Biology 204 Final Exam Study Guide
Fall 2008

NOTE: Study guides 1 and 2 are also relevant for material from earlier in the quarter, and you should look for topics with overlap among the three major themes of the course – Evolution, Biodiversity & Ecology.

General tips
Know definitions of terms, but, as importantly, know how to apply the relevant concepts to real world situations and examples. Be able to recognize how examples illustrate the main concepts. What are the various predictions, implications, expectations that follow from those concepts? Be able to distinguish among and relate key concepts in real world situations.

Fungi – Chap. 30
Distinguish the following terms: spore, sporangium, fruiting body, hypha, mycelium. Why are the latter two important for the fungal lifestyle? Describe how fungal hyphae gain nutrition and grow. How is this similar to and different from animals? How is the fungal lifestyle related to the key ecological roles and economic impacts of fungi?

Know the features of the following fungal phyla (including the diagnostic cell of each): Chydtridiomycota, Zygomycota, Ascomycota, Basidiomycota. Why are the Zygomycota and Deuteromycota not really true phyla? You need to know (e.g., be able to draw) the basic fungal life cycle, including knowing the key steps (meiosis, plasmogamy, and karyogamy), the ploidy of the different life stages, and which components are multicellular. Where do spores arise? You do not need to memorize the details of the life cycles of the individual phyla, but you do need to know the diagnostic features (i.e., differences in fruiting bodies, where present, important reproductive cells, importance of dikaryotic (heterokaryotic) growth). For each of the three terrestrial phyla, you should know the main economic and ecological importances, if any.

Describe what is meant by the following fungus life forms, including which types of organisms are involved: yeasts, molds, endophytes, mycorrhizae, lichens. Understand the economic or ecological importance of each, including examples. What is a symbiosis and what are the different categories? For mutualistic symbiotic relationships that fungi have with other organisms, what is the advantage to the fungus and what is the advantage or disadvantage to the associated organism?

Chapter 31 – Lecture 13, Animals

What are the basic characteristics of animals? What are at least four reasons that animals are important (besides that "they're cool.") What are the two main themes of animal evolution? Which phylum of animals "rules the world", at least in terms of species diversity? Describe the morphological characteristics used to classify animals (symmetry, coelom, protostome/deuterostome development, diploblast/triploblast). What are the three main developmental differences between protostomes and deuterostomes? Describe the probable common ancestor of all animals. What is a "tube within a tube" body plan and which animals, in addition to worms, have it? What does it mean to be a bilaterally symmetric coelomic triploblast with either protostome or deuterostome development? Which animals are like this and which are not? Be able to discuss the costs and benefits of the evolutionary changes that we see throughout the animal phylogeny (true tissues, bilateral symmetry, coelom). Why was the evolution of cephalization correlated with the evolution of bilateral symmetry?

What is the main basis for evolutionary diversification among the animals? How does this compare with the main basis for evolutionary diversification among the plants? What are the four main animal feeding types and what are some examples and adaptations of each? What are the differences between herbivores, detritivores, carnivores, and omnivores? What's the difference between a sit-and-wait predator and a stalk-and-capture predator? What is the difference between an ectoparasite and an endoparasite? What are some examples of each, including key adaptations? What are the three main types of skeletons that we've encountered and what function(s) do they serve? Why is movement an important feature of animal ecology and evolution? What are some advantages of jointed limbs? In which group(s) are they found, and are <u>jointed</u> limbs shared by these groups' common ancestor? Are limbs in general (not just jointed ones) homologous in animals? What is the basic life cycle of all animals? Be able to sketch it

and know the different steps. Both terrestrial plants and terrestrial animals have solved the problem of gamete desiccation during fertilization. What are some similarities and differences in how this is done? What is metamorphosis? What are the differences between and advantages and disadvantages of holometabolous metamorphosis and hemimetabolous metamorphosis? What are some examples of each?

Chapter 50 – Lecture 14, Ecology Introduction

What are the five general levels of ecology that we considered in class? What types of questions are asked in each? What is a population? a community? an ecosystem? How do history, species interactions, and the abiotic environment affect the biogeographic patterns of species? Be able to give examples of these factors and describe how they might affect various organisms. How are these principles relevant to invasions of exotic species?

What is a biome? Describe how climate influences the location of biomes. What are the five main factors determining climate? For the six terrestrial biomes described in this chapter, understand how these climatic factors plus nutrient availability interact to determine the dominant species types and levels of productivity, but you don't need to know all the details of each biome. What are the two main factors affecting the types of aquatic habitats? How do they influence light and oxygen availability? What areas are the "tropical forests" and "deserts" of aquatic habitats? Why?

Chapter 52 – Lecture 15, Population Ecology

Describe some characteristics that populations have that individual organisms do not. Describe exponential growth. How do birth rates and death rates combine to determine the intrinsic rate of increase (r)? What is the difference between dN/dt and r? Be able to use the exponential growth equation to calculate population size. How does the exponential growth curve change with different r_{max}? What does growth look like if r is negative? if r is zero? Under what conditions would you expect exponential growth? Describe logistic growth. What is a carrying capacity? How does the relationship between N and K affect dN/dt? How does that relationship affect r_{max} and the effective r? What are some key assumptions of the logistic model of growth?

What is a life history table? What information can we get from it? How do the net reproductive rate (R_o) and the generation time influence r? Describe and give examples of the three main survivorship curves. How might reproduction and survival affect each other? What are two different reproductive strategies? What are the tradeoffs for each? Understand density-dependent and density-independent characteristics that affect population growth. Give examples of each. How do population-limiting factors work together to cause cyclic growth in some populations (think snowshoe hares and lynx here)? Does the human population show exponential or logistic growth? What are some reasons for this type of growth? What is a population age-structure pyramid, what information does it give us, and why might it differ between developed and developing nations? What factors influence K for humans? How is an ecological footprint calculated (in general terms)? What are some conclusions that can be drawn from the ecological footprints of various nations?

What is a metapopulation? How might metapopulation structure be relevant to conservation of rare species?

Chapter 54 - Lecture 16, Ecosystems

What is an ecosystem and what are the 3 main types of organisms relevant to energy and material fluxes in ecosystems? Be able to sketch a simple carbon cycle that includes those three components and any relevant fluxes. Why is it that materials cycle within ecosystems but energy flows through ecosystems? Who are the primary decomposers and how is it that they provide a critical link in ecosystems? How does this relate to the fungal lifestyle of being an absorptive heterotroph? What is meant by primary production? How does production differ from biomass? We talked in class mostly about photoautotrophs, but chemoautotrophs are important in some instances as well. What types of organisms are most likely to be photoautotrophic and which are most likely to be chemoautotrophic (i.e., what domain, kingdom or phylum)? What is NPP and how is it relevant to whole ecosystem energy budgets? What is the difference between GPP, NPP, NEP, and secondary production? Which one is most relevant for understanding the net sequestration of atmospheric CO_2 in ecosystems? Why might NPP vary among different ecosystem types (biomes)? What factors control primary productivity in different ecosystem

types (e.g., aquatic vs. terrestrial)? What implications does this limitation have for uptake of CO_2 put into the atmosphere by human activity?

What is secondary production and who does it? What is a food web? What is a trophic pyramid? How do the 3 main groups of organisms fit into such a pyramid? Why is energy lost at each level of the pyramid? How do trophic pyramids relate to population sizes of top predators and how is this relevant for both conservation of endangered species and human carrying capacity?

By what activities and in what direction are humans changing the atmospheric pool of carbon? How do current levels of atmospheric CO_2 relate to levels in the last 50, 1000, and 650,000 years? What consequences might this have for global climate? What are negative feedbacks and positive feedbacks, and what are some examples of these that might influence atmospheric CO_2 levels and global climate?