks and minerals in place.
   C. materials transported from one location to another by water, ice or wind.
   D. materials more dominant in Iowa than in the Southern United States.
   E. upland materials formed with relatively little chemical weathering.

7. Glacial till is a term used to describe parent materials that:
   A. were transported by water gushing from glacial fronts.
   B. were laid down in the bottom of former glacial lakes.
   C. were transported by high winds during glacial periods.
   D. are sorted by rapidly flowing melt waters.
   E. contain a heterogeneous mixture of mineral debris dropped by receding glaciers.

8. If you wanted to find a soil where physical weathering dominated over chemical breakdown you would be most apt to find it in _____.
   A. a desert region of ArizonaB. a humid region in Brazil C. the hill lands of Georgia
   D. a lacustrine deposit in Minnesota E. a coastal plain area of Delaware

9. Igneous, sedimentary, and metamorphic are three _____.
   A. types of rocks B. basic classes of soils C. master horizon names
   D. forms of minerals E. processes of weathering

10. The element most often involved in oxidation reactions as minerals weather is _____.
    A. copper B. silicon C. aluminum D. magnesium E. iron

11. In which of the following horizons has the process of illuviation most likely occurred?

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A. O horizon B. C horizon C. A horizon D. E horizon E. B horizon

12. Organic matter accumulation is most pronounced in the ____.
A. O horizon B. A horizon C. E horizon D. B horizon E. C horizon

13. Silicate clay accumulation is most common in the ____.
A. A horizon B. B horizon C. C horizon D. O Horizon E. E horizon

14. Which of the following statements is <u>not</u> correct?
A. Grasslands are found in semi-arid and sub-humid areas.
B. Coniferous forests are found mostly in cool humid areas.
C. The type of native vegetation is controlled primarily by climate.
D. Dense forests are found soil profiles have prominent O horizons.
E. Tropical forests protect the soil from excessive weathering.

15. Which of the following statements is correct?
A. Soils on hillsides tend to be deeper than those on level lands.
B. Lacustrine parent materials have been subject to weathering for shorter periods of time than residual parent materials nearby.
C. Limestone parent materials enhance the process of acidification.
D. Nutrient cycling in forested areas contributes little to soil formation.
E. Calcium carbonate accumulation is more prominent in humid than in arid regions.

16. Secondary minerals are most prominent in the fraction of soils.
A. organic B. sand C. silt D. clay

17. The presence of rocks such as shale and sandstone indicate the existence of _____.
A. a high water Table B. ancient seas C. old mountain ranges
D. iron-rich minerals E. highly weathered soils

18. "Biotite-->clay-->iron oxide" represents a _____.
A. catena B. weathering sequence C. silicate mineral sequence
D. both A and B E. none of the above

19. Granite is an example of a(n) _____.
A. primary mineral B. sedimentary rock C. secondary mineral
D. igneous rock E. eolian parent material

20. The transformation of gneiss into mica, quartz, and feldspar crystals is an example of:
A. physical weathering B. chemical weathering C. disintegration
D. hydrolysis E. both A and C

21. The reaction: <u>mica + H_2O Æ K^+ + OH^- + acid clay</u> is an example of _____.
A. chemical weathering B. physical weathering C. exfoliation
D. carbonation E. both A and C

22. Exfoliation is caused by changes in _____.
A. hydration B. oxidation C. temperature
D. carbon dioxide dissolution E. all of the above

23. The mixed angular gravel, rock, and soil found at the foot of a slope is typical of what type of parent material?

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A. eolian B. colluvial C. fluvial D. glacial E. lacustrine

24. Alluvial fans are usually characterized by _____ soils.
A. sandy and gravelly B. clay textured
C. poorly drained D. nearly level

True or False Questions

(Write T or F after each question.)

25. Igneous rocks are formed when molten magma cools and solidifies.

26. Sandstones are good examples of metamorphic rocks.

27. Secondary minerals are recrystallized products of the chemical breakdown and/or alteration of primary minerals.

28. Iron and aluminum oxides are major components of igneous rocks.

29. Chemical weathering is accelerated by water, oxygen, and organic and inorganic acids moving down through the regolith.

30. Hydrolysis involves the splitting of water into its H^+ and OH^- components while hydration attaches intact water molecules to a compound.

31. The presence of iron in a mineral generally increases its resistance to chemical breakdown.

32. Alluvial parent materials are those that have been laid down in former lake bottoms.

33. Residual parent materials have formed in place and have not been transported from one area to another.

34. Glacial till is laid down by melt waters gushing out from the front of glaciers.

35. Marine sediments are typical parent materials in coastal plain areas.

36. Organic deposits are most common in areas where water flow over the soil surface is restricted.

37. Climate influences not only the rate of weathering but the type of native vegetation dominant in an area.

38. Living organisms affect soil formation primarily by their constraining the level of oxygen in the soil.

39. Residual parent materials have generally been subjected to weathering for a longer period of time than have lacustrine or alluvial parent materials.

40. The O horizons of a soil are dominantly organic horizons occurring above mineral horizons.

41. The A horizons are more apt to be cultivated than the E horizons.

42. In most B horizons one of the dominant processes of soil formation has been eluviation.

43. The C horizons are generally more completely weathered than the other horizons.

44. Even if all the glaciers present today in the world were to melt, the melt water would have no measurable effect on the level of the world's oceans.

45. Glacial till can be recognized by the distinct layering of different kinds of particles.

46. Soils developed in wind-blown parent materials such as loess are generally of little agricultural value.

47. Sapric and fibric are terms used to describe peat parent materials.

48. A soil developed in residual parent materials will likely have properties related to the properties of the rock below the C horizon.

49. A soil developed in transported parent materials will likely have properties related to the properties of the rock below the C horizon.

50. The topmost horizon in most humid region forest soils is the A horizon.

51. Eluviation of clay, iron, and other materials is the principal process responsible for the formation of an E horizon.

52. Weathering of rocks usually is most intense in the center of a rock fragment, and gradually decreases toward the outside.

53. The parent materials for most coastal plain soils are residual in nature.

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Chapter 2 Answers

1. A
2. D
3. B
4. C
5. D
6.B
7. E
8. A
9. A
10. E
11. E
12. A
13. B
14. E
15. B
16. D
17. B
18. B
19. D
20. E
21. A
22. C
23. B
24. A
25. T
26. F
27. T
28. F
29. T
30. T
31. F
32. F
33. T
35. T
36. T
37. T
38. F
39. T
40. T
41. T
42. F
43. F
44. F
45. F
46. F
47. T
48. T
49. F
50. F