

Name: _____

AGRONOMY 354
Test 4
November 16, 2011

INDICATE THE ONE BEST RESPONSE.

1. Today, most N fertilizers start with:
a) NH_3 . b) urea. c) $(\text{NH}_4)_2\text{SO}_4$. d) NO_3^- . e) NH_4NO_3 .
2. Nitrogen is an integral part of all but:
a) chlorophyll. b) enzymes.
c) protein. d) nucleic acids.
e) cellulose.
3. Nitrogenase is an enzyme that functions in the process of:
a) aminization. b) ammonification. c) nitrification. d) nitrogen fixation.
4. Chlorotic soybeans north of Ames are usually growing on:
a) broad flat areas of black soils.
b) depressions in nearly level areas.
c) eroded spots on the shoulders of hills.
d) slopes steeper than 5%.
5. Under which of these conditions would you expect the greatest amounts of N_2 fixation with green beans in a garden setting?
a) ten tons of hogs manure added per acre
b) 100 lbs/acre of urea nitrogen added
c) 4 tons/acre of tree leaves worked into the soil
d) 100 lbs/acre of sewage sludge worked into the soil
e) fixation similar with all of these additions
6. In which of these states would you expect soil salinity to most limit yield potential?
a) Iowa b) South Dakota c) Minnesota d) Wisconsin e) North Carolina
7. Low to moderate yields of rice are grown in underdeveloped areas year after year with no nitrogen fertilizer, largely because of the nitrogen-fixing ability of:
a) free-living bacteria. b) blue-green algae.
c) lichens. d) rhizobia bacteria.
e) anaerobic bacteria
8. Your reading discusses 'leaching requirement,' which is:
a) the amount of water required to move nitrate out of the soil profile.
b) the amount of water to move calcium carbonate into the soil following liming.
c) the amount of water to convert ammonium nitrogen into nitrate nitrogen.
d) the amount of water in a normal soil to determine soil pH.
e) the amount of water to move salts out of the rooting zone.
9. Magnesium stored by soil organic matter is mostly:
a) a structural component in cell walls.
b) built into protein molecules.
c) contained in chlorophyll.
d) held by cation exchange sites.

10. As a greenhouse operator, you wish to add 10 pounds of N from KNO_3 to 1000 gallons of water. How many pounds of KNO_3 would you use? (At wts: K=39, N=14, O=16).
a) 1.4 b) 22 c) 39 d) 55 e) 71
11. The sodium compound that forms and should be leached away when a sodic soil is reclaimed with gypsum as the soil amendment is:
a) NaCl . b) NaHCO_3 . c) NaNO_3 . d) Na_2SO_4 .
12. Shortly after anhydrous ammonia is injected into a soil having an initial pH of 6.5, the soil pH in the center of the injection zone is expected to be about:
a) 5.0. b) 6.5. c) 7.0. d) 9.5. e) 13.0
13. Milorganite is:
a) an active ligand in soil organic matter.
b) a N-containing organic fertilizer.
c) a clay found in soils of the SE USA.
d) an inorganic source of urea N.
e) a name for bat dung (manure).
14. Grower Jim has a wheat field ready to harvest in Nebraska that is badly lodged. He has checked weather records and no unusually strong winds have been reported. What probably happened?
a) not enough N was applied
b) too much lime was applied, too high of soil pH
c) too much N was applied
d) no lime was applied, too low of soil pH
e) too much P was applied
15. A nitrogen deficiency is indicated by a chlorotic (lack of chlorophyll) condition that shows:
a) about equally in all parts of the plant.
b) mostly at the growing points.
c) mostly at the tips and midribs of older leaves.
d) mostly on stems or stalks and adjacent plant parts.
16. An Iowa soil might deliberately be acidified if the user intended to grow _____ for a number of years in succession.
a) corn b) soybeans c) potatoes d) tomatoes e) alfalfa
17. Concerning soil organic matter,;
a) it is a significant source of N, P, and K.
b) 80 lbs of N per year is a reasonable mineralization rate from an Iowa soil with 4% OM.
c) we should be able to till the soil and improved OM levels above those of virgin conditions.
d) increasing microorganism populations will increase OM long term.
18. The average soil microbe appears to be about _____ efficient at converting plant residue carbon into microbial tissue carbon.
a) 10-15% b) 20-25% c) 40-50% d) 80-100%
19. Soil organic matter stores significant amounts of _____ as integral parts of its organic structure.
a) Ca, Mg, K b) Ca, Mg, S c) N, P, K d) N, P, S e) N, K, Ca

20. The major portion of nitrogen in Iowa soils is found as:
- a) soluble ammonium.
 - b) exchangeable ammonium.
 - c) soluble nitrate.
 - d) exchangeable nitrate.
 - e) organic nitrogen compounds.
21. Your reading discusses the amount of N mineralization coming from manure with time and concludes:
- a) the rate of release is linear during the first several months.
 - b) the rate of release decreases with time.
 - c) the rate of release increases with time.
 - d) the rate of release takes several years for significant increases in available N.
22. How do symbiotic bacteria work to fix nitrogen?
- a) the bacteria concentrate themselves on the outside of the epidermal tissue similar to ectomycorrhizae and use special proteins to convert N_2 gas into ammonia
 - b) the bacteria are non-specific, free living in the soil, but the plant can use them in association with the roots to concentrate nitrogen they are continuously fixing into ammonia
 - c) the bacteria enter the cortex cells via an infection thread and use carbon manufactured by the plant to denitrify N_2 gas into a usable form
 - d) The bacteria enter through a root hair, become established as a swelling of infected plant cells and reduce N_2 gas into a usable form
23. The study of Jenkinson showed in a temperate environment that of organic carbon added to soil,:
- a) about 80% remained in the soil after 4 years.
 - b) about 80% remained in the soil after 1 year.
 - c) about 20% remained in the soil after 4 years.
 - d) about 20% remained in the soil after 1 year.
 - e) the C was completely lost within a 4-year period.

POSSIBLE POINTS ARE INDICATED IN THE LEFT-HAND COLUMN.

24. Give two (2) reasons why one would expect soil organic matter levels to increase when the soil is converted from conventional tillage to no-till or minimum tillage.

(4)

25. What is the most deficient micronutrient expected in an organic soil? Why?

(4)

26. Describe the general characteristics of a sodic soil.
(5)

27. Describe in general the process by which anhydrous ammonia (NH_3) is made. What are the starting materials?
(5)

28. Why are we concerned about the carbon-to-nitrogen ratio of plant residues that we add to soil? What do the terms mineralization and immobilization mean? At what ratios do these processes occur?
(6)

Part 1 _____
Part 2 _____
Total _____