Sample questions for the comprehensive final examination
Monday, May 11 (On-campus students - see notes below)

Note. These are sample questions. Use these questions as only one of *many* study aids for the examination! These questions for you to guide your studies and cover the materials presented class, the textbook, and the course internet site. Be sure your answers for these questions are scientifically sound and presented in the technically appropriate terminology and concepts used in ecology.

The examination will be conducted with the Blackboard Learn system and may include any combination of short answer, multiple choice, true/false, and numerical answers. You may be asked to interpret graphs and formulas presented on the examination. You should be prepared for questions that require scientifically sound answers, and mastery of the technically appropriate terminology and concepts used in ecology.

Be sure you are familiar with the Blackboard system well in advance of the examination.

Be sure that you have mastered the subject matter so that you are able to answer questions such as those below in a scientifically sound manner and in technically appropriate terminology and concepts used in ecology. The examination will be comprehensive and will cover all materials presented in class, the textbook readings, and the course internet site.

Note that the subject matter for the final examination will be weighted toward material covered since the second examination (i.e., the material covered in Sections VI - X), but will contain questions for all topics in the course.

Notes.
The examination will be comprehensive and will cover all materials presented in audio lecture presentations, interactive lessons, the textbook, additional readings, and the course internet site.

Proctors will be required to enter their password to release the examination. Please make arrangements with your proctor for a convenient time and location for your examination (the examination must be taken on a computer).

For students on the UI Moscow campus, all assessments will be proctored by the professor, by appointment.

Sample questions for: Examination I | Examination II | Final examination

Examination I sample questions

What is the definition of ecology?

What is autecology?

What is synecology?

What is the environment?

Name three prominent ecologists and their major contributions since 1900.

What was the major difference between classification and geography done by naturalists before 1900 and modern ecology?

What are two internationally prominent societies that specialize in the science of ecology? What are two major prominent societies that specialize in applied ecology? How does an approach that emphasizes basic science of ecology differ from approaches for the application of ecology?

What are the major attributes of a species?

What is ecotype? How do ecotypes develop within a species?

Why is habitat distinctiveness important in the development of ecotypes?

In what types of environments would ecotypes develop relatively quickly?

What is a "common garden" experiment and who is credited with developing this technique?

In what principal way did the experiments of Clausen, Keck, and Hiesey differ from those of Turesson?

What are some the major conclusions of Clausen, Keck and Hiesey's experiments?

What is the version of Liebig's Law of the Minimum we use today?

What is Shelford's Law of Tolerance?

How do tolerance limits of a population change over time?

What is meant by the physiological and ecological optima for a species? How do these optima determine the distribution of a species along environmental gradients?

How can an environmental gradient be used to illustrate the range of an organism?

What is a genotype and how does the genotype determine an organism's ability to tolerate a particular set of environmental conditions?

What is phenotypic plasticity and how does the phenotypic plasticity influence an organism's ability to tolerate a particular set of environmental conditions?

How does an individual adapt to new environmental conditions?

What is "fitness" and how does it relate to evolutionary process?

Contrast proximate and ultimate factors, and give an example of each. Specifically, what determines whether a factor qualifies as an ultimate factor?

What are poikilotherms and homoiotherms? What are the ecological advantages and disadvantages of each type?

What are the principal ways that a poikilotherm can regulate its body temperature?

Contrast the ecological significance of autotrophs versus heterotrophs. What are some of the ecological significance, i.e., advantages and disadvantages, of each type?

What are the principal chemicals that attenuate or absorb solar radiation as it penetrates through the atmosphere?

Which molecule is the principal absorber of UV-C and UV-B radiation?

In the lower atmosphere, what are the major factors that influence irradiance at the ground?

List the name for the wavelength regions of the solar spectrum received at the earth's surface in order of increasing wavelength. Next to each region list the principal effect or significance (i.e., the biological action) of the wavelength region for plants and animals. Include the relationships between wavelength, energy, and biological action for solar radiation?

What are the wavebands of the ultraviolet region?

What principal biological action is caused by each of these UV wavebands?

What part of the UV region is both invisible to humans and visible to insects?

In regard to solar radiation, what principal interactions occur between insects and flowers?

Do the terrestrial and solar radiation spectra overlap to a substantial degree? Explain why or why not.

Why is IR radiation sensitivity a useful characteristic in a predator?

What are the principal pigments in leaves that affect penetration of radiation into the leaf?

What are the basic optical properties of leaves and how do these change from the UV to farIR wavebands?

Contrast the radiation environment at the top of a plant canopy with that at the bottom of the plant canopy. How do the changes in radiation between the top of a forest canopy and the understory occur?

Is the shade environment underneath a dense canopy dark?

What type of radiation dominates the understory of a closed forest canopy?

Describe the typical transmittance spectrum for green leaves.

Describe the typical absorption spectrum for green leaves.

What are the ecological advantages and disadvantages of a plant with highly reflective leaves in the visible waveband?

In what ways can the reflectivity of leaves be altered by plants?

During a walk on an exposed ridge in Yellowstone National Park, you notice your skin has been sunburned. What specific wavelength region caused this sun burning?

Even though you have been sunburned, what substance in the upper atmosphere prevents you from even more severe sun burning?

You are standing on the top of a ridge in the Frank Church Wilderness of No Return. Why is there more global radiation (i.e., total shortwave radiation from the sun) incident on the steep south-facing slope that you see below you from the ridge than on the top of the ridge?

What energy exchange process causes you to feel cold on this wind-swept ridge?

Why would you lose less energy on this windy ridge if you crouched near the ground?

While you lean against the rocks on the ridge, what energy exchange process allows you to feel the warmth of these rocks?

Even though the wind has stopped blowing on this warm and sunny day, what energy exchange process allows you and the plants to remain cool?

What American ecologist in the early part of this century developed many of the principles we use in ecology?

As you walk through the forest after sunset, what type of radiation are you exposed to?

What type of radiation do you expect from the camp fire you make at night?

What global environmental problem are you contributing to when you make a fire using the wood you found near your camp site? What is the key reason and consequence for this predicted environmental problem?

What is the equation for the overall energy balance for a herbaceous plant growing in the middle of a large clear-cut?

How does the energy balance differ between nighttime and daytime for a lizard in the Sonoran Desert?

What is convection? What is the principal driving force for convection and how is convection important for elephants?

What energy balance processes are important for an iguana when it is in its burrow at midday?

Does the wind chill factor apply to plants? Why or why not?

What is conduction and what is the driving force for this energy exchange process?

Why is conduction the principal energy exchange process for animals in burrows?

For animals with relatively large and thin ears, why is convection important?

What is latent heat of vaporization and what is the driving force for this energy exchange process.

For thin, relatively small, and highly dissected leaves, why is convection important?

Why can organisms gain heat through the development of frost?

Why do animals cool (i.e., lose energy) when they perspire or breathe?

What are all the sources (i.e., inputs) and losses (i.e., outputs) of energy for a ponderosa pine or a lizard that is resting on a rock in the sun at noon?

Discuss several examples of how animal and plant have adapted to the energy processes in their environment.

Describe and diagram the energy balance processes for a burrowing lizard?

Describe and diagram the energy balance processes for a small herbaceous plant (i.e., a forb) in the middle of a recent forest clear cut?

Describe and diagram the energy balance processes for an elk in meadow, and underneath a forest canopy?

Examination II sample questions

What are the major ways to graphically describe climate?

What are the major climatic types of the world?

What are the principal characteristics of the following types of climate: Mediterranean, arctic tundra, continental, cold desert, hot desert, monsoonal, tropical?

Summarize the physiological and ecological principal differences among C3, C4, and CAM plants.

Why do C4 plants have a higher water use efficiency than C3 plants?

What do CAM plants have the highest water use efficiencies?

What parameter is used to describe the availability of water in the soil?

What determines whether soil water is available to a plant?

What are the three principal components that comprise the total water potential of plants?

Which component of the soil water potential would be changed the most by the addition of salts to a soil?

Explain why a plant can wilt to the permanent wilting point in a soil that still contains water?

What is the soil-plant-atmosphere continuum, and what is the ecological significance of this continuum?

During your walk in the forest you observe many plant species that appear to be facultative sciophytes. What is a facultative sciophyte?

Would you expect to find an obligate heliophyte in the understory of a dense forest?

What is demography, and what are some important analyses used by demographers?

How does a population change in size?

What are the different ways that a population is regulated?

How do population regulatory mechanisms change as the population size increases toward carrying capacity?

What are the principal characteristics of r-selected species?

What are some examples of r-selected species?

What are some characteristics of a k-selected species?

What are some examples of k-selected species?

What are the different categories of life-spans of plants? What are the ecological consequences of each type life span?

Define and give one example of a protocooperative interaction.

Define and give one example of a mutualistic interaction.

How does parasitism differ from a predation?

Define competition and explain how this fundamentally differs from allelopathy.

What is logistic growth?

What different types of growth curves occur in nature, and how is each type of growth regulated?

What are the major types of survivorship curves found in nature?

What are life tables and what are they used for?

What are the different types of interactions among organisms?

What is evolution and how is natural selection involved in this process?

What is carrying capacity?

What is the intrinsic rate of increase?

What is natural selection and who first formulated this theory?

Explain how the experiments of Gause related to predator and prey populations.

Explain how the experiments of Huffaker related to the predator prey populations.

What were Lotka and Volterra's contributions to understanding population growth and decline?

What are populations pyramids and how do they relate to the understanding of populations?

How do annuals, perennials, and biennials differ in their allocation of carbohydrates?

Explain the mechanism and consequences of stratospheric ozone depletion.

Explain the mechanism and consequences of global climate change.

What are the principal global environmental problems? Explain the causes and effects of each global environmental problem.

Since species extinction occurs naturally, why are ecologists so concerned about species extinction?

What is coevolution? Give two examples of coevolution.

How do new genotypes arise in a population?

What are the advantages and disadvantages of mimicry? How do mimics develop in nature?

Final examination - Sample questions

Describe the major types of interactions among species? Give specific examples of each type of interaction.

What is a community?

What are the two theories of communities?

What are fundamental and realized niches?

How are niches characterized?

How is niche overlap minimized over time?

What is an ecotone and how is it determined?

Who are the two ecologists credited with basic theories of community development? What two theories resulted from their work?

How can both major theories of communities be supported from the same landscape region?

What are the principal attributes of communities?

In what ways are communities more that a collection of populations?

What are convergent communities and why do they develop?

What are the three major indexes by which an ecologist can describe the complexity of a community?

In what ways can a species be considered dominant in a community?

What are some examples of convergent communities, including where they occur?

What is succession and what are the two major types of succession?

What is allogenic succession? Examples?

What is autogenic succession? Examples?

What is primary succession? Examples?

What are two specific categories of primary succession? Examples?

What is secondary succession? Examples?

What are the principal stages of secondary succession as developed by Clements?

What is a polyclimax and how does it develop?

What are some major causes of retrogressive succession?

What are some of the major factors that cause and maintain a cyclic succession?

What are some of the principal factors that change in progressive succession?

How do energy balance processes change with succession from bare rock to a forest?

Diagram an old field succession in the Palouse prairie region.

Diagram an old field succession on a recent forest clear cut on Moscow Mountain.

Diagram a primary succession on a rocky area recently exposed by a rock slide in the mountains of central Idaho.

What were the major contributions of the following ecologists: MacArthur, Carson, Clements, and Cowles?

How is the concept of stability related to succession?

What are the major events and communities that occur along a xerarch successional sequence ?

What are the major events and communities that occur along a hydrarch successional sequence ?

What is a biome and what are some of the major biomes on earth?

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What was the principle goal of the International Biological Program (IBP)? After IBP ended in the mid-1970s, what national program (funded by the National Science Foundation) was formed to continue the work of IBP?

Who was the noted ecologist that developed the classification of 36 biomes types?

What is an ecosystem and how does it differ from a community and a biome?

What is the relationship between climate and the distribution of ecosystems on the Earth?

What is the geographical distribution of the arctic tundra biome?

Describe the major characteristics of the arctic tundra ecosystem.

Where do the major tropical rainforests occur on earth?

Describe the major characteristics of the tropical rainforest ecosystem.

Compare the net primary productivity (NPP) of the following ecosystems: arctic tundra, coniferous forest, and tropical rainforests.

Compare the net primary productivity (NPP) of the following ecosystems: temperate deciduous forest ecosystems, woodlands, and grasslands.

How does the productivity ranking (e.g., high to low productivity) of ecosystems on the Earth change when ranked on the basis of kcal m^{-2} y^{-1} versus kcal y^{-1}?

What are the principal environmental factors that characterize tundra ecosystems, and what are major biotic components of these ecosystems? What are the principal human influences on these ecosystems?

What are the principal environmental factors that characterize tropical rainforest ecosystems, and what are major biotic components of these ecosystems? What are the principal human influences on these ecosystems?

What are the principal environmental factors that characterize boreal forest ecosystems, and what are major biotic components of these ecosystems? What are the principal human influences on these ecosystems?

What are the principal environmental factors that characterize shrubland ecosystems, and what are major biotic components of theses ecosystems? What are the principal human influences on these ecosystems?

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