The Final Exam Study Questions for bs148h fall 2012

The questions for 2013 will be identical, or very close to those for 2012; they are very general and change very little from year to year, but I reserve the option to fine-tune them late in the semester to address new issues, perspectives and facts that come up this semester. At the final exam I will choose one of these 10 questions for you to answer. You must write your answer on a clean sheet of paper, from memory. I want the best answer you can write in approximately one page. (something you wouldn’t be embarrassed to have posted on the www for all the world to see). I want you to demonstrate that you understand the facts and know and what we don’t know; That you understand what are the open issues and questions, and that you can use relevant examples to make your explanation more effective. Your answer should be much more broad and deep than our typical 2 pt, 5 min quiz.

I want you to write out detailed answers and memorize them, that’s OK too, but I do not want to see those practice answers at the final exam. I suggest you discuss your ideas with classmates and at least outline your answers to all the questions. If you want to write out detailed answers and memorize them, that’s OK too, but I do not want to see those practice answers at the final exam.

1. Use examples from lecture and text to help explain (a) the concepts and (b) the processes of adaptation. (c) Explain at least three reasons why adaptations are not ‘perfect.’

2. What is life? Your answer should include (a) the properties listed in the text, readings and lecture and (b) a careful analysis of the criteria for detecting life on Mars. (c) Explain the strengths & weakness of each of the criteria and specify what level of biological organization these criteria can be applied to. Apply these properties & criteria to I) real viruses II) computer viruses, III) human fetuses, and IV) the earth.

3. Summarize the Endosymbiotic Theory for the origin of eukaryotes. Use facts & examples to help describe the data and patterns that are consistent with this hypothesis.

4. What is a species? Your answer should include a careful analysis of the alternative species concepts and their strengths & weaknesses, illustrated with examples. What concept is most often used to comply with the US Endangered Species Act?

5. Describe the life cycle of the cellular slime mold Dictyostelium and explain why it serves as a model for questions about the evolution of multicellularity and cooperation.

6. Explain why the Reptiles are not a monophyletic group. A good answer will provide an overview of modern phylogenetic methods, including an explanation of what is a monophyletic group. Explain possible ways to solve ‘the reptile problem.’

7. Explain the principle of negative feedback regulation. Use examples from lecture and text to illustrate how this works in the realms of (a) mammal homeothermy, (b) endocrine regulation of blood glucose, (c) posture and the knee-jerk reflex, and (d) population regulation via density dependent demographics.
8. Describe the Nonspecific Defense Mechanisms and Specific Immune Responses that a human would put up against bacteria that enter the body on a splinter. Explain the roles of (a) Helper (CD4) T cells, (b) Cytotoxic (CD8) T cells, and (c) B cells. Briefly compare and contrast primary and secondary responses.

9. What are the component demographic processes that combine to determine population growth rate? What kinds of ecological processes influence these demographic processes? What is exponential (or geometric) population growth and what conditions should lead to this kind of growth? What is the logistic model and what additional ecological and demographic processes does it incorporate. What general characteristic tends to make logistic population growth chaotic?

10. What is the Lotka-Volterra competition model and what additional ecological and demographic processes does it incorporate? Use examples to help explain competitive exclusion. What, in general, tends to lead to coexistence rather than competitive exclusion in competitive interactions? Explain how predators or parasites can increase biodiversity. Illustrate with examples from lecture and/or the text.