

BIOE 370 Spring 2012
Study Guide EXAM 2

1. There will be questions that include figures from the overheads in class, asking you to interpret them.
2. How are R_0 , r and λ related? What is the exponential growth model for each of these growth rates? At what value is a population stable?
3. Use the equation for discrete exponential population growth to calculate a population's doubling time. (Set $N_t = 2N_0$ and solve for t , yielding $t = 0.7/r$. So, for example, a population growing exponentially at a rate of $r = 7\%$ annually, takes $t = 0.7/0.07 = 10$ years to double).
4. In words, what is reproductive value? What is residual reproductive value? How can you use a plot of residual reproductive value vs fecundity to identify the optimal solution to trade-offs between current reproductive effort and expected future fitness?
5. What are the differences between exponential and density-dependent population growth?
6. How did the data sets for rotifers, sparrows and white-tailed deer we examined in class (similar to Fig 11.14 and 11.15 in the book) reveal density-dependent changes in survival and/or reproduction?
7. Explain the Pearl-Verhulst (logistic) model of density dependent population growth. Figures 11.1, 11.2 and 11.4 in your book are important here.
8. Use a plot of per-capita realized population growth, $\frac{dN}{dt}/N$, versus population size to show why Pearl-Verhulst is a model of *linear* density dependence. How can we deal with nonlinear density dependence in simple models of population growth?
9. In what circumstances is population limitation by density-independent factors usually strong? In what circumstances is population limitation by density-dependent factors usually strong?
10. What is the ecological definition of competition? What are the distinctions between interference competition and exploitation competition?
11. Explain Gause's experiments on interspecific competition in *Paramecium*. What is competitive coexistence with density compensation? Competitive exclusion?
12. Explain the Lotka-Volterra model of population growth with intraspecific and interspecific competition. What is a competition coefficient? What is a zero isocline? How do you derive a zero-isocline from the Lotka-Volterra model, and what is the underlying logic? How can phase-plane plots of zero isoclines be used to predict the outcome of interspecific competition? Figures 13.1 and 13.2 in your book are useful here.
13. Why is it believed that African wild dogs are limited mainly by interspecific competition with lions and spotted hyenas?
14. Niches: basic definition, hutchinson's 'hypervolume', fundamental vs realized, niche breadth, within vs between phenotype,
15. Niche partitioning: 4 patterns of overlap and 2 non-overlap. Which patterns imply competition (symmetric & asymmetric) might currently be occurring. Which implies past competition?

16. Werner's bluegill/bass study, patterns & inferences
17. Hairston's salamander study, patterns & inferences
18. Holmes' tapeworm/spiny worm study, patterns & inferences
19. Dayan's carnivore guild study, patterns & inferences. Hutchinson's (1.3:1) ratio.