

I. Multiple Choice: Circle the *best* answer for each question; 2 pts. each.

1. A soil property that *cannot* be changed by management:
 - A. humus content
 - B. structure
 - C. color
 - D. bulk density
 - E. texture
2. Soils located on *foot slopes*, compared to those of the back slope of a hillside, are usually--
 - A. more rocky, as the regolith is shallower here.
 - B. formed in colluvium.
 - C. Inceptisols rather than Ultisols or Alfisols.
 - D. similar to backslope soils, but with a thinner Bt horizon.
 - E. usually a redder color and better drained
3. *Low values* in the Munsell color system tell you that a soil--
 - A. has a high Fe content
 - B. has a high humus level (is dark).
 - C. is wet (waterlogged) a significant part of the year.
 - D. has oxidized forms of Fe in it.
 - E. is well-drained.
4. *Tillage pans* often form in soils –
 - A. when soils are tilled too often.
 - B. when heavy machinery is run over wet soils.
 - C. if soil is tilled at the same depth over time.
 - D. if humus declines to very low levels.
 - E. all of the above.
5. Which one of the following processes occurs at the *fastest* rate during soil formation?
 - A. accumulation of humus in the A.
 - B. translocation of clay minerals into the B.
 - C. transformation of rock into parent material at the C / R boundary.
 - D. losses of weatherable minerals such as biotite and feldspar from the regolith.
 - E. disintegration of rock into smaller particle sizes by physical weathering.
6. Which of the following is true about the history of the Coastal Plain over the past 50 million yrs?
 - A. it has been repeatedly inundated by the ocean, depositing thick sediment layers.
 - B. numerous volcanoes have deposited ash in the region.
 - C. earthquakes due to tectonic forces have been common occurrences.
 - D. erosion has stripped off much of the original sediment deposited there.
 - E. none of the above.
7. Blocky structure forms due to—
 - A. binding of humus to clays.
 - B. cation bridging between clays.
 - C. compressive forces within aggregates
 - D. binding of illuvial clay coatings on ped faces.
 - E. leaching of soluble cations from the solum.

8. The two major minerals that weather by hydrolysis to form clay minerals are (circle TWO)--
 A. muscovite B. feldspar C. iron oxide D. calcite E. quartz
9. Native American Indians had a part in the formation of Mollisols by—
 A. herding buffaloes around the Great Plains.
 B. fertilizing the soil with buffalo manure.
 C. cultivating wide areas of the Plains to grow corn.
 D. burning the prairies in order to hunt buffaloes.
 E. cutting down the trees for wood, encouraging grass growth.

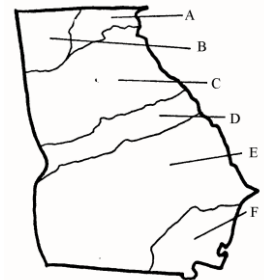
II. Fill-in: Write the best term or response in the blank; 1 pt each.

- 10 _____ most common type of structure in A horizons
 11 _____ bulk density of a soil that has 50% pore space
 12 _____ most common *rock* found around the Athens area
 13 _____ term for a land area that drains surface water to a single outlet
 14 _____ *process* of soil formation responsible for formation of Bt horizons
 15 _____ movement of rainwater *into the surface* of the soil
 16 _____ symbol for O horizon with partially decomposed plant remains
 17 _____ symbol for the master horizon that is *illuvial*
 18 _____ continent that collided with N. American 300 million years ago
 19 _____ rock that weathers by solution to form landscapes with caves, sinkholes
 20 _____ type of reaction that weathers ferromagnesian minerals to clays and oxides
 21 _____ name for void spaces in soil that hold and store water for plant use

III. Matching: Write the letter of the best response in the blank; use each response only once; 1 pt.
 each

22. *Georgia Regions*

- _____ Steep, folded sedimentary rocks
 _____ Region containing the Fall Line
 _____ Gently rolling region of metamorphosed rocks
 _____ Rolling to flat marine sediments, mostly Ultisols
 _____ Recent marine sediments, includes Spodosols and Histosols



23. *Parent Materials*

- _____ common on floodplains
 _____ deposited in lake beds
 _____ weathered in place without transport
 _____ wind-blown materials

- A. colluvium
 B. alluvium
 C. aeolian
 D. lacustrine
 E. residuum

24. *Soil Orders*

- _____ deep, dark, high base A horizon
- _____ soils of glaciated region under hardwood vegetation
- _____ ochric or umbric over an acidic argillic
- _____ peats and mucks of depressional areas
- _____ highly weathered soils of the tropics

- A. Oxisols
- B. Mollisols
- C. Alfisols
- D. Inceptisols
- E. Ultisols
- F. Histosols

25. *Textural Classes*

- | | | |
|--|--------------------|---------------|
| _____ forms a ball, but no ribbon | A. clay loam | E. silt loam |
| _____ forms a moderate (1-2") ribbon; very gritty | B. sandy clay loam | F. clay |
| _____ forms a strong (>2") ribbon | C. sand | G. loamy sand |
| _____ forms a weak ribbon, neither gritty nor smooth | D. loam | |

IV. Short Essay/Problems: Write a concise, to-the-point, legible answers to the following questions; *show* your calculations for any partial credit.

26. On a map with a scale of 1:36,000 and a contour interval of 50', a slope segment is measured and found to be 3.5" long and crosses 12 contour lines; what is the average slope gradient (in %) of this segment? (3 pts)

27. List the Five Factors of soil formation, and describe how each factor has contributed to the formation of Ultisols in most of central Georgia. (5 pts)

28. Define the term *tilth*; how can you improve the tilth of a fine textured soil like a silty clay loam? (3 pts)

V. Soil Profile: Write the full, correct horizon designations in the blanks next to each horizon, and answer the questions following the soil description. 1 pt. per blank

29. **Pedon 1:** Coastal Plain uplands, on backslope on 1% slope in managed forest.

____--0 to 2 inches; pine needles and twigs.

____--2 to 12 inches; very dark gray (10YR 3/1) loamy sand; weak medium granular structure; very friable; many fine roots; strongly acid; clear wavy boundary.

____--12 to 26 inches; gray (10YR 6/1) loamy sand; many distinct brownish yellow (10YR 6/6) mottles; weak medium granular structure; very friable; few fine roots; strongly acid; gradual wavy boundary.

____--26 to 38 inches; brownish yellow (10YR 6/6) sandy loam; common prominent pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; very friable; sand grains coated and bridged with clay; very strongly acid; gradual wavy boundary.

____--38 to 59 inches; brownish yellow (10YR 6/6) sandy clay loam; common prominent yellowish red (5YR 4/8) and light gray (10YR 7/1) mottles; weak medium subangular blocky structure; friable; sand grains coated and bridged with clay; very strongly acid; gradual irregular boundary.

____--59 to 67 inches; multicolored strong brown (7.5YR 5/6) and yellowish red (5YR 4/8) sandy clay loam; common prominent light gray (10YR 7/1) mottles; weak coarse angular blocky structure; friable; very strongly acid.

30. Give the following for this soil profile:

_____ diagnostic surface horizon name

_____ diagnostic subsurface horizon name

_____ Soil Taxonomy order of this soil

31. What is the parent material of this soil (be as specific as possible) _____

32. What is the drainage class of this soil? _____ Describe what in the profile makes you think so.

33. What is the depth of the solum for this soil? _____ Depth of the regolith? _____

Bonus (2 pts):

Briefly describe the "ant (bioturbation) theory" of B horizon formation as discussed in class. Illustrate with a diagram.