

Name: _____

AGRONOMY 354
Test 2
February 25, 2009

INDICATE THE ONE BEST RESPONSE.

1. Which of these forms is a source of anion exchange capacity in soil?
a) NH_4^+ b) R-NH_3^+ c) R-COO^- d) Al(OH)_3 e) H_2AlO_3^-
2. During the growing season, a tomato crop might absorb as much as _____ of the available K^+ in its root zone by root interception.
a) 2% b) 25% c) 75% d) 125% e) 400%
3. Which one of the following ions is not included in the "exchangeable bases"?
a) Al^{3+} b) Ca^{2+} c) K^+ d) Mg^{2+} e) Na^+
4. Identify the correct answer concerning the quantity of ions that 1 meq of exchange capacity could hold.
a) 6.02×10 to the 23rd power K^+ ions
b) 3.01×10 to the 20th power Ca^{2+} ions
c) 1.204×10 to the 21st power Mg^{2+} ions
d) 1.204×10 to the 24th power NH_4^+ ions
e) none of these is correct.
5. A significant amount of the plant nutrient requirements of _____ for all plants may presently be met from an atmospheric source.
a) P b) N c) K d) Ca e) S
6. Your text discusses that chelates such as EDDHA or DTPA are often used to:
a) extract micronutrients from soil.
b) measure a soil's pH.
c) test a soil for lime requirement.
d) extract nutrients from plant tissue.
e) measure a soil's cation exchange capacity.
7. A nutrient is most apt to be deficient in a cold, wet spring if the major mechanism of uptake is:
a) diffusion. b) contact exchange. c) solution. d) mass flow. e) root elongation.
8. A tropical soil contains 40% hydrous oxides of Fe and Al, 30% kaolinite, 20% quartz, and 1% organic matter. Which component probably supplies the most anion exchange capacity?
a) hydrous oxides b) kaolinite c) quartz d) organic matter
9. Which process converts some of the constituents of soil into available plant nutrients?
a) mineralization b) immobilization c) fixation d) leaching e) isomorphic substitution
10. Which of the following solutions has the lowest pH if the number refers to H^+ activity?
a) 0.0001 M b) 0.0002 M c) 0.000001 M d) 0.000002 M
11. Which of the following soils at pH 7.0 should have the highest CEC?
a) 2% humus, 10% illite, 40% silt, 50% sand
b) 3% humus, 30% montmorillonite 30%, silt, 40% sand
c) 4% humus, 40% kaolinite, 20% silt, 40% sand
d) 5% humus, 50% illite, 30% silt, 40% sand

12. The percentage phosphorus in the plant sap is influenced by _____ as well as by the amount of available phosphorus in the soil.
- the moisture supply in the soil
 - the nitrogen supply in the soil
 - the part of the plant sampled
 - the time of sampling
 - all of the above
13. One normally does not take a soil sample adjacent to a rock road because the sample may be unrepresentative in _____.
- drainage
 - pH
 - cation exchange capacity
 - organic matter content
 - clay content
14. This source of charge in soil is not pH dependent.
- anion exchange capacity associated with soil organic matter.
 - cation exchange capacity associated with soil organic matter.
 - broken bonds on the edges of clays giving anion exchange capacity.
 - broken bonds on the edges of clays giving cation exchange capacity.
 - charge coming from isomorphous substitution.
15. Which of these contain K between adjacent silica tetrahedral layers?
- illite
 - vermiculite
 - hydrated oxides of Fe and Al
 - montmorillonite
 - kaolinite
16. Which of these elements is taken up by plants as an anion?
- calcium
 - manganese
 - molybdenum
 - iron
 - copper
17. Your text discusses the influence of soil organic matter on pH and concludes that it:
- increases pH due to release of OH⁻ ions during decomposition.
 - decreases pH due to release of Al³⁺ during decomposition.
 - increases pH due to release of Ca²⁺ during decomposition.
 - decreases pH due to release of CO₂ during decomposition.
 - has no effect on soil pH.
18. A soil test that is well correlated:
- gives reproducible results.
 - can be used equally well for all soils within a country.
 - relates well to the ability of a plant to extract nutrients from a given soil.
 - will indicate the exact quantity of nutrients required for a given crop on a given soil.
19. As the pH of the soil decreases:
- anion exchange appears to increase.
 - cation exchange appears to increase.
 - cation exchange stays the same.
 - anion exchange stays the same.
20. Which of the following combinations of ions and weights would neutralize the greatest number of negative exchange sites in soil? The atomic weights are given in parentheses.
- | | |
|-----------------------------------|-----------------------------------|
| a) 78 mg of K ⁺ (39) | b) 23 mg of Na ⁺ (23) |
| c) 40 mg of Mg ²⁺ (24) | d) 60 mg of Ca ²⁺ (40) |
21. Which of the tests listed below is best suited for telling whether a growing plant is adequately supplied with a particular nutrient or is suffering from "hidden hunger"?
- deficiency symptoms
 - pH determination
 - sap test
 - tissue analysis

22. Iron pyrite is a problem in some environments for plant growth because it:
- a) releases toxic levels of iron.
 - b) ties up soil potassium.
 - c) makes soils acid when exposed to oxygen.
 - d) contributes to excessive soil CEC.
 - e) causes soil to become anaerobic.
23. The essential element in orthoclase is:
- a) Ca. b) Co. c) K. d) Mg. e) P.

POSSIBLE POINTS ARE INDICATED IN THE LEFT-HAND COLUMN.

24. What acids are involved with acid rain and where do they originate?
(4)

25. Describe to a friend the basic concepts of a statistical factorial design. What is involved?
(4)

26. If a soil can hold 350 mg of Mg^{2+} per 100 g, how many mg of Ca^{2+} would this same soil hold? Please show your work. (At wts: Mg = 24; Ca = 40)
(5)

27. Describe to a U of I graduate why a large soil testing laboratory in California might not give you the best fertilizer recommendations for an alfalfa crop in Iowa.

(5)

28. Specifically indicate why one cannot determine the quantities of lime required based solely on soil pH? Explain.

(4)

29. What are the two (2) chemically available forms of P for plant growth?

(2)

Part 1 _____

Part 2 _____

Total _____