What is quorum sensing and why do bacteria do it?

Explain 2 examples of ecologically important bacterial signaling.

Give 3 ways in which the S-cycle and the N-cycle are similar and 2 ways in which they are different.

Why is SO4 reduction retarded by NO3, FeIII, and Mn IV?

Why are many S oxidizers acidophilic?

What is the electron donor and acceptor for:
S- oxidation, S- reduction, Fe- reduction

What are 2 ways by which soil microbes increase P-availability to plants?

What is the “great plate count anomaly?”

Explain the difference between genomics and metagenomics.

Complete genomic sequences for acid mine drainage have been 90% assembled; for Sargasso Sea: 50% and for soil: 0%. Why is metagenomic community analysis of the community composition of these 3 habitats so different in terms of its success?

What do plants and fungi provide and receive in a typical mycorrhizal interaction, and how does this answer differ with different types of mycorrhizae?

What are the major forms of inoculum that AM and Ecto mycorrhizal fungi use to colonize new plant roots?

What types of spores do AM fungi produce, and how are they distinguished.

When AM spores germinate how do they find and colonize a host?

What types of infection structures are found in AM fungi, and what sorts of processes occur at them?

What are the differences between the evolution of AM and Ecto mycorrhizal fungi in terms of age (in geologic time) and groups of fungi involved? What types of evidence indicate support the time estimates?

Which plant groups (in broad and not necessarily taxonomic terms) associate with AM and Ectomycorrhizae?
Define or describe the following terms: appresorium, glomalin, Hartig net, mantel, Extraradical mycelium, peleton, paris-type colonization, epiparasite, mycoheterotrophic plant, trap culture, bioassay.

How are Arbutoid, Monotropoid and Ectendo mycorrhizae different from typical ectomycorrhizae and how are they similar?

Ericoid mycorrhizae are minor in the sense that they are limited to a single plant family, but how are they major players from a global perspective?

What types of fungi are involved with ericoid mycorrhizae?

What does a typical ericoid mycorrhizal interaction look like – which cells are colonized and how long does the interaction last?

How is the orchid mycorrhizal interaction functionally different from others?

What form of nitrogen is delivered to plants by AM versus Ectomycorrhizae?

Why is carbon transferred to plant from ectomyocorrhizal fungi in the process of Nitrogen transfer?

How is phosphorus and nitrogen transport theorized to be coupled in AM associations?

One of the biggest benefits to plants derived from association with AM fungi is increased phosphorus, but what is known about how fungi achieve this?

What soil phosphorus pools are available to EM fungi, and what is known about how they access them?

What form of carbon is typically transferred from plants to mycorrhizal fungi and what compounds does the fungus convert this into?

How is carbon transported to the extraradical mycelium in AM fungi?

What are some of the ways that researchers have tried to estimate the carbon cost of mycorrhizal fungi in the lab and in the field.

How important is respiration in terms of the total carbon budget of mycorrhizal fungi, and how dependent is fungal respiration on current transfer of carbon from the host?

What is the Gadgil hypothesis?
When a common mycorrhizal network connects two plants what are some of the possible outcomes for the plants?

What evidence is there that carbon can be transferred between plants via common mycorrhizal networks and how do skeptics of the process interpret this evidence?

What are the essential features of early stage mycorrhizal fungi that make them particularly successful colonizers? Or conversely what are the features of late stage mycorrhizae that allow them to dominant undisturbed forest settings.

If you plant a seedling of an ectomycorrhizal dependent plant under a mature tree, what type of mycorrhizal fungi would you expect to colonize it? Would your answer change if the seedling were planted in a pot with the same soil?

Discuss the main factors that seem to partition the species in the ectomycorrhizal and arbuscular mycorrhizal fungal communities.

Diagram and explain Bever's negative and positive feedback model and discuss how each would effect plant and fungal diversity.

How are these processes thought to relate to plant successional patterns?

Defend the idea that mycorrhizal interactions are balanced parasitism by discussing several examples of non-mutualistic behavior.

In Jessup et al.'s review of the use of microbial models systems in ecology, they discuss several perceived problems with the approach; what are these and how do they address them?

What types of laboratory experiments have been conducted to test the effect of spatial structure on the maintenance of diversity? What are the basic results from these experiments?

Relating spatial structure back to the soil community - what are the features of the soil that would create the types of structure that could maintain microbial diversity?

What types of experiments have been conducted to test the effect of species richness on ecosystem function and what were the results?

Why is it necessary to use estimators of species richness in natural microbial communities? And what are some of the options available for estimation?

How does the Chao1 estimator work - specifically what observation do you need to use it? And how would you know if the estimate would increase with additional sampling?
Who are the major players in the leaf cutter ant symbiosis and what are their roles?

What is a lichen and what are its components?

In what settings are lichens particularly important?

Discuss examples of the ways in which soil borne pathogens persist at a site.

What is suppressive soil? what indicates it is caused by living organisms? and what mechanisms are involved in the suppression?

Why is it difficult for microbes and plants to acquire iron for nutrition?

Why is iron important to life?

How abundant is iron in soil and in what forms is it found?

By what means do microbes access and assimilate Fe?

Describe the relationship between iron solubility and pH.

Describe the environmental consequences of dissimilatory ferric iron reduction.

In what habitats would you expect to find large populations of dissimilatory Fe(III) reducing bacteria?

Under what conditions is biological ferrous iron oxidation important?

How are the iron and phosphorus cycles linked?

List four terminal electron acceptors important for bacteria and/or archaea in anaerobic environments in order from highest to lowest redox potential.

What are the sources of electrons for dissimilatory Fe(III) reducing bacteria and Fe(II) oxidizing bacteria?