BIO 1C Study Guide 3: Plant nutrition, physiological ecology, short distance flow, xylem and phloem flow, fungi, community ecology

Remember that this is a guide only. DO NOT rely on it solely for your studying. Use your notes, study sessions and the book. I cannot possibly put all the necessary details on here!
Also, remember, be able to draw (not just recognize), and explain and label. Know how things fit together, don’t just memorize terms and cycles out of context.

- Guard cells and stomata: know what they are, how they work, and the important functions they play in plant physiological ecology and vascular transport
- Mycorrhizae and N2 fixing bacteria (and nodules eg. *rhizobium*): mechanisms and importance
- Importance of nutrients and soils: role of topsoil
- Adaptations to water availability: mesophytes, halophytes, hydrophytes, xerophytes
- Know some abiotic and biotic factors affecting growth and development of plants
- Stomata: how they function and cues for opening and closing
- C3, C4 and CAM pathways: when are they used, what are the advantages and disadvantages, what is the mechanism. Be able to draw the general pathways, and the intermediate for Carbon storage
- What are some other ways plants deal with environmental stress
- Physical/mechanical, behavioral (eg. ant mutualists), and chemical (secondary compounds) defense mechanisms in plants.
- Know what allelopathy is and how it is used

Long and short distance flow

- Flow: diffusion, bulk flow, osmosis, co-transport, role of proton pumps and active transport, membrane potential, and transport proteins.
- Xylem sap flow: role of transpiration and the stomata, transpiration/cohesion/adhesion model. Bulk flow
- Water potential = solute potential + pressure potential. Water flows into areas of low water potential.
- Role of the Vacuole
- Structure and role of tracheids, vessel elements, sieve tube members and companion cells
- Short distance (lateral) flow: via the symplast, apoplast, transmembrane
- Casparian strip
- Phloem sap flow: source to sink via active transport and water flow. Bulk flow

Fungi:

- What are some of the general traits of the fungi?
- What major ecological role do many of them play? What other ecological roles (eg. parasites etc.)
- Know what hyphae are and what the mycelium is and what it does
- In many fungi, what is the actual structure that we see above the surface, and what is its primary role?
- Define coenocytic and septate hyphae
- Describe a lichen (its mutualistic association)
- What are mycorrhizae? What are two major kinds?
- Be able to draw the generalized fungal life cycle, and know how each of the four phyla relate and/or are different from it (I may ask questions about key differences)
- In addition to the general life cycle, also know the specifics of the life cycle of a basidiomycete and an ascomycete
- Know some distinguishing features of each of the four fungal phyla (eg. the chart in your book and in the powerpoint handout I handed out)
ECOLOGY: be able to give examples! Define the subfields (organismal, ecosystem, community, population)

- Why do grasslands have such fertile soil? Why do tropical rain forests, which have high biomass, have such poor soil?
- What are key abiotic factors that define aquatic (oceanic) biomes?
- List specific biotic factors that can define community structure (e.g. Zonation in the intertidal)
- What is a limiting factor? Describe one, and its significance
- What are the two primary defining abiotic factors that describe a biome? What biome community generally describes a biome? (e.g. Plants). Be able to describe a specific biome
- List some factors that could determine/explain the range of a population or species.
- What is meant by the 'law of tolerance'? Give an example
- Give an example of a long-term and a short term response of an organism to a tolerance limit.
- Give an example of an ecosystem that has high primary productivity, and one with low
- What is biomagnification? Why does it mostly affect high order predators? Give an example.
- What is eutrophication? What causes it? What is a dead zone? What does oligotrophic mean?
- Be able to discuss the role of ocean currents, rain shadows, Hadley cells and insolation on biome distribution (e.g. on weather and climate patterns)
- What is the difference between weather and climate?
- When considering species diversity in an ecosystem, what two aspects of the species assemblage is it important to consider (e.g. relative abundance and species richness). Give an example.
- What does functional group diversity mean?
- List factors that can lead to high species diversity (e.g. habitat heterogeneity, interspecific competition, tolerance levels to abiotic factors, functional group diversity, intermediate disturbance to the system...). For each, explain how
- Give an example of resource (niche) partitioning
- What is a keystone species? Give an example of what might happen in a community if a ‘keystone’ species is removed. Other species with large impact: engineers, facilitators, indicator species
- Give examples of interspecific species interactions. For each, describe the effect of the interaction on each species (e.g. parasitism, predation, mutualism, commensalism).
- Give an example that explains how an interspecific interaction can be a driving force in the evolution of the species involved.
- What two main outcomes does the competitive exclusion principle predict will happen when two species attempt to occupy the same niche? (resource partitioning and competitive dominance)
- List two effects competition can have on a species assemblage (eg one dominant species – low species diversity, resource partitioning-high species diversity, genotypic differences – speciation, etc.).
- What is character displacement? Under which conditions does it tend to arise?
- What likely effect would large episodic (infrequent) disturbances have on species diversity?
- What does the intermediate disturbance model predict about disturbance and species diversity? Why?
- What is the dynamic stability hypothesis? (long food chains are unstable). What type of food chain could be predicted in an unpredictable or disturbed environment?
- What is a sere? What are the general characteristics of organisms that form early successional seres (r-selected, rapid colonizers etc.) compared with late ones?
- What is the difference between primary and secondary succession
- Why is patchiness in terms of disturbance such as patches in a forest important in promoting succession and recovery?
- What type of sere is likely to have high species diversity? Why?
- What are some characteristics of 'mature' seres compared with early ones.

Compare top down and bottom up forcing as factors that drive community structure
- What is a trophic cascade? Be able to give a specific example of how this dynamic can alter an ecosystem (e.g. the killer whales and the wolves)
- What (specifically) is driving the collapse of the kelp forest ecosystem in the Aleutian islands? Be able to give some historical background too.
- Explain what Biogeography means. How is biogeography different from phylogeography?