

204 Midterm #1 Study Guide

Scientific Method – Chapter 1

What are the differences between: a hypothesis and a theory? Induction vs. deduction? Correlation vs. causation? How are these concepts and approaches used in the scientific method? Can you think of examples of each?

Phylogenies and Systematics - Chapters 25 and 26:

What types of organisms are most likely to be fossilized? Why? What is the difference between relative dating and radiometric dating? How do each work? (fig. 25.2) How do these techniques give us information about the phylogenies of organisms? What is biogeography? How can it give us information about the phylogenies of organisms? (figs. 25.3 and 25.4) What were the ramifications of the Permian and Cretaceous mass extinctions? How have these extinctions influenced the biodiversity that we see today? (fig. 25.5)

Be familiar with the Linnaean classification system (hierarchical classification). Know the order of the categories (i.e. most to least broad). (fig. 25.7) Be able to interpret a cladogram. Where are common ancestors for organisms represented by the cladogram? Which organisms are more closely related? How do we construct cladograms? What types of characteristics do we use? What is an ancestral versus derived characteristic? Can characteristics evolve more than once in a phylogeny? If so, how might this affect the construction of a cladogram? What are homologous characteristics versus analogous characteristics? What is parsimony? (figs. 25.11, 25.12, 25.15, 25.16). What is the difference between monophyletic, paraphyletic, and polyphyletic clades? (fig. 25.9) How has the classification of major groups of organisms changed in the last several years. Why has it changed? (26.16)

Be familiar with the timeline of life. When did the first living organisms appear on earth? When did the major groups first appear? (fig. 26.1, 26.2) What are some current hypotheses about the origin of life? What evidence supports these hypotheses? (We didn't cover this in class, but there is a good description on pp. 516-522 of your book).

Viruses and Prokaryotes - Chaps. 18 and 27

What is the basic structure of a virus? Identify the different parts. (fig 18.2) Be able to describe how viruses reproduce themselves (fig. 18.3). Describe how HIV replicates itself (fig. 18.7). What are the different classes of viruses? How are they distinguished from each other? (table 18.1)

What distinguishes a prokaryotic cell from a eukaryotic cell? What are the two domains of prokaryotes? What are general characteristics of organisms in these domains? What are the three basic shapes of prokaryotic cells? What is the difference between gram-positive and gram-negative bacteria? Describe their cell walls. (fig. 27.5) How do bacteria move? (27.7) Describe the internal structure of bacteria. How much DNA do they have compared to eukaryotes? How are bacteria with specialized membranes similar to some organelles of eukaryotes? (27.8) What are the different ways prokaryotes reproduce? Describe the process of binary fission (fig. 12.10). How are the three ways bacteria acquire DNA? What is an endospore (27.10)? Why are they produced? What are the major classifications of organisms based on nutritional mode (table 27.1). Be able to place an organism in the correct category with information about its energy and carbon sources. What is nitrogen fixation?

How are Bacteria and Archaea related to each other (fig. 27.13). What are some general characteristics of Archaea? Where are they found? What are some of the ecological roles of bacteria? Think of some examples of different prokaryotes in these roles.

Life cycle fundamentals – Chap 13 (pp. 234-239)

How do mitosis and meiosis differ in terms of the number and ploidy of the daughter cells in relation to the parental cell? Know the steps of the three basic life cycles and understand how the three types differ from one another, and which major groups of organisms have which types. Be able to look at a schematic of a life cycle and know which type it is, as well as which phases are haploid, diploid, important for dispersal, dominant, or subordinate. What is "alternation of generations" and what are the three variations on that type of life cycle?

Protists - Chap. 28

How do the protists vary in terms of body size, morphology, motility, and energy sources? What are the definitions of protozoans and algae? Are these natural groups? Understand the terms monophyletic, polyphyletic, and paraphyletic, and be able to use them to explain your answer.

How did the mitochondria and chloroplasts likely arise in ancestral eukaryotes? What is secondary endosymbiosis and what is some of the evidence for such a process? How is it important for evolution of the protists? What is the "LUCA hypothesis" and how does this relate to more recent formulations of the phylogeny of prokaryotes and ancestral eukaryotes?

Which of the protist phyla that we studied are photosynthetic? Which are non-photosynthetic? Which have species that can do both or different species that do one or another? Have a general idea of who is most related to whom (fig. 28.8), but you don't need the whole figure memorized.

In which phyla do we find macroalgae? What are the main parts of a macroalgae and what are the functions of these parts? What are some of the key ecological roles of the protists and what are examples of each?

Plants – Chaps. 29 and 30

What are some of the key plant functions and what structures are responsible for those functions? In what ways do land plants differ from algae (e.g., Chlorophyta) in those structures? What are the Charophyceans and how are they related to the green algae and the plants? What are some of the defining characteristics of land plants and which ones are shared with other algae vs. being representative of the land plants only? What is an embryophyte?

What are some of the problems associated with living on land (i.e., in air), and how are these solved along the major steps of plant evolution?

What are the 3 phyla of Bryophytes and what are some of their general characteristics? What are at least three important ecological roles of bryophytes? Be familiar enough with the structure and general life cycle of the bryophytes that you would be able to answer fundamental questions about them.

What are the two current phyla of seedless vascular plants (SVP's) and some representatives of each? What's new evolutionarily with the seedless vascular plants? What are enations, microphylls and megaphylls and how do they differ? What's the difference between a true root and a rhizoid in both structure and function? What is heterospory, how does it work and who has it (in both SVP's and seed plants)? What problems of living on land have the SVP's solved and which have they not solved?

What is new with the seed plants? What is a seed? What is pollen? What is an ovule? How do these structures relate to the general plant life cycle? What are the 4 phyla of gymnosperms? How do these compare in terms of species diversity and overall abundance? Be familiar enough with the conifer life cycle that you can answer fundamental questions about it and know how it relates to the life cycles of SVP's and bryophytes. What problems of living on land have the gymnosperms solved and how?

What are the two largest groups within the Angiosperms? What are the parts of the flower and how do they relate to functionally similar structures in the other plant groups that we've studied? What is a fruit, where does it come from developmentally, and why is it an improvement in its main function compared to what happens in the gymnosperms? What is coevolution and how has this been important for the angiosperms? What's new with the angiosperm life cycle? Be familiar enough with the angiosperm life cycle that you can answer fundamental questions about it and know how it relates to the life cycles of the other plant groups that we've studied. In what ways are angiosperms important ecologically and for humans directly?

Fungi – Chap. 31

What are the parts of a fungus? Which ones are haploid and which ones are diploid? What is a yeast? Know the basic life cycle of the fungi. What are heterokaryotic, dikaryotic, plasmogamy, and karyogamy? What are the gametes in fungi? What is the basic fungal lifestyle and what are three variations in this lifestyle? Know some examples of each. How are fungi important ecologically and economically?

To which other kingdom are the fungi most closely related? What are the four fungal phyla and what are some examples of each? How are each of them important economically and ecologically? How do the 3 main phyla differ in terms of their life cycles, particularly with regards to 1) presence/absence of dikaryotic growth; 2) the types of fruiting bodies (are these really fruits, in the angiosperm sense of the word?); 3) the hyphal structures that make the spores; 4) the number of spores produced per hyphal structure; and 5) the extent of asexual reproduction. What are the deuteromycota and is this a true phylum (i.e., a natural group)? Why or why not?

What are symbiosis, mutualism, commensalism, and parasitism? How do these concepts relate to the variety of fungal lifestyles? For lichens and mycorrhizae, what fungal and photosynthetic partners are involved? What is the “currency” of the mutualism; that is, how do the partners benefit from one another? What is the structure and/or morphology of the organismal interaction? What is the ecological importance of lichens and fungi?