Name_____

Agronomy 485/585

Test 1

October 7, 2008

Part I. Circle the one best answer (2 points each).

1. This individual won a Nobel Prize for his work with antiobiotics.
   a) Brown b) Winogradsky c) Beijerinck d) Pasteur e) Waksman

2. Of expected biomass (living tissue) in soil, rank these organisms from greatest to least expected biomass.
   a) nematodes, fungi, bacteria, actinomycetes
   b) bacteria, fungi, actinomycetes, nematodes
   c) actinomycetes, fungi, nematodes, bacteria
   d) fungi, bacteria, actinomycetes, nematodes
   e) biomass is often about equal for all four groups.

3. Per mole, which of these would you expect to have the most potential energy to microorganisms metabolizing aerobically these compounds?
   a) HCHO b) CH_4 c) CO_2 d) CHOOH e) CH_3OH f) all would have the same per mole

4. An ideal soil often has by volume:
   a) 75% mineral material.
   b) 50% organic matter.
   c) 50% pore space.
   d) 10% living matter.
   e) 75% water.

5. This element is very common in soil but is not a common element in living tissue.
   a) nitrogen b) phosphorus c) aluminum d) calcium e) zinc

6. The very coarse sand fraction of soil is as large as 2.00 mm. Compare this size roughly to the size of a single mastigophora protozoan (in the order sand:protozoan).
   a) 1000:1 b) 100:1 c) 10:1 d) 1:10 e) 1:100 f) 1:1000

7. According to your reading, a method involving luciferase is used to measure _____ in soil.
   a) ATP b) redox potential c) texture d) fungi e) water potential

8. The expected average oxidation state of C in methanol (CH_3OH) is _____.
   a) -2 b) -1 c) 0 d) +1 e) +2

9. This group of organisms often only contains DNA.
   a) archaea b) bacteria c) actinomycetes d) fungi e) bacteriophages

10. According to your reading, the plural of flagellum is:
    a) flagellums b) flagella c) flagellae d) flagelli e) flagelluma

11. Soil microorganisms bring about chemical changes of compounds in soil. The conversion of Fe^{+2} to Fe^{+3} is called _____ and serves as an _____ for the microorganism.
    a) reduction, electron acceptor b) oxidation, electron acceptor
    c) reduction, electron donor d) oxidation, electron donor

12. Which of these groups of organisms are eukaryotic?
    a) bacteria and actinomycetes
    b) fungi and cyanobacteria
    c) viruses and archaea
    d) green algae and fungi
    e) blue-green algae and green algae

13. This group of organisms is often most numerous in soil.
    a) fungi b) nematodes c) protozoa d) algae e) bacteria

14. Which of these is a geochemical grouping?
    a) aerobic b) thermophiles c) ammonium oxidizers d) gram positive e) fungi

15. Most soil protozoa consume _____ for reproduction and growth.
    a) bacteria b) viruses c) fungi d) other protozoa e) actinomycetes

16. Vegetative growth of fungi is most likely to be decreased in the soil by:
    a) flooding.
    b) adding manure.
    c) adding sulfur to decrease soil pH.
    d) warming a soil at 10^{o}C to 20^{o}C.
    e) cultivation.

17. This group of algae does not have their pigments localized in chromatophores but rather the pigments are distributed throughout the cytoplasm.
    a) diatoms b) cyanophyta c) chlorophyta d) xanthophyta

18. Identify the true statement about actinomycetes.
    a) the name means “true bacteria.“
    b) often dominate in acid soils.
    c) do poorly relative to other bacteria in dry soils.
    d) often are considered slow growers.
    e) no members form relationships with higher plants.

19. The factor most limiting microbial activity in soil is usually:
    a) pH. b) moisture.
    c) available N d) energy.
    e) available P

20. Which group of microorganisms would you expect to find making up the lowest percentage of its population at a 40-cm depth compared with a 5-cm depth?
    a) actinomycetes b) bacteria c) algae d) fungi e) anaerobes

21. Members of this group of fungi include smuts, rusts, and many classical mushrooms.
    a) Basidiomycota b) Ascomycota
    c) Zygomycota d) Chytridiomycota
    e) Oomycota

22. Which of these groups of organisms is expected to be favored in an alkaline soil?
    a) bacteria b) actinomycetes c) fungi d) fauna e) yeasts

23. A soil sample (10.2 g) containing 18% water is added to a 95-mL dilution blank. What is the initial dilution?
a) 8.64 b) 11.6 c) 12.0 d) 12.4 e) 12.8

24. An example of anaerobic metabolism is:
a) NH_4^+ is being used as an electron donor.
b) SO_4^{-2} is being used as an electron acceptor.
c) NH_4^+ is being used as an electron acceptor.
d) SO_4^{-2} is being used as an electron donor.
e) none of these is an example of anaerobic metabolism.

25. Identify the true statement concerning mull and mor horizons in soil.
a) both involve zones relatively low in microbial growth.
b) the mor horizon tends to be acid.
c) the mull horizon typically is found under conifer vegetation.
d) the mull horizon forms in wetter soils.
e) both relate to the temperature of the surface soil.

Part II. Short answer and essay. Be to the point in your responses (possible points are indicated in the left-hand column).

26. In Bradyrhizobium japonicum USDA 110 (Jordan), discuss each component of this name. What specifically is the word "japonicum" known as? How is USDA 110 determined?
(6)

27. Describe a fairy ring. How does it form and what causes the characteristic pattern?
(5)

28. Discuss this statement, “Viruses are known to multiply in soil.”
(5)

29. a) Explain to a U of I graduate why some consider the actinomycetes to be a transitional group between bacteria and fungi.

(5)

b) In the end, they are classified as bacteria. Why?

(2)

30. A lichen consists of a symbiotic relation between a(n) _____ partner and a(n) _____ partner. Specifically explain the contributions of each partner to the symbiosis in the initial stages of soil formation.

(6)

31. Blue-green algae are thought to be very important in the production of rice. What specific environmental conditions allow the blue-green algae to fix large quantities of N in rice culture? Explain?

(5)

32. Why with plate counts would you use the plate that has 27 organisms growing at the 10^{-6} dilution and not the plate that has 176 organisms growing at the 10^{-5} dilution? Be specific in your reasons.

(5)

33. We have studied in Agron 485/585 the tremendous diversity of organisms that exist in soil and have seen a few of these organisms so far in the laboratory. Speculate on why you think such diversity has evolved and is present in practically any soil on planet Earth.
(5)

34. Define:
a) capsid
(2)

b) chemical reduction
(2)

c) ergosterol
(2)