

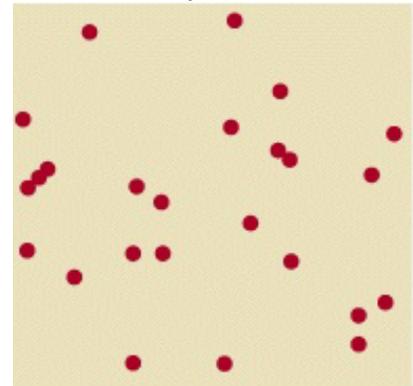
Ecology 203, Exam I. October 1, 2001. **Print name:** _____

Rules: **Read carefully, work accurately and efficiently (THIS IS A LONG EXAM!).** Answer questions to the best of your ability. There are no questions that were submitted by students. “[FG:page #]” is a question based on information from the field guide, “[TB:page]” the textbook, and “[L]” the lectures. I hope this helps you track down information when you get the exam back. Good luck!

HAND IN BOTH THIS EXAM AND YOUR ANSWER SHEET.

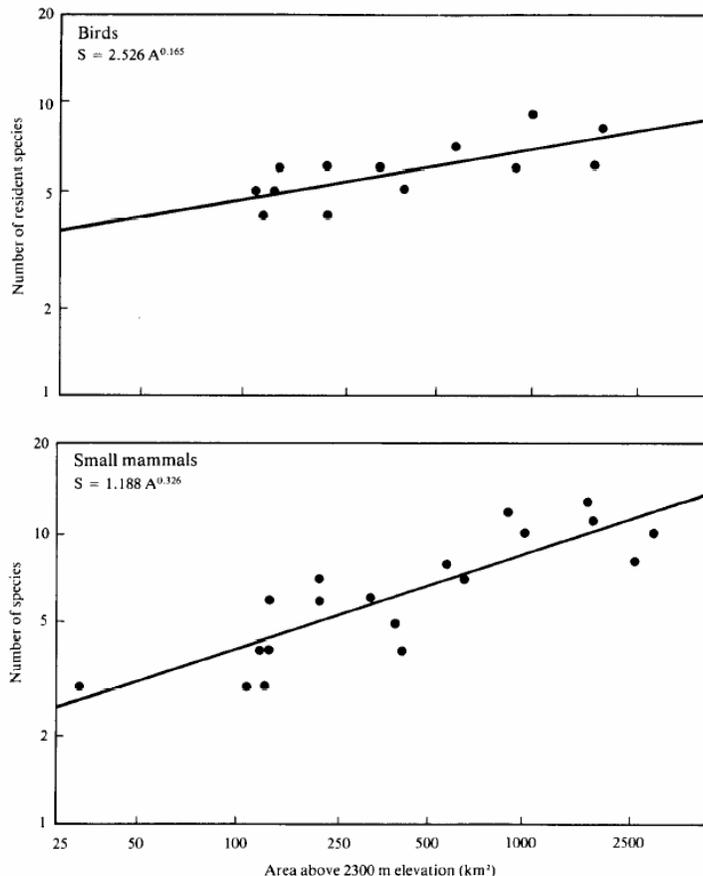
Multiple Choice. (3 pts each; 60 pts total) Please use the computer answer sheet thing.

1. If an ecologist is asking a question that involves how rainfall rates influence nutrient availability they are working in the subdiscipline [L]
 - a. physiological ecology.
 - b. population ecology.
 - c. community ecology.
 - d. ecosystem ecology.
 - e. meteorological ecology
2. In general, how do lions deal with the heat of mid-day? [L]
 - a. physiologically, they use evaporative cool with sweat glands located on their bellies.
 - b. behaviorally, by being inactive.
 - c. at a population level, where large groups gather and work collectively to cool themselves down.
 - d. all of the above.
 - e. none of the above.
3. “Indicator species” represent species [FG:13, L]
 - a. that tell us about the sensitivity of a community to disturbance.
 - b. that are unique to an area (found no where else).
 - c. are simply the most abundant or dominant species in an area.
 - d. all of the above describe “indicator species.”
 - e. none of the above.
4. *At the scale of the entire image*, the population in the figure just below most closely exhibits which of the following dispersion patterns: [FG:32; TB:256, L]
 - a. clumped.
 - b. uniform.
 - c. random.
 - d. all of the above.
 - e. none of the above.
5. If you capture and mark 50 mice and then, one week later, capture 80, 25 of which are marked, estimate the population. [L]
 - a. 25
 - b. 50
 - c. 105
 - d. 150
 - e. 160
6. The use of quantitative approaches in ecology, like all sciences, is useful because [L]
 - a. it allows for accurate understanding of complex systems and predictions of their dynamics.
 - b. scientists need to use math to understand nature.
 - c. evolution can only be understood in terms of numbers.
 - d. all of the above.
 - e. none of the above.

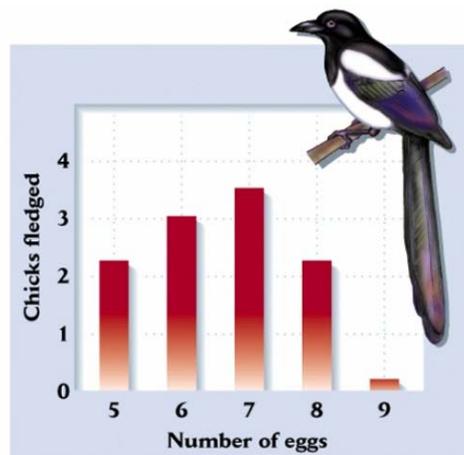


7. Science is [L]
 - a. a collection of facts about the universe
 - b. information about the physical universe and the process used to gain this information.
 - c. primarily a way of approaching complex problems that have no easy answer.
 - d. all of the above
 - e. none of the above.
8. The word “statistics” refers to [L]
 - a. summary values of data, such as “mean” and “standard deviation.”
 - b. procedures used to better understand patterns in data.
 - c. lies that have numerical support.
 - d. a and b.
 - e. none of the above.
9. In ecology if a statistical test of whether two means are different results in a p-value of 0.050 this *suggests* that [L]
 - a. the two means are different.
 - b. the two means are not different.
 - c. the test is inconclusive (the test or experiment should probably be repeated).
 - d. all of the above are possible conclusions to this problem.
 - e. none of the above.
10. In the Arboretum we saw a tree native to this area that had numerous large thorns (honey locust). The best explanation for these thorns is that they are [L]
 - a. an adaptation to protect it from squirrels.
 - b. an adaptation to protect it from huge herbivores now long extinct.
 - c. not an adaptation to anything.
 - d. actually adaptations that increase gas exchange (CO₂).
 - e. none of the above.
11. Lysenko, of the former Soviet Union, headed up their Soviet Biology and Agricultural Programs and believed that [L]
 - a. competition is a capitalistic idea not seen in biological systems.
 - b. Mendal’s genetic approach to understanding how traits were passed from generation to generation was false because it relied on nature having a random mechanism driving evolution.
 - c. given the proper environmental conditions one species could transform into another species.
 - d. all of the above
 - e. only a and b.
12. If we wish to test the effect of cowbird brood parasitism on the reproductive rate of Kentucky warblers our study might involve looking at the number of nests effected as a function of distance from the edge of an agricultural field into a forest. Our null hypothesis for such a study is [TB:253, L]
 - a. There is no effect of cowbirds on nests of Kentucky warblers.
 - b. Cowbirds have the greatest effect on nests closest to the field.
 - c. The presence of Kentucky warblers nests has no effect on cowbird populations.
 - d. The percent of Kentucky warbler nests affected by cowbirds is unrelated to their distance from the fields.
 - e. Cowbirds are reducing the population of Kentucky warblers.
13. Why does the Earth have seasons? [TB:79-80 partially, L]
 - a. Rotation on its axis.
 - b. Rotation on its axis and revolution about the sun.
 - c. Rotation on its axis, revolution about the sun, and prograde rotation.
 - d. Rotation on its axis, revolution about the sun, and tilting of its axis.
 - e. Rotation on its axis at a rate that differs from once a year in a prograde direction, revolution about the sun, and tilting of its axis.

14. The graph on the right shows data from the Sierra Nevada range. These mountain tops have a variable number of bird and small mammals species (see graph). The data suggest two important results: [L]
- more species are found on larger mountain patches while the lower slope seen in the data for birds is due to their ability to fly.
 - birds migrate; small mammals do not.
 - small mammals hibernate and birds migrate.
 - more species are found on mountains than valleys and birds have more individuals per species than small mammals.
 - all of the above can be seen in these graphs.



15. According to the model by Lamont Cole (1954), and termed “Cole’s Paradox,” the advantage of being a perennial (multiple reproductive bouts) over being an annual (such as a plant that waits 50 years, flowers, and then promptly dies) is that [L]
- the perennial needs only one more offspring to equal an annual’s “big bang” strategy.
 - the annual needs only one more offspring to equal the perennial strategy.
 - is equal to the biomass of the perennial at death divided by the biomass of all the annuals produced during the perennial’s lifetime.
 - all of the above were analyzed to be true by Cole.
 - none of the above, there is no such advantage because the strategies are equal.
16. The important result from the data on the right for magpies is that [TB:201, L]
- birds lay between 5 and 9 eggs on average.
 - the most number of eggs laid is 7.
 - the largest number of chicks fledged occurs when birds lay 7 eggs.
 - the most number of eggs laid is 9.
 - all of these are important results found in this graph.
17. The following term represents one male mating with many females: [TB:229 in part, L]
- polygamy
 - polygyny
 - monogamy
 - polyandry
 - none of the above.



18. Sexual dimorphism may evolve in a population because of [TB:231, L]
 - a. dissimilar function of males and females.
 - b. mate choice (sexual selection).
 - c. contests between members of the same sex.
 - d. all of the above.
 - e. none of the above.
19. A game theory model, discussed in lecture and developed by me, suggested that global cooperation is achieved by [L]
 - a. individuals helping each other out whenever benefits exceeded costs.
 - b. individuals interacting with strangers (large neighborhoods) and reacting little (small ϵ).
 - c. individuals interacting with friends (small neighborhoods) and reacting little (small ϵ).
 - d. individuals interacting with strangers (large neighborhoods) and reacting a lot (large ϵ).
 - e. all of the above; global cooperation without costs is essentially free.
20. Unregulated populations that mate and have offspring throughout the year would best be modeled using [TB:272,L]
 - a. exponential growth.
 - b. geometric growth.
 - c. logarithmic growth.
 - d. all of the above are appropriate.
 - e. none of the above is best.

True-False. On your answer sheet fill in “A” for true and “B” for false. (2 pts each; 20 pts total).

21. Ecologists ask questions ranging in scale from subatomic particles to the entire biosphere (earth’s living surface). [L]
22. Ecological communities of eastern North America often exhibit stratification where there are different, distinguishable layers such as shrub, understory, and canopy layers. [FG:10]
23. “Species richness” refers to the value of species found in rare ecological communities. [FG:25]
24. If I conducted a large experiment in the Roemer Arboretum on the effect of fertilizer on the growth of red cedars and found it increased their growth statistically I would be able to formally state (publish), without qualification, that “fertilizer increases the growth of red cedars.” [L]
25. A p-value is the estimated probability that the null hypothesis is false. [L]
26. Hamilton and Zuk’s “parasite-mediated sexual selection hypothesis” suggests that a member of one sex may evaluate the quality of a potential mate’s genes by looking at its health, which is an indirect measure of the individual’s ability to tolerate parasites. [TB:234]
27. As discussed in lecture and your book territoriality in animals such as birds depends on the quality and quantity of a resource. [TB: 239-240, L]
28. Birds generally do not benefit from foraging in flocks because it requires sharing food. [TB:241,FG:442,L]
29. An altruistic act, in an ecological sense, requires that the cost of the behavior be greater than the benefit received. [L]
30. Landscape ecology models of population dynamics differ from metapopulation and source-sink models because they incorporate information about how species utilize the intervening matrix. [TB:259,L]

Short, precise answer. Use only the space provided. (5 points ea., 10 points total)

1. List the four, easily observed characteristics that define natural selection.[L]

2. **Use the back of this sheet for this answer.** Assuming you are not sure whether the population you're studying should be modeled using geometric growth ($N_t = \lambda N_0$) or exponential growth ($N_t = N_0 e^{rt}$), provide a single graph for each model over 10 years. Provide the values for “ λ ” and “ r ” if the population increases from 100 individuals to 110 individuals over the first year. [L]

Short, precise answers. Use only the space provided. (**ANSWER 2 OF 3**; 5 points each; 10 points total)

2. Describe two basic experimental techniques used in ecology to test hypotheses. [L]

3. Briefly identify (to a point that I know what you're talking about) the difference between science and religion. [L]

4. Your GPA, or grade point average, is a summary of your academic (grade) performance in college. Why, in technical terms discussed in lecture, might this be (likely is) a poor summary of one's academic performance? [L]