BI 203 - Midterm #1 Study Guide

Introduction

Reading: Chap. 1

What are the 3 domains and 4 current kingdoms? How are these related to each other? Can you sketch a simple lineage among them? Which are most closely related to which? Which kingdoms are natural groups? Which are not and why not?

What features differentiate the eukaryotes and prokaryotes? What features do they share?

Major evolutionary steps and systematics introduction

Reading: Chap. 13

We briefly discussed 8 major steps in the evolution of plants. What are these steps and in what order did they occur? In what 3 major ways did the development of non-cyclic photosynthesis influence subsequent evolution on Earth?

What are the different taxonomic levels (e.g., kingdom, phylum, class, etc.). Which are biggest, which are most narrow?

What is a "natural group"? What is the meaning of the terms monophyletic, polyphyletic, and paraphyletic? How do they relate to natural groups? Of the algal, fungal, and plant taxa we have discussed so far, which are natural groups? Which are not, and why not?

Life cycles

What are the three main types of life cycles? What events are common to all three and how are they different from each other? What's the difference between spore, zygote, and gamete? What's the difference between sporophyte and gametophyte? What does alternation of generations mean? What are some different ways that this could happen? How do the different groups of true plants differ in this respect?

Plant cells

Reading: Chap 3, especially pp. 48-52, 54-55, 61-68

What are the 3 main way in which plant cells differ from animal cells? What are the general structures and functions of these structures?

What are the main parts of a plant cell wall? What are the different parts composed of chemically or biochemically? What is cellulose made of? How does it differ from starch? Where is the cell wall laid down in relation to the plasma membrane? How does this take place?

Algae

Reading: Chap 16: 347-352, 356-369, Table 16-1. Skip slime molds (352-356)

Focus on Ps pigments, carbo storage, cell walls, and life cycles (zygotic, gametic, or sporic) in the Euglenophyta, Rhodophyta, and Dinophyta. You don't need to memorize the details of the different life cycles presented, but be familiar enough with them so that if presented with one, you will be able to classify it into one of the 3 major types.

Chap 17: focus on diatoms, brown algae, and green algae in the reading and Table 17-1; skip oomycetes (pp. 371-374), but include information in fig. 17-2.

For table and reading, focus on

1. what is the variety of growth forms?
2. which class in which phylum is closest to the non-vascular land plants? Why?
3. major ecological and economic roles.

Overview

What are algae? Are they a natural group? Why or why not? What are phytoplankton and how are they related to algae? What are the major ecological roles that we talked about for algae in general? Which ones are specific to certain algal groups? Which ones are more general across all algae?

How do the different phyla of algae differ from each other, from fungi, and from animals, in terms of

1. Chlorophylls and accessory pigments?
2. Polysaccharide storage molecules
3. Cell wall structure
4. Life form
5. Life cycles

How is the diversity of algae related to multiple endosymbiotic events? Are there some groups in which this took place more than once? How do we know? What are some of the defining features of plants? Which algae share some of these? Which algae share the most?

Phyla

Euglenophyta - What characteristics define the euglenoids? What is their carbon source?

Dinophyta - Where are they found? What are their distinguishing characteristics, both morphological and biochemical? What is interesting about their ecology?

Bacillariophyta - Where are they found? What are their distinguishing characteristics, both morphological and biochemical? What is interesting about their ecology? Are they very diverse?

Rhodophyta - Where are they found? What are their distinguishing characteristics, both morphological and biochemical? What is interesting about their ecology?

Phaeophyta - Where are they found? What are their distinguishing characteristics, both morphological and biochemical? What is interesting about their ecology?

Chlorophyta - same questions as above. What is the diversity of growth forms in the Chlorophyta? What features do they share with plants? Is this true for all Classes of green algae? Which are most closely related?

Fungi

Reading: Chapter 15

Basics

What are the 4 phyla of fungi and the one catchall group of fungi? What feature(s) unites the last group? What is the primary lifestyle of a fungus? Given this lifestyle, what are three ways a fungus can satisfy its energetic and nutritional needs?

Ecology

What are some important ecological aspects of fungi? What about human uses of fungi? Fungi have become important sources of antibiotics and other chemicals for humans. What roles might some of these chemicals play in the ecology of fungi in the natural world?

Structure

What are the primary structural components of fungi? How is this different for yeasts? In what phyla are yeasts found?

What types of septa are found in which fungal phyla? What are some advantages and disadvantages of the different types of septa?

What are fungal cell walls made of? Is it more similar to plant cell walls or the structural material of some animals?

Life cycle

What is the basic life cycle of all fungi? How does the fungal life cycle differ from the simple form of the zygotic cycle we discussed previously? How do plasmogamy and karyogamy relate to fertilization in fungi? Are most fungal structures haploid or diploid? What is a dikaryotic cell and where does that fit in to the life cycle? Do all the fungal phyla have dikaryotic growth phases?

Is it possible to differentiate between male and female fungal individuals? What are heterothallic and homothallic fungi?

How do meiospores differ from condiospores? Are each of these diploid or haploid?

Phyla

Zygomycota

What are some examples of fungi in the Zygomycota? How are they important ecologically and/or economically?

What are the main steps in the life cycle and meiospore formation for the Zygomycota? How do heterothallic and homothallic fungi differ in terms of self-compatibility? What is a zygosporangium? How does it differ from a true sporangium? Is there dikaryotic growth in zygomycetes? Is this different from or similar to the other fungal phyla?

Is asexual reproduction common in the Zygomycota?

What types of septa are found in the Zygomycota? Do Zygomycetes ever form septa? If so, when?

Ascomycota

What are some examples of fungi in the Ascomycota? How are they important ecologically and/or economically?

What type of mutualisms are common for ascomycetes?

What are the steps in the life cycle and meiospore formation of ascomycetes? What is an ascus? What happens there? Does dikaryotic growth occur with the ascomycetes? When? How many meiospores are formed in each ascus? What is an ascocarp? Is it the same as an ascoma?

What are conidia? What other type of asexual reproduction occurs in the Ascomycota? In what particular type of growth form?

What type of septa are found in the Ascomycota?

Basidiomycota

What are some examples of fungi in the Basidiomycota? Are they common? What are the different classes of Basidiomycota? How are they important ecologically or economically?

What are the steps in the life cycle and meiospore formation for the Basidiomycota? How are these different from or the same as the other fungal phyla? Is there dikaryotic growth? What is the basidioma or basidiocarp? How does it relate to the rest of the fungal body? Are Basidiomycetes septate? How so? How is this similar to or different from the other phyla?

Is there asexual reproduction in the Basidiomycota? If so, how? What are clamp connections? Do other fungal phyla have them?

Deuteromycetes ("fungi imperfecti")

What are some examples? How are they ecologically and/or economically important? What is the common feature of all the deuteromycetes? Is this a natural group?

<u>Fungal Symbioses</u>

What are the meanings of symbiosis, mutualism, parasitism, and commensalism? How are they related?

Lichens

Who are the symbionts in lichens? From what phyla do most of the fungal partners come? What do the fungi contribute to the symbiosis in terms of structure and exchange? What is the basic internal structure of lichens? What are the three main types of lichen morphology? Do lichens have true roots?

What does the algal partner contribute to the symbiosis? What are haustoria? How do lichens reproduce? Are both partners involved in both asexual and sexual reproduction?

What do fungi get from the symbiotic interaction? What do the algae get? Can each live independently?

How are lichens important ecologically?

Mycorrhizae

Who are the partners? What does each give and get? What plants form these types of symbioses? What fungi? What are the two types of mycorrhizal associations and how do they compare in terms of structures, partners, specificity, and where they are found?

Bryophytes

Reading: Chap. 18

Introduction

What are the three phyla of bryophytes? Which is most diverse? Which least? What are the three classes of mosses?

Which of the bryophytes are thought to have diverged closest to the common ancestor of land plants? Which are thought to be most closely related to the vascular plants? What are the important ecological and economic roles of bryophytes?

What are some of the major obstacles to colonization of land by plants? How did plants solve some of the problems of desiccation? What are some of the tradeoffs involved with their solution? How did plants solve desiccation problems for spores and gametes? At what stage did they do this? Be able to synthesize this material with our discussions and readings on the seedless vascular plants.

How are light limitation, the need for structural support, achieving better spore and gamete dispersal, and the need for a vascular system all interlinked? How might these demands and the need for desiccation resistance be linked in the development of true roots?

Life cycles

Know (be able to sketch) the basic life cycle of all plants. How is the life cycle of the bryophytes similar to and different from the life cycles of the vascular plants? How is the sporic life cycle of bryophytes similar to and different from that of the algae?

Bryophyta - Mosses

What is the dominant stage in the life cycle for mosses? Is it photosynthetic? Does it typically have conducting tissue in stems? Does it have true roots? Does it need true roots? Why or why not? What does it have and what function do they serve?

What are antheridia and archegonia? Are they usually found on the same individual? How are these structures potential improvements for living on land compared to analogous structures in algae?

What are the parts of the moss sporophyte? What functions do they serve? What is the relationship of the sporophyte to the gametophyte?

Liverworts

How does spore dispersal differ between mosses and liverworts? How do liverworts do asexual reproduction? What

are the different growth forms of liverworts? Do liverworts have any vascular tissue?

Problems of land plants - Bryophyte solutions

How have the bryophytes solved (or not) problems of desiccation for the plant? For spores? For gametes?

Have mosses developed roots for water and nutrient acquisition? Why or why not? What about vascular systems and support to fight gravity?

Do bryophytes still need water for fertilization? For spore dispersal?

Seedless Vascular Plants

Reading: Chap. 19, skip 432-435 (Rhyniophyta to start of Lycophyta), skip Trimerophytophyta (p. 443)

Themes

What are some of the major changes in sporophyte morphology between the bryophytes and seedless vascular plants? What about changes in the reproductive cycle and life history?

<u>*Psilotophyta*</u> (*Psilotum*) (whisk fern)

What major morphological change was pioneered by the ancestors of Psilotum?

What are features of the Psilotum gametophyte? How is its method of carbon acquisition unusual? How many sporophytes can each gametophyte produce? Does a Psilotum gametophyte make both sperm and eggs?

What is evolutionarily new in the structure of Psilotophyta? Does a Psilotum sporophyte have leaves? Roots? A vascular system? What are the main tissues in Psilotum's stem? What are the functions of each? What different structures allow those functions?

What does xylem do? Phloem? What modifications do cells in the xylem have to allow them to better serve their function? What are the differences among protosteles, siphonosteles, and eusteles?

<u>Lycophyta</u> - [club mosses (*Lycopodium*), *Selaginella*]

When were club mosses in their heyday?

What three new structures do the Lycophytes have? What structure gives the club mosses their name? What are the differences among enations, microphylls, megaphylls, microsporophylls, and megasporophylls?

What is heterospory? Is it found in the Lycopodium? In Selaginella? In the other seedless vascular plants? Which ones? What is the trade-off in being heterosporous?

<u>Sphenophyta</u> (Horsetails - only 1 genus: *Equisetum*)

What are the differences between Equisetum and the previous Phyla? What are the similarities? What new structures do we see in Equisetum?

Pterophyta (Ferns)

Who were the plant companions of ferns back in the Carboniferous? How do the ferns differ from those other early vascular plants in terms of their current diversity and distribution?

How do the ferns differ from the other seedless vascular plants? How are they similar? What new structural innovations do they have?

How do the Eusporangiate and Leptosporangiate ferns differ in terms of sporangia structure, sporophyte structure, gametophyte structure, relationship to the other seedless vascular plants, life cycles, and current diversity and distribution?

Summary and Trends of Everything Seedless

How do the following change through the evolutionary sequence of seedless plants:

- Gametophyte size and longevity?

- Sporophyte size, dependence on the gametophyte, and tissue differentiation (e.g., roots, leaves, vascular system)?

- Reproductive structures?

With what groups in the sequence are critical structures first seen?

How have the seedless vascular plants solved some of the problems of land life: desiccation? Water and nutrient acquisition? Support? Fluid transport? Water needed for reproduction? What problems remain?