

**Section III Problems and Sample Examination Questions**

1. In the moist woodlands of the coastal Georgia and South Carolina, two species of salamanders are found. Spotted salamanders, *Ambystoma maculatum* and marbled salamanders *Ambystoma opacum* have very similar diets and ecological requirements, yet *Ambystoma maculatum* breeds early each spring while *Ambystoma opacum* breeds in the autumn. Could these two species be competitors?

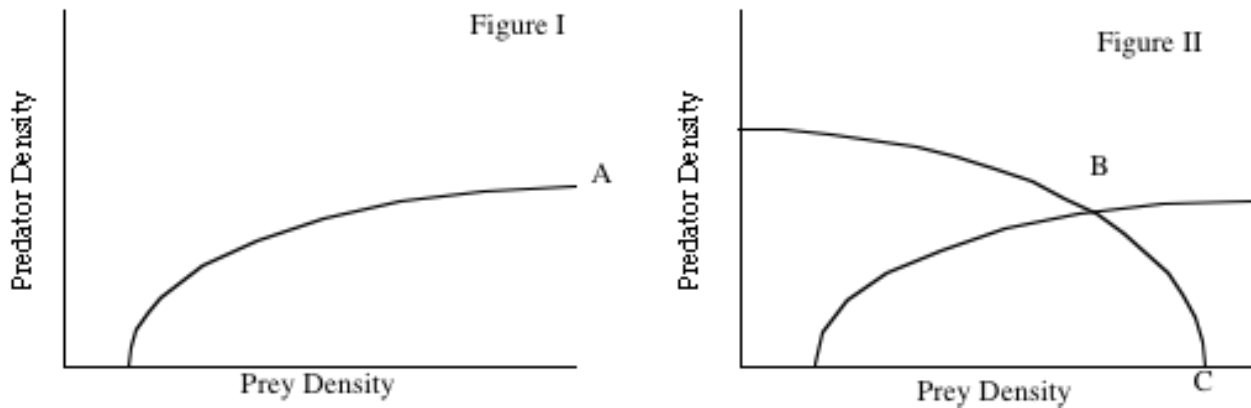
Describe an experiment that would enable you to evaluate whether these two species are involved in competitive interactions.

Let's say you found that three individuals of *Ambystoma maculatum* had the same inhibitory effect on the population growth of *Ambystoma opacum* as one individual *Ambystoma opacum*. If the carrying capacity of your woodland study site for *Ambystoma opacum* were 150 individuals and the *Ambystoma opacum* population were at equilibrium, what is the maximum sustainable number of *Ambystoma maculatum* that could live in this habitat if there were already 100 *Ambystoma opacum* and the equilibrium for *Ambystoma opacum* were maintained? Show your work by starting with an equation with all terms defined.

2. What are the characteristics of apparent and unapparent plants? How might these life history types differ in their tactics for minimizing the risk of predation?

3. Animals with aposematic (warning) coloration put themselves at risk of attracting predators and death for the sake of teaching predators about their toxicity. How could such an adaptation evolve by natural selection?

4. On Figure I, what is represented by the line labeled A? Draw the vectors for change in the predator population to the right and left of line A.



5. In Figure II, what is indicated by the label C? What would happen if the predator and prey densities were both at the point where the lines cross at point B?
6. On Isle Royale in Lake Superior, moose are a common herbivore and these moose are hunted by gray wolves. Define the terms for Lotka-Volterra Models for this interaction and state the population growth equations for each species.
7. What is a mast crop and how could it function as an anti-consumer defense?
8. Indiscriminate pesticides (most chemical insecticides) kill both herbivorous insects and their natural insect predators. Use of indiscriminate pesticides to remove insect herbivores (such as the cotton boll weevil) often results in the the return of an herbivore species in even greater numbers than before pesticide spraying. Explain this paradox with reference to the Lotka-Volterra Models of predator-prey interactions.

9. Satiation of predators may be an effective prey response to predators because:
  - a. total numbers of prey killed will decrease
  - b. some altruists die so others may survive
  - c. the risk of predation increases for all prey
  - d. the proportion of prey killed will decrease
  
10. Group living could minimize the risk of predation by:
  - a. providing an early warning of predator approach
  - b. increasing the success of defenses such as mobbing
  - c. permitting an individual to hid behind other individuals
  - d. all of the above
  
11. Quantitative chemical defenses are most common in:
  - a. annual plants
  - b. long lived trees
  - c. weedy species
  - d. all of the above
  
12. Secondary compounds such as the alkaloids cocoa, nicotine, and morphine are produced by plants for the purpose of:
  - a. inhibiting competitors
  - b. mutualism with humans
  - c. getting a natural high
  - d. discouraging herbivores
  
13. In the simplest (straight line) Lotka-Volterra predator-prey models, the zero isocline for the prey species is set by a given predator density because:
  - a. predators limit prey population growth
  - b. predators cannot induce prey population growth
  - c. predators and prey cooperate in nature
  - d. all of the above
  
14. The evolution of host specialization in an herbivore species is most likely when:
  - a. prey are ephemeral, rare, or unpredictable
  - b. prey chemical defenses are qualitative
  - c. prey chemical defenses are quantitative
  - d. prey defenses are physical and temporal

15. The existence of rapidly inducible chemical defenses by plants suggests that:
  - a. chemical defenses are inexpensive
  - b. plants are sessile and helpless prey
  - c. chemical defenses are expensive
  - d. none of the above
  
16. If competition were occurring between two species, when the two species were together, you might expect the interaction to result in:
  - a. increased growth in one or both species
  - b. decreased fecundity in one or both species
  - c. increased fecundity in one or both species
  - d. decreased mortality in one or both species
  
17. If two species coexist in some geographic sites and not others, and exhibit no differences when either sympatric or allopatric, this indicates that:
  - a. interspecific competition is absent
  - b. intraspecific competition is absent
  - c. niche overlap is extremely high
  - d. interspecific competition is high
  
18. Character displacement is a predicted outcome of competition in which:
  - a. one species goes extinct
  - b. niche overlap increases
  - c. niche overlap decreases
  - d. both species go extinct
  
19. Interference competition is competition that occurs when there is:
  - a. limited access to resources
  - b. limited supply of resources
  - c. a very small population size
  - d. a very high population density
  
20. The purpose of a removal experiment in the study of competition is to determine whether:
  - a. one species benefits when another species is removed
  - b. one species was inhibited by the presence of another species
  - c. growth of the remaining species changes after a removal
  - d. all of the above