

Biology 204 Final Exam Study Guide Fall 2009

NOTE: Study guides 1, 2, and 3 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.

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? (We focused particularly on one of these – patterns of gastrulation. How do they differ?). 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 jointed 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 four main factors determining climate? Which two of these are most important for determining biome distribution, and in what two ways? What is net primary productivity (NPP)? How does it differ from biomass? Why is NPP important in ecosystems? (Note: you should be familiar with these last three questions from the Sehome Hill Lab as well.) 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. However, 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 ? 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 the relationship between N and K affect r_{\max} and the effective r ? What are some key assumptions of the logistic model of growth? Understand the application of and implications of the equations $\Delta N/\Delta t = r_{\max}N$ and $\Delta N/\Delta t = r_{\max}N(K-N)/K$.

What is a life history table? What information is summarized in one? Describe and give examples of the three main survivorship curves. What is the tradeoff between reproduction and survival, and how is this related to life history differences among different species or among different populations of the same species? 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)? What is a metapopulation? What two factors determine metapopulation dynamics? How might metapopulation structure be relevant to conservation of rare species?

Does the human population show exponential or logistic growth? What are some reasons for this type of growth? What is “replacement rate”? Why might a population continue to grow even after it reaches replacement rate? What is a population age-structure, 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 density-dependent factors might regulate human population size?