

Each week you will hand in both your stapled log book as well as a final long paragraph, on notebook paper, showing evidence of your reasoned contemplation of the quality of the thinking you've encountered that week. Come prepared to briefly discuss the results.

Environmental Biology: Sample Assignments

For this course, the students receive a 150-page outline of lecture notes prepared by the instructor from approximately 30 sources. These lecture notes comprise the main lecture components. A major assignment is a thorough understanding of the fundamental concepts presented in those notes. The textbook serves as supplementary material that the students refer to for a more in-depth understanding of the subject matter. There are an additional nine assigned readings, nine assigned videos, and one assigned audiotape. During the semester, the students complete five exams in this course (three lecture exams, two lab exams). The exams are specifically designed to test for conceptual understanding as well as basic science knowledge.

Literature and the Environment: Sample Assignments

For this course there are two analytical papers that are required, one on Henrik Ibsen's *An Enemy of the People* and the other on Rick Bass's novella, *The Sky, the Stars, the Wilderness*. In addition, there is class writing, both creative and expository, in the form of impromptu assignments and quizzes as well as written homework assignments. Readings and discussion of the readings form a critical component of the course. In addition to four books, there are 11 required readings and four assigned films.

Environmental Biology: Sample Oral Exam (20-30 minutes)

In my opinion, the instructor gets a better feel for the student's true understanding of the tested lecture material through an oral exam than can be obtained through a written exam. It becomes evident during an oral exam if a student has memorized something without

conceptually understanding it. I explain to my students that an oral exam is like a graded conversation: if the student understands the material, the half hour will seem short and not particularly stressful; if the student does not understand something, there will be an embarrassing moment during the conversation when both student and instructor simultaneously realize which piece of information requires more understanding. With a written exam, students often look at their grades without addressing their areas of weakness; with an oral exam, the student cannot avoid acknowledging ignorance and addressing it. Oral exams prevent students from excusing their ignorance by saying that they misinterpreted the question: if a student strays from the central focus of a question during an oral exam, it is a simple matter to bring him/her back on track. For oral exams to work in providing an accurate measure of a student's understanding, it is important that the student not be made to feel intimidated during the exam. In that regard, I explain to the student at the beginning that we can return to any question without penalty should the student desire to, and near the end of the exam, there is an opportunity for the student to make any informational changes before leaving

the room. The exam takes place in a room that includes a blackboard, in case the student wishes to illustrate a concept.

The week prior to the oral exam, I present the class with half-hour, sign-up, time slots, making it clear in the syllabus and in class that it is the student's responsibility to select a time slot and to show up on time for the oral exam, risking a zero for not showing. To minimize communication among students during the week that it takes to give the oral exam to everyone, I tell each student that I grade on a curve if the average grade is below 75%, that if the student discusses the exam with others who have not yet had the exam, those students will have an unfair advantage over him/her and will likely score higher as a result, thus raising the mean score and consequently reducing the degree of curving that

would otherwise benefit the student. In this manner, I make it clear that it is not in the best interests of the student to discuss the exam with others.

For each oral exam question except the definitions, I include a score line, which I use to indicate my immediate impression of the student's degree of understanding of the question. I also include enough spacing between questions to allow for my note-taking during the exam. After each exam, I reconsider my notes and sometimes revise my immediate impression.

After all students have taken the oral exam (approximately a week), I average the grades to determine the class mean, then curve if necessary to bring the class mean up to 75%. I speak with each student individually during the next lab period to discuss the grade. I do not return the exam sheets.

While the week of the oral exam is a busy one for the professor, the grading is essentially completed by the last exam, with no weekend grading required.

Below is a sample oral exam:

(1) Describe the biological components of a hypothetical ecosystem. Explain the process of energy transfer within an ecosystem. Explain the process of matter (atoms) transfer within an ecosystem. (20%)

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0 10 20 30 40 50 60 70 80 90 100

(2) Describe the concept of living sustainably. (Include the concepts of population growth, carrying capacity, and limited resources.) (20%)

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0 10 20 30 40 50 60 70 80 90 100

(3) What is the difference between a renewable energy resource and a nonrenewable energy resource? Provide two examples of renewable energy resources and two examples of nonrenewable energy resources. Explain how those examples are renewable/nonrenewable. Which nonrenewable energy resource in current use are we likely to run out of first? Last?

(10%)

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0 10 20 30 40 50 60 70 80 90 100

(4) Contrast the terms overpopulation and overconsumption. Explain how each leads to degradation of the environment. Provide examples to illustrate your points. (10%)

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0 10 20 30 40 50 60 70 80 90 100

(5) Describe the general process of Darwinian evolution. (20%)

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0 10 20 30 40 50 60 70 80 90 100

Definition: atom vs molecule (5%)

Definition: gene vs protein (5%)

Definition: species vs community vs ecosystem (5%)

Definition: nitrogen-fixing bacteria (5%)

Environmental Biology: Sample Written Exam (1.5-2 hours)

When written exams are necessary, I require considerable writing. I avoid exams that require little of the student and do not address conceptual understanding, such as hastily prepared multiple-choice, matching, and fill-in-the-blank exams. When giving definitions, I require that the student go beyond the standard memorized definition. The student must make it clear to me that (s)he understands the term. For example, it is not sufficient to define Darwinian evolution as "survival of the fittest," because there is no evidence that the student understands what that definition means. An explanation is required.

Below is a sample written exam:

Definitions (Select eight of the following terms. On the back of the exam or on the sheets provided, write the term and provide a definition that makes it clear to me that you understand the term. Provide an example to help with your

definition when you
can. If in doubt regarding what is expected [not three-word
definitions], please let me
know during the exam. 6 points each)

suspended particulate matter half life
halogenated hydrocarbons volatile organic compounds
greenhouse effect photochemical smog
troposphere vs stratosphere radon-222

primary pollutant vs secondary pollutant Montreal Protocol

Two Mandatory Essay Questions (On the back of this exam or on the
sheets provided
write the essay question number followed by your essay. Define any
terms you use in
your essay, unless you have already defined them in this exam. Make it
clear to me that
you understand the concepts associated with the essay. If you have any
confusion
regarding any essay, please let me know during the exam. 17 points
each)

(E1) Define and describe global warming, including its cause(s),
possible effects and
suggestions for minimizing global warming.

(E2) Define ozone. How is ozone made naturally? Describe how ozone
depletion occurs,
where it is most evident, and what its effects are. What is being done
to deal with the ozone
depletion situation?

One Additional Essay (Select only one of the following essay
questions. (On the back
of this exam or on the sheets provided write the essay question number
followed by
your essay. Define any terms you use in your essay, unless you have
already defined
them in this exam. Make it clear to me that you understand the
concepts associated
with the essay. If you have any confusion regarding any essay, please
let me know
during the exam. 18 points)

(E3) Describe the general process of nuclear fission. Is Nevada=s
Yucca Mountain
appropriate for permanent burial of high-level waste? Use information

from the National Geographic article in your packet to support both sides of this issue.

(E4) Describe what happened in Donora, Pennsylvania, in 1948. How did that event come to pass? What was done afterwards to understand the cause of that event?

Environmental Biology: Sample Laboratory Exam (1.5–2 hours)

While laboratory reports help train science majors regarding objective reporting as they prepare for careers in the sciences, I have found that, for nonscience majors, required reports do little to achieve true understanding of scientific concepts or develop a sound scientific knowledge base. I therefore give two laboratory exams each semester which, combined with laboratory participation, provide the laboratory grade for this course (25 percent of the final course grade). The laboratory exams are similar in format to the written lecture exams described earlier.

Below is a sample laboratory exam:

Definitions (Select seven of the following terms. On the back of this exam or on the pages provided, write the term and provide a definition that makes it clear to me that

you understand the term. Feel free to provide an example to help with your definition. 6

points each)

LD50 energy efficiency

biological indicator meltwater

pH (potential hydrogen scale) anode

chemical scrubber photovoltaic cell

Artemia wind farm

acute injury chassis

Short-Answer Essay Questions (Answer the following essays. On the back of this exam

or on the pages provided, write the essay question number followed by your essay.

Define any terms you use in your essay, unless you have already defined them in this

exam. Make it clear to me that you understand the concepts associated

with each
essay. Feel free to use figures.)

(E1) Describe how a proton exchange membrane, hydrogen fuel cell works. (15 points)

(E2) What is a temperature inversion? Describe how you could create a temperature inversion in a laboratory setup. Explain your reasoning. (15 points)

(E3) How did we set up the air pollution experiment to create hydrogen sulfide (H₂S) and sulfur dioxide (SO₂)? Describe the effect of H₂S on one nonbiological material we tested in the laboratory. Describe the effect of SO₂ on one biological material we tested in the laboratory.

(13 points)

(E4) What are the three factors that determine the toxicity of a chemical? Describe the procedure for toxicity testing in the laboratory. (15 points)