Test 1 Microbial Ecology Spring 1999 _____Name

1. Describe how technological advances moved the field of microbiology forward from its beginning. (10)

2. Why is it difficult to distinguish among bacterial "species" and how do molecular techniques help to resolve this difficulty? (10)

3. How can different regions of the rRNA molecule be used to estimate evolutionary time when one lineage diverged from another, and how does this relate to function of the rRNA in the cell? (5)

4. Describe the evidence for bacterial origin of chloroplasts and mitochondria, and discuss why mitochondria probably only became a feature of eukaryotic cells after oxygenation of the earth. (10)

5. What are the three major groups of protozoa? (3)

6. Why can life not have the following characteristics: a) perfect order, b) violation of the second law of thermodynamics, c) perfect replication, and d) complete isolation from the surrounding environment? (8)

7. How come deep marine habitats are very cold (about 3.9 ^{o}C), even in tropical areas where the surface is always warm? (5)

8. In many habitats (such as the ocean), a majority of the biogeochemical cycling occurs in small organisms. How can this be the case if their relative biomass is low? (5)

9. Why is energy lost at each step in a microbial (or macroscopic) food web? (5)

10. There are two species of bacteria, each about 1 μm in diameter. One lives very close (within several cell diameters) to a rock in the groundwater, the other floating in the ocean. Which one experiences more resistance to movement, which one has slower diffusion to and from it? (4)

11. Why are resting spores of microbial species often spherical, whereas the active microbe has a shape that deviates significantly from spherical? (5)

12. Describe the random walk model of chemotaxis toward a diffusing chemical source. (10)

13. Why do magnetotactic bacteria that live in the sediments go north in the northern hemisphere, south in the southern hemisphere, and are not generally found in equatorial regions? (7)

14. Describe the special light harvesting system of cyanobacteria that allows them to compete well in low light situations, even when chlorophyll-containing organisms have already had a chance to absorb some of the light. (10)