BI 203 - Study Guide for Final Exam

The final is cumulative, so in addition to the material below, you should be familiar with the material from the previous two study guides and be able to synthesize that information with the material from the lab, including the Sehome Hill walk.

Water in plants

Reading: pp. 76-81, Chap.31

What are the components of the full water potential equation? How does each affect the free energy and movement of water - between cells, and between plant and soil?

What is transpiration and why is it a "necessary evil"? How important is transpirational water loss in the whole water budget of a plant? How does water potential and the tension-cohesion mechanism account for transpirational movement of water through plants? What is the water potential gradient through a plant? What factors, both biotic and abiotic control rates of transpiration?

How do plant roots take up water from soil? What components of water potential, both in the soil and in the plant, are important for this flow? What is guttation, when does it occur, and why? What is hydraulic lift and how does it work? How does it relate to water potential and water potential gradients? What are some ecological consequences of hydraulic lift?

What moves through phloem? What is meant by "source-sink" relationships in phloem flow? How does phloem flow differ from xylem flow? What is the pressure flow hypothesis and the three main steps involved? How does each step work?

In linking to past topics, how does cell structure differ in xylem and phloem? How does this relate to differences in the way transpiration and phloem flow work? How do secondary xylem and phloem arise and how does this affect a plant's ability to transport fluids? How do these morphological developments relate to the evolutionary developments in land plants (e.g., in terms of problems solved and in which phyla they are found)?

Plant nutrition

Reading: Chap. 30, pp. 726-731, 735-742 (Nutrient Cycles up to The Phosphorus Cycle)

What is an "essential element"? What is the difference between macronutrients and micronutrients? Who are the macronutrients, where do they come from, and what is at least one major function of each? What two factors contribute to the deficiency symptoms for the different nutrients? Of the macronutrients we have studied closely, which have high, intermediate and low mobility?

Why is nitrogen important to plants? In what forms is N available to plants in soils? What steps are important in plant assimilation of nitrogen and how does this differ among the different available forms?

What are the main steps of the nitrogen cycle? What are the main pools and fluxes? What organisms mediate the different steps? What are the primary ways in which nitrogen enters an ecosystem (inputs) and what are the primary ways in which it leaves (outputs)? Why is mineralization important in the nitrogen cycle? Why is N-fixation important to the nitrogen cycle?

What happens in the process of N-fixation? Who does it? What is the mutualistic tradeoff in symbiotic N-fixation? How specific is this process? What are the steps in nodule formation? What factors potentially constrain N-fixation and how does the plant solve the oxygen problem? What other organisms that we have studied exhibit N-fixation?

Where are they typically found in succession and how is this similar to or different from where N-fixing plants are found?

Plant hormones

Reading: Chap. 28 to p.693

What is the definition of a hormone? What factors control the expression of a hormone-induced response? What is a signal transduction pathway and what is at least one example from the hormones that we studied?

What is the primary natural auxin? Where is it made and how is it transported? What are the effects of auxin and how do they work? What is an experiment that demonstrates the role of auxin in apical dominance? What auxin mimics are important and why?

What are cytokinins, where are they made, and what are their effects? How do they interact with IAA? How were cytokinins discovered and how are they used today? What is totipotency?

What are giberellins, where are they made and what are their functions? How do they interact with the aleurone layer in monocot seeds?

What is unique about ethylene? What is its structure and what are its effects? What is a climacteric fruit and some examples of that type of fruit? How is ethylene used commercially now? How has this use contributed (indirectly) to the downfall of tomato flavor?

How does abscisic acid (ABA) affect stomatal closure? How does this relate to regulation of transpiration?

Plant responses to the environment

Reading: chap. 29, pp. 702-714, 722-724.

What is a positive tropism and what is a negative tropism? How does gravitopism work in roots and shoots? How is the mechanism and response similar and how different in these different tissues? What is phototropism and what is its mechanism of action?

What are the different photoperiod plant types? What role does phytochrome play in photoperiod sensation? What is phytochrome's sensitivity to different wavelengths of light? How does a plant measure the length of a dark cycle? How do we know these things from studies of seed germination and flowering?

What other roles does phytochrome play in etiolation and growth responses in shade? How might these be ecologically important to a plant?

What is solar tracking? What are the two types of heliotropism? Why would a plant want to orient towards the sun? Why would a plant want to orient away from the sun?