

BIOL 1005 – Concepts of Biology

Outline of topics covered since Midterm III (*final version!* posted Dec. 11, 2008)

DISCLAIMER: This outline is meant to help you organize your lecture notes. It is not intended to be a substitute for your lecture notes! Furthermore, it is NOT EXHAUSTIVE. Just because a word or phrase does not appear on this study guide, doesn't mean you "don't have to know it." In general, you are best off studying your lecture notes and letting this outline serve as a guide to help you get your notes organized.

Overriding topic for this portion of the class: ecology (what living things are doing out there); remember, 25 questions on the exam will come from this portion of the class!

I. Definition of ecology

II. Components of the environment that determine the distribution of organisms

- A. **Abiotic (nonliving) components:** what are some examples? Why is climate so important in the distribution of biomes; why does climate vary around the world?
- B. **Biotic (living) factors:** what are some examples?

Definitions of ecosystem, community, and population

Aquatic ecosystems and terrestrial biomes (see handout, which is also on my website)

- A. Types of aquatic ecosystems: marine and freshwater. In both cases, different zones have distinct groups of species adapted to each zone.
- B. Major types of terrestrial biomes; distribution depends MAINLY on climate, but some also require periodic disturbance such as fire.
- C. Patterns of rainfall and temperature that give Oklahoma a surprising variety of ecosystems

III. Population dynamics

- A. What population ecologists measure: density, dispersion, births, deaths, migration.
- B. Examples of important questions that population ecologists might study.
- C. Exponential and logistic population growth patterns. How are they different, and in which circumstances does each occur? What are examples of density-dependent and density-independent factors that limit population growth? What type of growth is the human population in, and what will happen in the future?
- D. Two strategies for reproductive success; what are the evolutionary tradeoffs between *r*-selected and *K*-selected life histories?

IV. Community ecology

- A. The relationship between ecology and evolutionary biology. Climate patterns differ around the world, so evolution occurs on different "stages," each with a unique set of selective forces that result in unique communities of organisms.
- B. Factors that structure communities
 - 1. Biotic interactions
 - a. Competition: What is competition? What is a niche? What is the competitive exclusion principle? What are some examples of ways that niche differentiation can occur?
 - b. Symbiosis: mutualism, commensalism, parasitism; how natural selection selects for different adaptations in both the parasite and the host; what is coevolution?)
 - c. Predation: how natural selection simultaneously selects for adaptations in predator (what are some examples of those adaptations?) and prey species

(what are some examples of those adaptations?) – coevolution applies here too.

- C. Ecological succession: change in the species composition of a community
 - 1. Primary succession – new habitat opens; role of pioneer species
 - 2. Secondary succession – disturbance in existing habitat. Why is it faster?
- D. Food chains and food webs: roles of producers (autotrophs), consumers (heterotrophs), and decomposers (also heterotrophs)
 - 1. How fertilizers add to the nutrient pool and increase producer biomass
 - 2. How nutrient inputs to water lead to eutrophication (and its consequences)

VII. Ecosystem ecology

- A. Energy *flow* and the reason for the shape of the energy pyramid
 - 1. Why are food chains limited to about four levels of consumers?
 - 2. Biomagnification: why hydrophobic substances like DDT and mercury accumulate in highest trophic levels
- B. Chemical *cycling*: carbon as our example. In what forms does carbon cycle among producers, consumers, decomposers, and inorganic forms?
- C. Human impacts on the environment: global climate change (facts and conjectures), main reasons that so many species are going extinct

Special finals week Action Center

Thurs., Dec. 18 from 5:00-7:00 p.m. at the Housing Learning Center in Adams dorm
I will not hold any other office hours or Action Center during finals week.

The final exam will be Friday, Dec. 19 at 8:00 a.m.!

Set your alarm and have a friend call you to make sure you're up!
Oh, and bring your clicker!