

Name: _____

AGRONOMY 354
Test 2
February 27, 2008

INDICATE THE ONE BEST RESPONSE.

1. It is expected with most plant responses that:
 - a) P shows little interaction with N.
 - b) N shows negative interaction with P.
 - c) P shows positive interaction with N.
 - d) K shows positive interaction with N.
 - e) P shows negative interaction with N.

2. For an equal weight, which of these components in soil has the greatest negative charge at neutral pH?
 - a) silt b) montmorillonite c) illite d) kaolinite e) granite

3. How many meq of charge is associated with 96 mg of Mg^{2+} ? (Atomic weight = 24)
 - a) 1/2 b) 1 c) 2 d) 4 e) 8

4. One of the primary minerals that might be found in Iowa that weathers to release K is:
 - a) quartz. b) plagioclase. c) apatite. d) orthoclase. e) calcite.

5. From the soil sampling problem, if you were calculating the costs per acre per year of soil testing, you should consider:
 - a) a soil sample can cover up to 30 acres.
 - b) a test should be good for 2 to 4 years.
 - c) the standard soil test at ISU costs \$24 per sample.
 - d) different soil types adjoining the test area likely will react the same.
 - e) unusual areas should be mixed in with the sample to represent all variability.

6. Your text calls the portion of a curve (when plotting concentration of nutrient in tissue on the "x" axis and growth on the "y" axis) where the concentration changes from deficient to adequate the _____.
 - a) critical nutrient concentration
 - b) minimum acceptable percentage
 - c) plant nutrient ratio
 - d) luxury consumption zone
 - e) top deficiency zone

7. A finding that potassium fertilization reduced the uptake of calcium by growing plants would probably be explained on the basis of:
 - a) cation competition.
 - b) the low solubility of calcium compounds.
 - c) the principle of antagonism.
 - d) the replacement of exchangeable Ca^{2+} with exchangeable K^+ .

8. In an Iowa soil at neutral pH, one would expect:
 - a) greater than 60% H ions on exchange sites.
 - b) less than 20% Ca ions on exchange sites.
 - c) considerable Al ions present on exchange sites.
 - d) the combination of Na and K ions to be less than 10% on exchange sites.
 - e) less than 5% Mg ions on exchange sites.

9. The two major components of acid rain also contain the plant nutrients:
 a) N and K. b) P and S. c) Fe and C. d) K and P. e) S and N.
10. The amount of fertilizer required for a good crop yield can be determined most accurately by:
 a) testing a soil before and after a crop is grown to see what is removed.
 b) analyzing healthy plant tissue to see what it contains.
 c) fertilizer trials.
 d) calculations based on our understanding of how the particular crop grows.
11. Which set of nutrients occurs in the most constant proportions to each other in any given plant tissue?
 a) Ca, Mg, K b) Ca, Mg, S c) N, P, K d) N, P, S e) can't predict
12. A soil solution was found to contain a concentration of 0.0001 M $[H^+]$. The pH of this soil is _____.
 a) 2 b) 3 c) 4 d) 5 e) 6
13. Both H and _____ ions are considered to be acidic when they occur on the cation exchange sites.
 a) Al b) Ca c) Na d) NH_4 e) K
14. The major mechanism by which K arrives at the plant-root surface for uptake is by _____.
 a) root elongation b) diffusion c) contact exchange d) mass flow e) gravity flow
15. Healthy plant tissue is likely to contain about 0.3% _____ on a dry-weight basis by tissue analysis.
 a) nitrogen b) phosphorus c) potassium d) molybdenum e) copper
16. Which of these tests is likely most variable during a single day?
 a) total tissue analysis b) K soil test c) pH d) P soil test e) sap tissue test
17. Under which of these conditions would you expect anion exchange in soil to be greatest?
 a) an Iowa soil at pH 7. b) an Alaska soil at pH 5.
 c) a North Carolina soil at pH 8. d) a Brazilian soil at pH 5.
 e) a Costa Rican soil at pH 8.
18. A soil contained 10% montmorillonite and 20% illite. What is the expected CEC contributed by these two components in meq/100g soil?
 a) 4.6 b) 14 c) 19 d) 36 e) 45
19. The term "hidden hunger" indicates that deficiency symptoms are not identifiable:
 a) because they are masked by a more serious deficiency.
 b) because they are masked by insect or disease damage.
 c) because they pertain to animals that eat the plants.
 d) because the deficiency is not severe enough.
20. As demonstrated in lecture, as one blows into a flask containing water, _____ is formed and the pH drops.
 a) H_2SO_4 b) NaOH c) H_2CO_3 d) HCl e) $Ca(OH)_2$
21. Much of the charge on soil clay particles resulting from isomorphous substitution results from:
 a) Ca^{2+} replacing Al^{3+} . b) Mg^{2+} replacing Al^{3+} .
 c) K^+ replacing Mg^{2+} . d) Fe^{2+} replacing Si^{4+} .

22. Air can be a source of these elements for at least some plants.
- | | |
|----------------|---------------|
| a) C, O, N, Ca | b) P, S, C, H |
| c) C, O, P, S | d) S, N, C, O |
| e) P, C, O, N | |
23. As discussed in lecture (and in your reading), Fick's Law is used to quantify:
- a) mass flow. b) CEC. c) root interception. d) diffusion. e) AEC.

POSSIBLE POINTS ARE INDICATED IN THE LEFT-HAND COLUMN.

24. Explain how the hydrous oxides of aluminum $[\text{Al}(\text{OH})_3]$ can have positive or negative charge depending upon pH. How does this happen?
- (5)

25. Explain illite clay to a University of Iowa graduate. How does it form and why is it different from other clays (aren't all clays the same?).
- (5)

26. Why might two soils that have the same pH of 5.5 need different amounts of lime to reach a pH of 6.5? Explain.

(5)

27. In soil testing, explain the differences between correlation and calibration data. Why is it important to use a soil testing laboratory that understands local conditions?

(5)

28. Identify at least one correct plant chemical available form of these elements.

(4)

Potassium =

Copper =

Sulfur =

Boron =

Part 1 _____

Part 2 _____

Total _____