

Review Sheet for First Exam, Ecology Spring 2009. Bring a # 2 lead pencil

The goal of this exam is to test your ability to USE the information and concepts presented in this course. The exam will emphasize material covered in lecture and in the text, and will consist of a mix of factual/definitional questions, and questions that require application of concepts and facts to problem solving. Multiple-choice questions ("fill-in-the-bubble") will account for > 50% of the points; short answers (1 word to 1 paragraph), and the pre-prepared essays on this sheet will account for the rest. For examples of how I structure tests, **see the example exams on the course website.**

For your convenience, I have summarized our topics and reading assignments below. I will be using my lecture notes and the Summary Concepts repeated below as guides when making up questions, so you should study accordingly. Pay special attention to the Summary and Review questions at the end of each chapter.

The exam is based on both my lectures, and on the chapters of the book listed below. Use the Key concepts and Review section of each assigned chapter as a guide to what you need to UNDERSTAND. Use the details in the book and in lecture to help you understand WHY those statements are true. Don't memorize the details of examples given in the text, but be familiar enough with them that you can recognize them. You will certainly be asked to interpret graphs and data, so be confident that you can do that. You will NOT be asked about the statistical calculations covered in the text's boxes.

Here is a list of the major take home points we have covered in class. They come from the Preface, Chapter 1, Chapter 4, Chapter 6, Chapter 9, Pg 320-321 (see syllabus for equivalent pages in the old book). Underlining is a reminder of topics you must know, but weren't covered in detail during lecture. ~~Strike-through~~ indicates topics that will **not** be on this exam.

Chapter 1. Introduction: What is Ecology?

Chapter 2. Life on Land.

- Uneven heating of the earth's spherical surface by the sun and the tilt of the earth on its axis combine to produce predictable latitudinal variation in climate
- ~~Soil structure results from the long term interaction of climate, organisms, topography, and parent mineral material~~
- The geographic distribution of terrestrial biomes corresponds closely to variation in climate, especially prevailing temperature and precipitation

Chapter 3. Life in Water.

- The hydrologic cycle exchanges water among reservoirs
- The biology of aquatic environments corresponds broadly to variations in physical factors such as light, temperature, and water movements and to chemical factors such as salinity and oxygen

Chapter 4. Temperature relations

- Macroclimate interacts with the local landscape to produce microclimates
- Most species perform best in a fairly narrow range of temperatures
- Many organisms have evolved ways to compensate for variations in environmental temperature by regulating body temperature
- Many organisms avoid extreme temperatures by entering a resting stage

Chapter 5. Water Relations (*know how temperature relations affect water relations*)

- The movement of water down concentration gradients in terrestrial and aquatic environments determines the availability of water to organisms
- Terrestrial plants and animals regulate their internal water balance by balancing water acquisition against water loss
- Marine and freshwater organisms use complementary mechanisms for water and salt regulation.

Chapter 6. Energy and Nutrient Relations.

- Organisms use one of three main sources of energy: light, organic molecules, or inorganic molecules
- The rate at which organisms can take in energy is limited
- Optimal foraging theory attempts to model how organisms feed as an optimizing process.

Chapter 9. Population Distribution and Abundance

- Environment limits the geographic distribution of species
- On small scales, individuals within populations are distributed in patterns that may be random, regular, or clumped
- On large scales, individuals within a population are clumped
- Population density declines with increasing organism size

Chapter 10. Population Dynamics

- Dispersal can increase or decrease local population densities
- Ongoing dispersal can join numerous subpopulations to form metapopulations
- A survivorship curve summarizes the pattern of survival in a population
- ~~The age distribution of a population reflects its history of survival, reproduction, and potential for future growth~~
- ~~A life table combined with a fecundity schedule can be used to estimate net reproductive rate (R_0), geometric rate of increase (λ), Generation time (t), and per capita rate of increase (r).~~

Important topics from lecture or the book that are not listed above

- Adaptation vs. acclimation (see glossary and chapter 8)
- Conditions and resources can limit performance
- The fundamental niche summarizes an organism's tolerance to conditions and resources.
- Doing ecological science / How to test hypotheses/ Realism-control
- Producer/ Consumer/ Autotrophic/ Heterotrophic/ Chemosynthetic/ Photosynthetic/ Herbivore/ Carnivore/ Detritivore
- Commonness and rarity of species are influenced by geographic range, habitat tolerance, and population size; rare species are vulnerable to extinction.
- What biome do we live in here in Akron?

One of the following questions will be on the exam. Be prepared to provide a well-reasoned and well-written answer to one of these questions during the exam period, based on information from the book and from lecture. You may discuss these questions with one another all you like *before* the exam-- I encourage you to collaborate and cooperate in constructing useful answers to these questions.

There are MANY possible full-credit answers to these questions. It won't be possible to include every piece of relevant information from the book and lecture in each answer, so you must pick and choose among the available ideas and facts. **One goal of these questions is that you distill all this information down and present it clearly.** In general, I won't grade you down for missing information, since all answers will of necessity be only partial. I will, however, grade you up when I see you pulling together information in a logical manner, and down when you miss an obviously important factor. One of your goals is to demonstrate that you have a good grasp of the concepts that are relevant to the question

Outline format is not acceptable -- your essay should be written out in full sentences during class, and part of your grade will be based on how well you present your answer in writing. An "A" answer to each question should be able to fit on a sheet of notebook paper (1-2 paragraphs). See the special handout on hints for take-home questions.

- 1. At this time of year in Akron, animals and plants must deal with very low temperatures, and they exhibit a variety of responses to this thermal challenge. For an organism of your choice (provide both common and scientific name), list two adaptations that allow it to deal with the cold temperatures of an Akron winter. Explain how these meet the definition of an adaptation, and how each of these adaptations works – how they affect the organism's heat balance and avenues of heat exchange.*
- 2. Because of increases in atmospheric CO₂, Earth is expected to warm on average 2-5C over the next 50 years. For an organism of your choice, construct a hypothesis for how these changes will affect its distribution, and then briefly outline two different ways of testing that hypothesis. Make sure to discuss the concepts of control and realism for your tests.*

SUGGESTIONS ON PREPARING FOR TAKE-HOME EXAM QUESTIONS

1. Read over the question and determine the general topic (e.g. life history, competition, etc.). Then analyze what the question asks you to do.
2. Review the lecture notes on that topic.
3. Review the textbook areas on that topic (use the index for help!)
4. Return to the question. Do you now have an idea of how to answer it? If so, go to next step. If not, try to identify where your confusion lies, and go back to 2 and 3, or consult the instructor
5. **OUTLINE** what your answer would be if that question were asked. Look over your outline one last time to see if there are leaps of logic and to verify that you've addressed the question that was asked.
6. In general, be very precise in your use of technical terms. Do not confuse population growth **RATE** with "increase in size"; do not use vague terms. Do not redefine important technical terms like distribution to mean dispersal, or dispersion, or density. Be sure you understand differences between any similar or confusing concepts in the question.
7. Remember, your preparations should be geared to two goals. First, finding the information you think is required of a good answer. Second, organizing that information in your head so you can write out a good essay during the exam just using your mental outline. Most people will find that it's more useful to generate and learn an outline than to write an answer and memorize it word for word. Writing out an answer from your outline once or twice might be useful. Collaboration with (not parasitism of!) other students for these questions is acceptable before, but not during the exam.
8. Remember, you must have the outline in your head, and must generate the essay in class, from what you've learned during your studies.

Gordon Uno (1999 p 85) points out that a good answer to an essay question will:

- a) Show understanding of the question and all its implications
- b) Show adequate knowledge of fact and theory related to the question
- c) Exclude irrelevant material
- d) Be well organized with emphasis placed on more important ideas
- e) Demonstrate ability to write clearly
- f) Contain valid reasoning
- g) Include originality when appropriate to the question

You can also see the professor for more information on how to prepare.