

PRACTICE MIDTERM EXAM BIOL121 SECTION 123

How to use this document:

1. Prepare as if you were going to take a real midterm
2. Set aside 50 minutes for taking this practice midterm
3. Print out this document
4. Find a quiet (and, if you can, kind of uncomfortable) place
5. Put away all your notes, books, and electronics. Do not let anything distract you
6. Have a clock or a timer available
7. Start the clock/timer and start writing the practice midterm (suggestion, for your real midterm as well: take a look at all the questions first, and start from the ones you are more comfortable with)
8. Give it your best effort
9. After exactly 50 minutes, stop writing, even if you are not done
10. Take a break
11. Go over your answers and, on a separate piece of paper, make a list of the questions/parts of questions that you were really unsure about. Also make a note if you did not finish some of the questions.
12. Match each question to the GBRF, Tynehead Park, Spotted owl, Niche&Interactions and Kentucky biology learning goals. For questions that you got wrong, review all material related to the learning goals that you matched to that questions (practice questions, in-class work, readings, videos, etc).
13. There will be an answer key posted around Thursday. Find the answer key and use it to mark yourself.
14. If you did well that's it, you are done. Good luck on Oct 9th! If you did poorly... it's time to work on the part you did not do well on, and to visit office hours!

Practice MIDTERM 1**Instructor: Pam Kalas****FAMILY/LAST Name:** _____ **FIRST Name:** _____**Student number:** _____**Instructions:**

1. This exam has 8 pages including this page. Look over the exam to make sure no pages are missing. Also before you begin, read over the whole exam first and see how much each question is worth. Plan your time accordingly.
2. Answer all questions in the space provided. Material written on the backs of pages, or anywhere other than in the space provided, will not be read or marked unless a student has obtained special permission from an instructor or TA during the examination.
3. All writing should be in ink. If you choose to write in pencil, there will be no chance of having your exam remarked even in the case of an addition mistake on the part of the markers.
4. Answers may be in sentences or point form.
5. No electronic devices are permitted during the exam.
6. No one may leave the examination during the final 15 minutes of the 50 minute exam period.
7. Students suspected of any of dishonest practices will be immediately dismissed from the examination and will be subject to disciplinary action.
8. No memory devices are permitted. Please turn off your cell phone and leave it in your bag.
9. Students may not speak or in any other way communicate with other students while in the examination room.
10. Students may not expose their written paper to other students. The excuse of accidental exposure, forgetfulness, or ignorance will not be accepted.
11. Following completion of the exam, the one-page note sheet must be turned in with your exam and must have your name and student number written at the top.

I have read and fully understand these instructions.**Student signature** _____**Mark allocation:**

Question	Marks possible	Your mark	Suggested time
Read over the exam			5 min
1.	14		13 min
2.	4		7 min
3.	8		8 min
4.	6		10 min
5.	7		7 min
Total	39		45+5 minutes

1. Skunks (*Mephitis mephitis*) and raccoons (*Procyon lotor*) are medium-sized mammals commonly seen in most Vancouver neighbourhoods. Both of them are omnivores; they eat a variety of plant products such as berries, leaves, nuts and roots, as well as invertebrates such as arthropods and earthworms, plus mushrooms, eggs, and occasionally small rodents (mice and squirrels) or birds.

a) Consider a stable community that includes skunks, raccoons, walnut trees, blackberry shrubs, earthworms, soil bacteria and mushrooms.

i) Draw a food web that represents the energy flow among these organisms (do so by adding the appropriate arrows to the figure below) **(4 marks)**

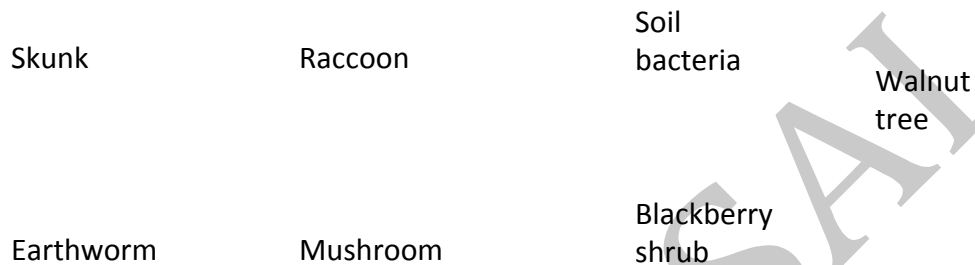


Figure 1. Proposed food web for the community described in part a).

ii) What organism or organisms from the stable community described in a) do you expect to have the largest biomass? Briefly explain your answer. **(3 marks)**

b) Consider the same community as in part a) and identify two potential examples of inter-specific competition (competition between organisms of different species). For each example indicate the two species involved as well as the specific resource that they would be competing for.

Each species can only be used in one example. **(2 marks)**

- c) The population of skunks in Stanley Park is increasing very quickly. A population ecologist is trying to estimate the carrying capacity of Stanley Park for skunks. What are two of the factors/parameters that she should measure in order to get an estimate of carrying capacity? (Note: you do not need to justify your answer). **(2 marks)**
- d) What would happen to the skunk carrying capacity of Stanley Park if the raccoon population in the park started to increase very quickly? Explain your answer. **(3 marks)**

2. *Lacerta bilineata* (“the lizard with two lines”) and *Lacerta viridis* (“the green lizard”) are two very closely related species of reptile found almost exclusively in Europe. Below are a map of the main biomes and a map showing the distribution of these two species throughout most of Europe.

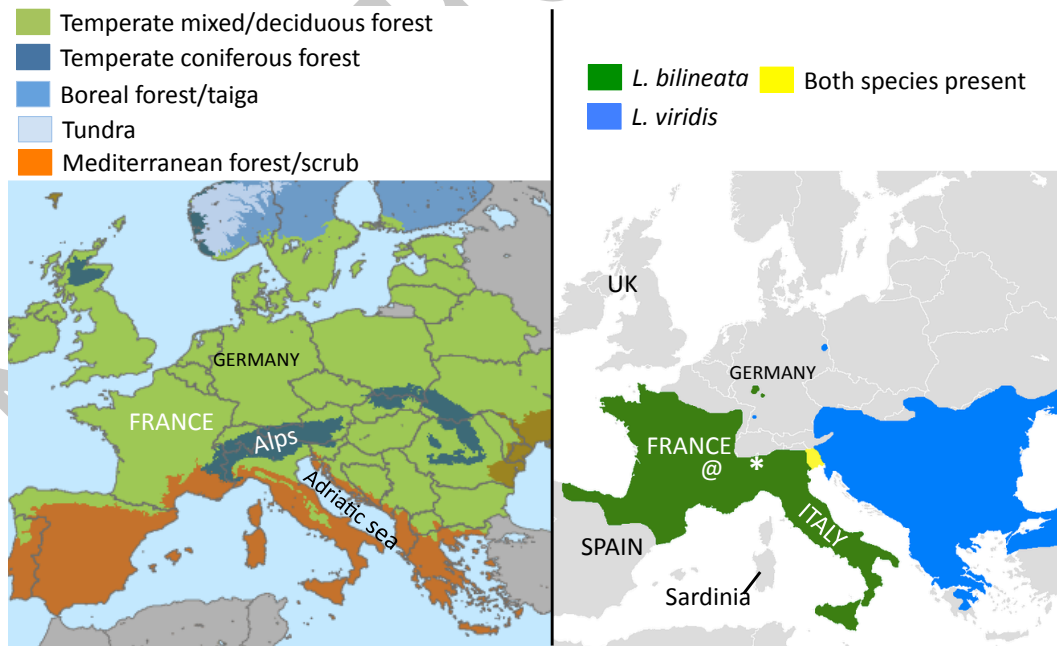


Figure 1. On the left: The main terrestrial biomes found throughout Europe. On the right: The distribution of two species of lizards, *Lacerta bilineata* and *Lacerta viridis*, throughout Europe. The asterisk (*) and the “@” symbols indicate the specific locations of two populations referred to in some of the questions.

- a) Propose one abiotic factor that could be responsible for the Northern-most limit of the distribution of both lizard species, and explain how this factor could affect the growth and reproduction of the two lizard species? Be specific! **(1 mark)**
- b) In some regions of France (indicated with the symbol “@” on the map) *Lacerta bilineata* is found at very low density. In contrast, very large and dense populations are found in Southern Switzerland (location indicated with an asterisk, *). Propose one biotic factor (or biotic interaction) that could explain this difference, and describe how this factor could affect the density of *Lacerta bilineata* in France and Southern Switzerland? **(1 mark)**
- c) Notice how neither lizard is present in Sardinia. Propose a coherent and consistent explanation for this phenomenon. **(1 mark)**
- d) Notice how, for the most part, the two species do not live in the same area. Propose an explanation for this pattern. **(1 mark)**

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3. Two separate locations in the temperate rainforest ecosystem (called “site A” and “site B”) have experienced severe fires during the same two weeks. As a result, all the organisms that used to live at those two sites have been killed, but the soil has remained in place. The abiotic conditions at the two locations are comparable. Site A is located very close to two other forested areas which were not affected by the fires. Site B, on the other hand, is very isolated, surrounded mainly by rocky terrain and a small freshwater stream.

a) Many years after the fires, several organisms establish populations at site A and site B. What are three characteristics necessary for a species to be the first one to establish a population at site A after the fire? **(3 marks)**

b) Before the fires, site A and site B were inhabited by the same types of communities. Based on the information provided about these two sites, and on your knowledge of population and community ecology, which of the two sites is expected to reach a late successional stage first? Briefly explain your answer.
 [You *must* make a choice between site A and site B, and explain your choice. Marks will be divided by two if you don't.] **(2 marks)**

c) Two species of lizards that have recently dispersed into site A, making it their home. Consider the characteristics of these two lizard species shown in the table below, and predict which one is most likely to establish a population at site A first? Justify your answer. **(3 marks)**

	Diet	Predators	Nesting sites	Reproduction characteristics	Survivorship
Lizard species 1	Small insects, worms, carcasses of dead animals	Birds, small mammals, coyotes, bear cubs	In trees (close to the ground) or holes in the ground	Start reproducing at 3 months; produces up to 60 eggs.	About 1 in 5 eggs survive and 1 in 10 newborn makes it to adulthood.
Lizard species 2	Small insects, worms, carcasses of dead animals	Birds, small mammals, coyotes, bear cubs	In trees (any height) or holes in the ground	Start reproducing at 6 months; produces hundreds of eggs.	About 1 in 10 eggs survive and 1 in 10 newborn makes it to adulthood.

4. The UBC campus squirrels, known as Eastern Grey Squirrels (*Sciurus carolinensis*) come in two colours: grey and dark brown. They are native of the East Coast and considered an invasive species in Vancouver as they are mercilessly outcompeting our local Douglas squirrel.

- a) A male grey squirrel mated with two separate dark brown females. The first mating resulted in three baby squirrels, one grey male, one grey female and one dark brown male. The second mating gave four baby squirrels: two dark brown females, and two dark brown males, but one of the males died right after birth from some unexplained injuries. Draw a pedigree of this extended squirrel family! **(3 marks)**

- b) While in Vancouver we see both grey and dark brown Eastern Grey Squirrels, in Northern Ontario they are almost exclusively dark brown, and in the Southern parts of North Carolina they are almost all grey. Explain, as a biologist would, the process that might have lead to these differences among the Vancouver, Northern Ontario, and North Carolina populations. **(3 marks)**

5. The figure below shows the number of individuals in a deer population over 12 years.

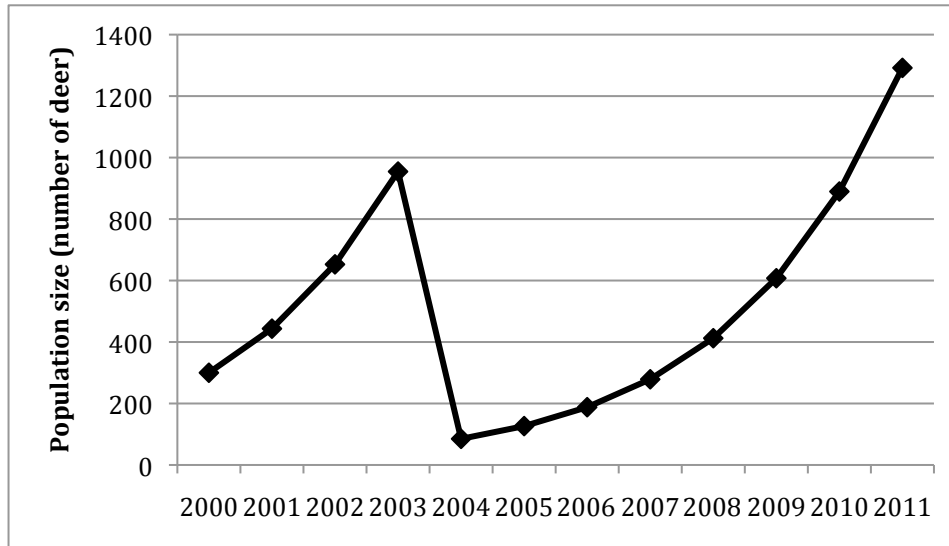
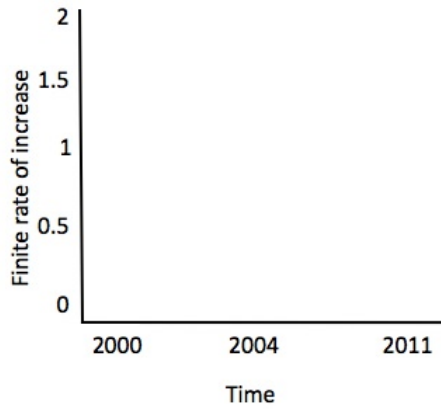


Figure 1. Size of a deer population (in number of individuals) at the start of each year, from 2000 to 2011 in a secret location.

- a) Describe the growth of this deer population between years 2000 and 2011. Your description should be specific and include any patterns, trends and anomalies observed. **(2 marks)**
- b) Deer are relatively large herbivorous mammals. They generally have small litters and live up to 10 years. You have been asked by a deer conservation group to predict what will happen to the deer population shown in the graph over the next 12 years (that is, between now and 2023).
What additional pieces of information would you want to have, and why is that piece of information crucial to make an accurate prediction in this specific scenario? **(3 marks)**

- c) On the template below, sketch a graph that shows population growth, measured as the finite rate of increase on the Y-axis as a function of time (on the X-axis) for the deer population between years 2000 and 2011. **(2 marks)**



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