Bio 115 study questions

Limited utility of study questions:

These questions are intended as a supplement to the procedure that I have recommended in another handout regarding taking, improving, and studying your notes. There is no way to create a comprehensive list of study questions so there is a risk that a student might think, "If I can answer these then I can answer every possible question on an exam." That would be an errant conclusion. This is not an exhaustive list of topics that might serve as the basis for questions. Rather, this list is intended to help you anticipate the sorts of questions that you will encounter on exams. That said, a well-prepared student will be able to answer all of these questions before arriving for an exam. As you work to answer them, make sure your answers are precise and thorough. Check them with classmates or others.

These study questions are based on the course lectures alone. They do not include questions regarding material that is covered in the assigned readings but not during lecture, and they do not explicitly cover the material in the EvoBeaker (SimUText) simulations. You should also study and answer any questions at the end of the text chapters that pertain to assigned readings, the questions in the simulation workbooks, and try to make up your own study questions for other text material and other readings especially any major (lengthy) topics in the readings that were not covered during class.

These questions generally do not include examples but exams may ask you to describe particular examples. As you study the various questions review the applicable examples and make sure you understand those examples. Note that definition ≠ explanation ≠ example. A question may ask for a definition, an explanation, and one or more examples for any given phenomenon, such as, say, convergent evolution.

EvoBeaker (SimUText) material on exams:

Also, be able to answer any of the questions of understanding in the EvoBeaker (SimUText) simulations. If I have not returned one or more of your simulation workbooks when you are studying for the exam, remember that you have access to the workbooks and the questions, so you can study the material even if you do not have a workbook that you already completed.

Readings:

As noted above, these study questions are drawn from course lectures and discussions, not from the readings or SimUText material.

Know the main point, fundamental argument, and main evidence of every reading assignment.

Understand the major points made in any textbook readings, both those that are covered during class sessions and those that are not covered during class sessions.

(Reading assignments are chosen intentionally but are not necessarily covered during class.)

Exam format:

Exams will typically have 2-4 essay questions and about 35 multiple choice or other short answer questions.

How to work with these study questions:

Read the following questions carefully and then *write out* precise, specific, articulate, thorough answers to essay questions. Then describe particular examples. Resist the temptation to simply look at the questions and say to yourself, "I know that."

Work on answering the essay questions precisely and completely while omitting any tangential or unnecessary information. Avoid "brain dumps." In other words, avoid simply writing everything you know about a general topic. Brain dumps take too long and may not actually answer the particular question asked.

In some cases, it might be useful to supplement written answers with drawings.

After you answer the following questions, compare your answers with those of a friend and see if your friend understands your answers.

Study questions:

INTRODUCTION TO COURSE

Why do we teach evolution and ecology in the same course?

What are ecosystem services? Give some examples of ecosystem services?

What sorts of difficulties do first-year students report? Which particular difficulty do students most often report?

What must you be able to do to be confident that water is safe to drink, an electrical device will not shock you, a set of blood test results are correct, etc.

How can one distinguish science from non-science?

What are the limits of science?

What does it mean for a hypothesis to be "potentially falsifiable?"

Describe *in detail* (all the steps of) Dr. Schulze's recommended procedure for producing excellent notes.

Describe *in detail* (all the steps of) Dr. Schulze's recommended procedure for using those notes to prepare for an exam.

What good does it do to read the book if you already have good notes from class?

INTRODUCTION TO EVOLUTION & NATURAL SELECTION

What is evolution? (Define it precisely).

Define gene, gene pool, and population.

What is natural selection?

What combination of circumstances result in natural selection?

What is the relationship between natural selection and evolution?

What is artificial selection and how does it help us understand natural selection?

Describe several different examples of natural selection that have been directly observed? (Get together will classmates & see how many examples you can list & describe. Do the same for other similar study questions that ask about examples. Make sure you can describe and understand each example.)

Describe several different types of historical evidence that are consistent with the theory of evolution by natural selection. Make sure not to omit any that were discussed in class or in the assigned reading.

Describe several cases of artificial selection.

(Note regarding examples – examples provide evidence for ideas, so scholars love examples. Make sure you understand each example that is discussed in class or in an assigned reading, but realize that an example of a phenomenon is not the same as an explanation of a phenomenon. An example is often useful for illustrating an explanation, but the two are not synonymous.)

NATURAL SELECTION & OTHER PROCESSES THAT ALTER ALLELE FREQUENCIES

What four types of processes alter allele frequencies?

Explain the mechanism of each of those processes (how each process works, under what conditions it occurs, etc.). Which of the four processes are usually adaptive?

What is the definition of evolution?
(Note that alteration of allele frequencies = change in composition of a gene pool.)

Define allele.

Define dominant allele

Define recessive allele

Define homozygote

Define heterozygote

Define fitness.

Why is fitness a useful concept for studying and understanding natural selection and evolution?

What is the ultimate source of new genetic variation?

Define mutation.

What is the significance of mutations?

Why is inbreeding dangerous to individuals? (Give a detailed explanation that defines inbreeding *and does not omit any key steps* of the explanation.) (For example, the following explanation is incomplete. What is missing? "Inbreeding fosters expression of deleterious, recessive alleles because inbred individuals are often homozygous for such alleles.")

Explain the apparent conundrum that mutations are generally harmful to individuals but enable populations to adapt to new circumstances?

What are stabilizing, directional, and disruptive (= diversifying) selection? Under what general circumstances would you expect each to occur?

What examples of each of these were discussed in class? In the book? Explain each example.

Might stabilizing selection occur after directional selection? Why or why not?

What is sexual selection and what circumstances cause it to occur?

Which gender is usually the choosiest about mates? Why? (Explain in detail.)

What would be the evolutionary consequences of choosing mates badly? (What would it mean, from an evolutionary perspective, for a wild creature, to choose mates badly? In other words, how would we identify a bad choice?)

What is gene flow & how can it alter allele frequencies in a population (cause evolution)? Is gene flow adaptive?

What is genetic drift & how can it alter allele frequencies in a population (cause evolution)? Is genetic drift adaptive? How and why does genetic drift depend on population size?

Under what circumstances would genetic drift be likely to substantially alter allele frequencies?

What is a population bottleneck and why is the concept of a population bottleneck relevant to genetic drift and thus evolution?

What is the founder effect and how is the founder effect important to allele frequencies?

When is a bottleneck event also an example of the founder effect? Is it possible for a bottleneck event to occur without a founder effect? Hint: Yes. Explain.

Maintenance of Genetic Diversity in Populations

What 5 factors prevent natural selection from eliminating genetic variation?

How does each of these factors have the effect of increasing or preserving genetic variation?

Provide a real or hypothetical example of each of the processes and situations that prevent natural selection from eliminating genetic variation.

Does evolution lead to perfect organisms?

No. Why not? You should be able to offer at least 3 reasons.

Genetic Diversity in Small Populations

What are the two genetic risks to small populations?

Why is genetic drift particularly relevant to small populations?

Endler's experiments with guppies

How did Endler's study of guppies illustrate the trade-off between selection for camouflage and sexual selection?

What question(s) did Endler test?

What were the key design features of Endler's experiments?

What were the most important results of each of Endler's experiments?

How did Endler's experiments contribute to understanding of conflicting selective forces?

- End of material for 2020 mid-term exam 1 -