

Name _____

Agronomy 485
Test 1
September 27, 2007

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

1. This individual first isolated the nitrification organisms from soil.
a) Dumas b) Brown c) Pasteur d) Winogradsky e) Hesse
2. Of the total living component of a soil, the living microbial portion is expected to make up about _____ of the living volume.
a) 90% b) 60% c) 30% d) 5% e) 1%
3. Which of these elements important to life does not constitute at least 1% of the most abundant elements in the earth's crust?
a) calcium b) nitrogen c) magnesium d) iron e) oxygen
4. The most important microbial group in promoting soil structure likely is the _____.
a) actinomycetes b) algae c) bacteria d) fungi e) yeasts
5. In comparing the size of an actinomycetal hyphal strand and a fungal hyphal strand (in this order), one would expect the relationship to be approximately:
a) 100:1 b) 10:1 c) 1:1 d) 1:10 e) 1:100
6. This group of soil organisms includes both eukaryotic and prokaryotic cells.
a) actinomycetes b) bacteria c) algae d) fungi e) archaea
7. Which group of organisms is correctly identified as an order?
a) actinomycetales b) streptomycetaceae c) streptomyces
d) *actinoplanes* e) actinomycetes
8. One of the most common organic compounds in nature likely is:
a) sucrose. b) cellulose. c) mannitol. d) glycine. e) chitin.
9. A given environment is said to be copiotrophic, which means the environment is:
a) low in nitrogen. b) high in salt. c) high in water. d) low in microorganisms.
e) high in nutrients.
10. Members of this group are known for nitrogen fixation.
a) *Frankia* b) *Streptomyces* c) *Aspergillus* d) *Nitrosomonas* e) *Pseudomonas*
11. Identify the generally true statement concerning soil actinomycetes.
a) require organics as a terminal electron acceptor
b) are rather tolerant of acid conditions
c) have a greater soil biomass than fungi
d) are more abundant than soil bacteria
e) are prokaryotic
12. Which of these components in soil will heat most slowly with a given amount of heat input?
a) quartz b) air c) water d) ice e) humus

13. Evaluate the oxidation state of the carbon in methane (CH₄).
a) -4 b) -3 c) -2 d) -1 e) 0
14. Five bacteria with a generation time of 30 minutes would produce _____ cells after 2 days of logarithmic growth.
a) 1×96^2 b) 5×30^{10} c) 1×5^{96} d) 5×2^{48}
e) none of these answers is correct.
15. Identify the expected relationship of soil populations.
a) One would expect more protozoa than fungi.
b) One would expect more actinomycetes than bacteria.
c) One would expect fewer fungi than algae.
d) One would expect fewer actinomycetes than fungi.
e) One would expect fewer protozoa than algae.
16. The ideal moisture in soil for the growth of the greatest number of organisms is usually considered to be between _____ bars soil-moisture tension.
a) 0.1-1 b) 1-3 c) 0-15 d) 15-30 e) 30-50
17. Nitrifying bacteria can be classified as:
a) chemoheterotrophs. b) chemoautotrophs. c) photoautotrophs.
d) photoheterotrophs.
18. Actinomycetes may be cultured selectively by:
a) growing anaerobically in the presence of nitrate.
b) using antifungal agents in the medium.
c) adjusting the soil pH to 4.5.
d) using chitin as an electron donor.
e) heating the soil before culturing.
19. Identify the specific epithet of *Bradyrhizobium japonicum*.
a) *japonicum* b) *Bradyrhizobium* sp. c) *Bradyrhizobium* d) *Bradyrhizobium* spp.
e) *B. japonicum*
20. A large silt-sized soil particle is 0.05 mm in diameter. Of an average sized actinomycetal hyphal diameter, how many hyphal diameters would reasonable fit this dimension?
a) 2.5×10^{-1} b) 2.5 c) 2.5×10^1 d) 2.5×10^2
e) none of these answers is within 10X of the expected value.
21. A saturated soil is often anaerobic because:
a) it tends to be too cold for organismal growth.
b) the terminal electron donors are leached away.
c) gasses diffuse slowly through water.
d) growth factors are not rapidly released from the mineral fraction.
e) only a few organisms can live under these conditions.
22. The complete fermentation of glucose results in:
a) water and organic acids.
b) methane and carbon dioxide.
c) organic acids and carbon dioxide.
d) organic acids and alcohol.
e) water and carbon dioxide.

23. Your text discusses osmotic potential in relation to soil water, which is the attraction of water to:
a) other water molecules. b) soil particles. c) ions in solution.
d) soil microorganisms. e) gravitational forces.
24. Your reading discusses "white-rot decay" in wood. The major compound degraded is _____ and the decomposing group is the _____.
a) hemicellulose, bacteria
b) lignin, fungi
c) chitin, actinomycetes
d) cellulose, fungi and actinomycetes.
e) protein, bacteria
25. Actinomycetes in a broad sense could be classified as:
a) Gram + bacteria. b) small eukaryotic fungi. c) Gram - fungi. d) Gram + archaea
e) Gram - archaea.

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

26. What are lichens and why are they often pioneering organisms in recently denuded areas.
(8)

27. How are cyanobacteria similar to bacteria and how are they similar to green algae?
(6)

28. In soil temperature, briefly discuss:

a) albedo

(4)

b) $Q_{10} = 2$

(4)

29. Soil bacteria are more numerous, reproduce faster, can live aerobically or anaerobically, and as a group are more mobile. How can fungi compete?

(6)

30. Briefly indicate and discuss at least two ways you could evaluate fungal vegetative growth in soil.

(6)

31. Besides water, organisms need the “five essentials” as discussed in lecture for growth. Indicate your understanding by discussing these essentials and the fascinating diversity used by organisms living in the soil.
(8)

32. When considering the actinomycetes of soil, briefly discuss:
a) the origin of the smell of freshly turned earth.
(4)

b) the uniqueness of their base-pair composition.
(4)

The End