

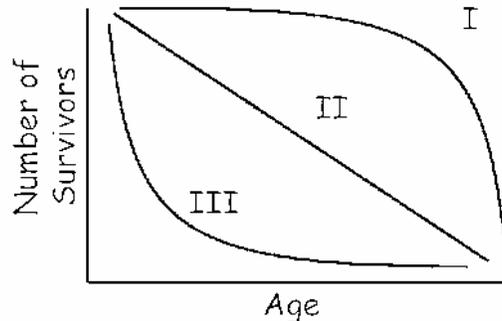
Ecology 203, Exam II. 10-22-01. **Print name:** _____ (10 pts, spelling counts).
Rules: **Read carefully, work accurately and efficiently.** Answer questions to the best of your ability. There was only one question submitted by a student. Good luck!

Some equations to keep in mind:

$$\begin{array}{ll} N_t = N_0 \lambda^t & dH/dt = rH - pHP \\ N_t = N_0 e^{rt} & dP/dt = cHP - dP \\ dN/dt = rN(1-N/K) & \end{array}$$

Multiple choice. (3 pts each; 60 pts total)

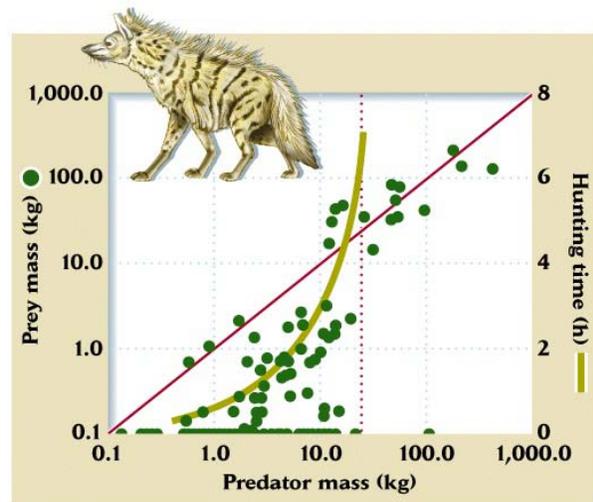
1. What is the approximate doubling time for a population that grew from 200 in 2000 to 350 in 2001? [SS]
 - a. 0.7 years
 - b. 1.2 years
 - c. 1.4 years
 - d. 1.75 years
 - e. 2.0 years
2. Exponential growth does not assume one of the following. Which one?
 - a. A population is not limited by resources.
 - b. A population is not limited by predators.
 - c. A population's doubling time is unrelated to density.
 - d. All of the above are assumptions.
 - e. None of the above are assumptions.
3. In the graph to the right humans have which of the survivorship curves?
 - a. I.
 - b. II.
 - c. III.
 - d. all of the above.
 - e. none of the above.



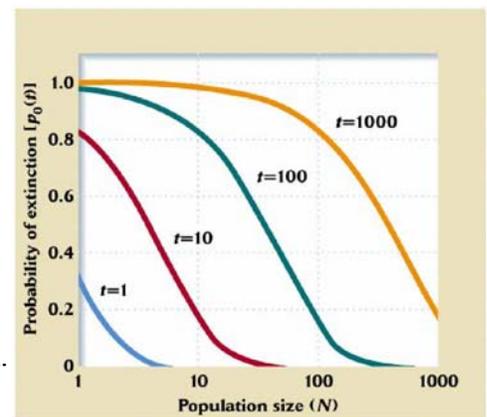
4. Assume that the following Leslie matrix summarizes the life history of a species. If the population begins with 100 individuals in each of three age classes (babies, young adults, and old adults) for a total of 300 individuals at time $t = 0$ what will be the number of individuals in each of these age classes at time $t = 2$?

$$L = \begin{matrix} & 0 & 1 & 1 \\ & .25 & 0 & 0 \\ & 0 & .5 & 0 \end{matrix}$$

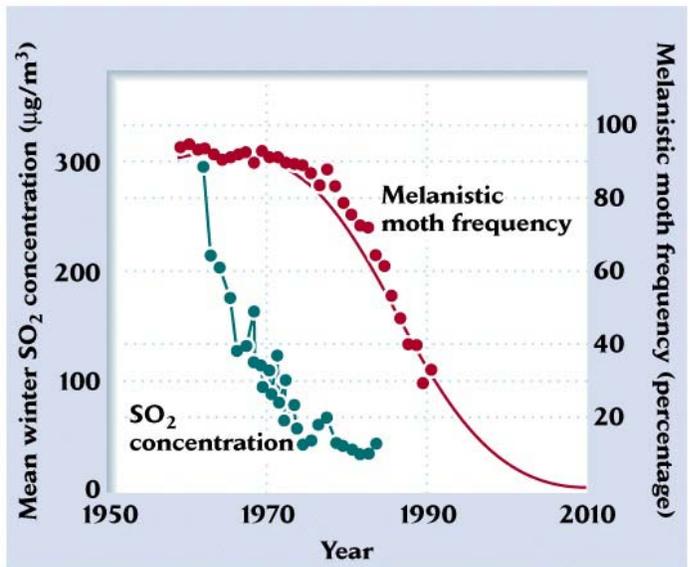
- | | <u>babies</u> | <u>Age class</u>
<u>young adults</u> | <u>old adults</u> | <u>total</u> |
|----|---------------|---|-------------------|--------------|
| a. | 100 | 100 | 100 | 300 |
| b. | 50 | 75 | 100 | 225 |
| c. | 75 | 50 | 50 | 225 |
| d. | 75 | 50 | 25 | 150 |
| e. | 75 | 50 | 12.5 | 137.5 |
5. The graph suggests that
- prey populations increase with increasing predator populations.
 - prey actually grow bigger when their predators grow bigger.
 - larger predators have to spend relatively more time foraging than smaller predators.
 - all of the above.
 - none of the above.
6. If a population is growing according to the Leslie matrix model then it immediately exhibits
- a stable age distribution and exponential growth.
 - an unstable age distribution and geometric growth.
 - a stable size distribution and exponential growth.
 - an unstable size distribution and geometric growth.
 - none of the above.
7. Which of the below is not a factor in regulating populations:
- intrinsic biotic.
 - extrinsic biotic.
 - intrinsic abiotic.
 - extrinsic abiotic.
 - none of the above, all are possible.



8. Andrewartha and Birch (1954) argued that populations of *Thrips* are regulated primarily by
 - a. competitors.
 - b. predation.
 - c. weather.
 - d. all of the above.
 - e. none of the above (populations are not regulated).
9. If birth and death rates of a population are equal then the population must be
 - a. growing.
 - b. decreasing.
 - c. in a stable equilibrium.
 - d. in an unstable equilibrium.
 - e. we don't know enough to determine this.
10. When "self-thinning" in plants takes place the population density
 - a. goes down while average plant size increases.
 - b. goes down while average plant size stabilizes.
 - c. goes up while average plant size increases.
 - d. goes up while average plant size decreases.
 - e. all of the above can result from self-thinning.
11. Chaos, in terms of population dynamics, is
 - a. random fluctuations of a population over time.
 - b. the result of random fluctuations in the environment.
 - c. seen in a standard model of intraspecific competition.
 - d. seen in a standard model of interspecific competition.
 - e. none of the above.
12. Assume that a bird species around Geneseo functions as a metapopulation over this region and there are 100 habitats that could be occupied by this species. If the extinction rate from patches is 0.25 and the colonization rate is 0.5 you should expect the equilibrium number of occupied patches to be
 - a. 25.
 - b. 50.
 - c. 75.
 - d. 100.
 - e. 200.
13. What is the main conclusion from this graph?
 - a. Populations increase over time.
 - b. Populations decrease over time.
 - c. The probability of extinction increases with time.
 - d. The probability of extinction increases with N .
 - e. Populations change according to the logistic equation.
14. Thorns on roses would be considered a type of
 - a. deduced defense.
 - b. constituent defense.
 - c. induced defense.
 - d. all of the above.
 - e. none of the above.



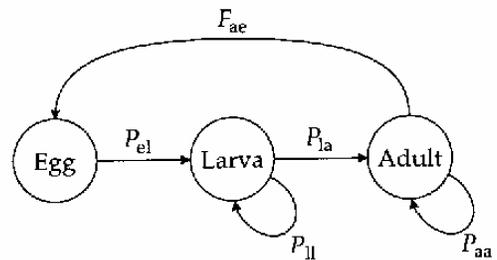
15. Which of the following is an assumption of the predator-prey model?
- Predators never get full by consuming prey.
 - Prey grow exponentially in absence of predators.
 - Predators eat only this one prey species and nothing else.
 - Predators see all prey simultaneously.
 - all of the above.
16. The field guide suggests that birds flock for which of the following reasons?
- It is an adaptation for males to maximize access to females.
 - The food birds eat is usually concentrated so the birds are themselves concentrated in flocks.
 - It increases predation but reduces the likelihood an individual will be eaten (predator satiation).
 - It reduces predation rates because of increased vigilance by group members.
 - all of the above.
17. Populations generally exhibit *negative* density dependence where per capita growth rates decrease as a function of density. Populations may, however, exhibit *positive* density dependence under which of the following circumstances? [TB:290]
- Increasing populations may have higher levels of genetic diversity.
 - Populations that are increasing may better manage their prey to support increased population growth.
 - When populations are just above a critical size their populations will actually grow. Below this level populations decrease (Allee effect).
 - all of the above.
 - none of the above.
18. This graph from your text (page 326) suggests that
- the moth population is in decline and is expected to become extinct around 2100.
 - the pollutant SO₂ has been in decline since 1970 and has now been eliminated.
 - the frequency of the melanistic form of the moth declined in response to the decline in SO₂.
 - the frequency of the melanistic form of the moth declined after a decrease in SO₂ which is consistent with the hypothesis that the pollutant was the causal agent of the high frequency of the melanistic moth.
 - all of the above.



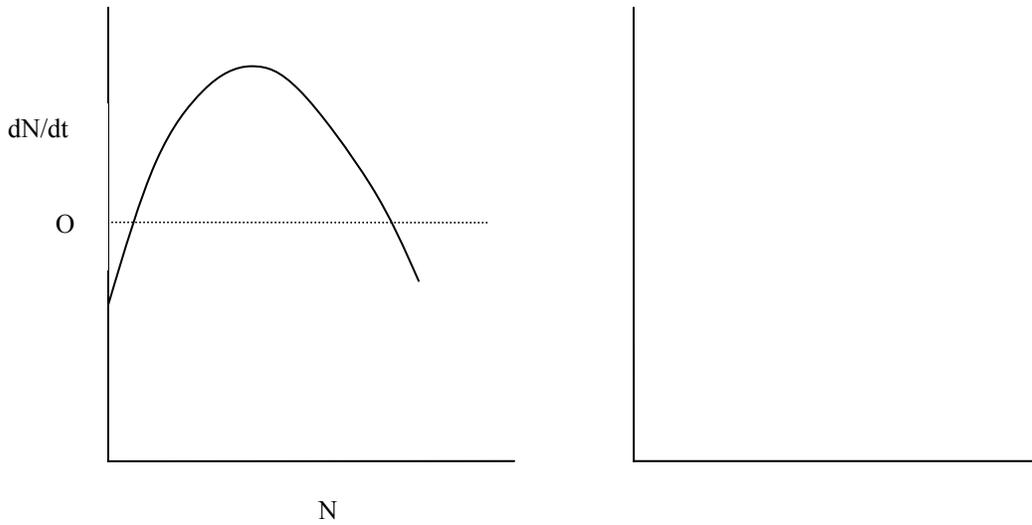
19. The herbivore optimization hypothesis suggests that
- herbivores optimize the amount of consumption of plants, avoiding overexploitation.
 - there is an optimum number of herbivores to exactly sustain a predator population.
 - under certain circumstances plants may experience increased performance from herbivory.
 - all of the above.
 - none of the above.
20. The professor of this course is named
- Mr. Bojangles
 - Dr. Kavorkian.
 - Ted Kaczynski
 - Osama Bin Laden
 - Gregg Hartvigsen

Short, precise answers. Use only the space provided. (5 pts each; 30 pts total)

1. Given the figure on the right provide the corresponding Leslie Matrix.



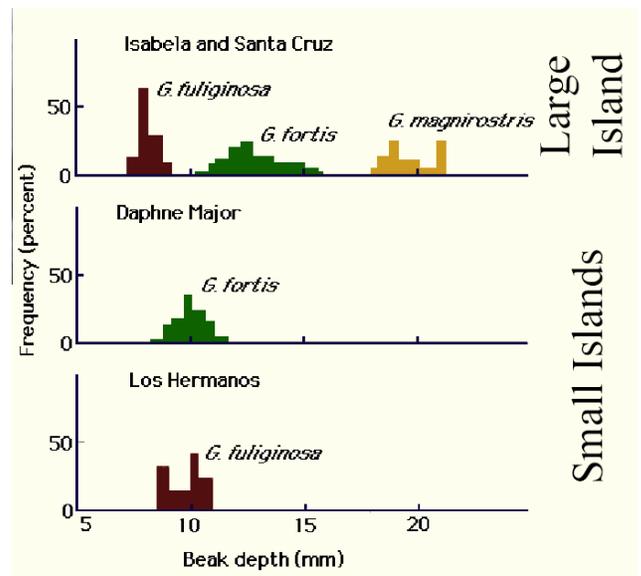
2. Analyze the graph on the left and provide a new graph of N vs. time on the right. Be sure to fully explore all population sizes in the graph on the right (e.g., small and large values for N). LABEL THE AXES.



3. Provide two possible explanations for the pattern seen in the graph.

a.

b.



6. Draw the phase-plane graph that is consistent with the graph of N vs. time below for predators and prey. Include zero isoclines for both populations and include density dependence for both populations. Also, include the Allee effect for the prey population. Analyze the graph.

