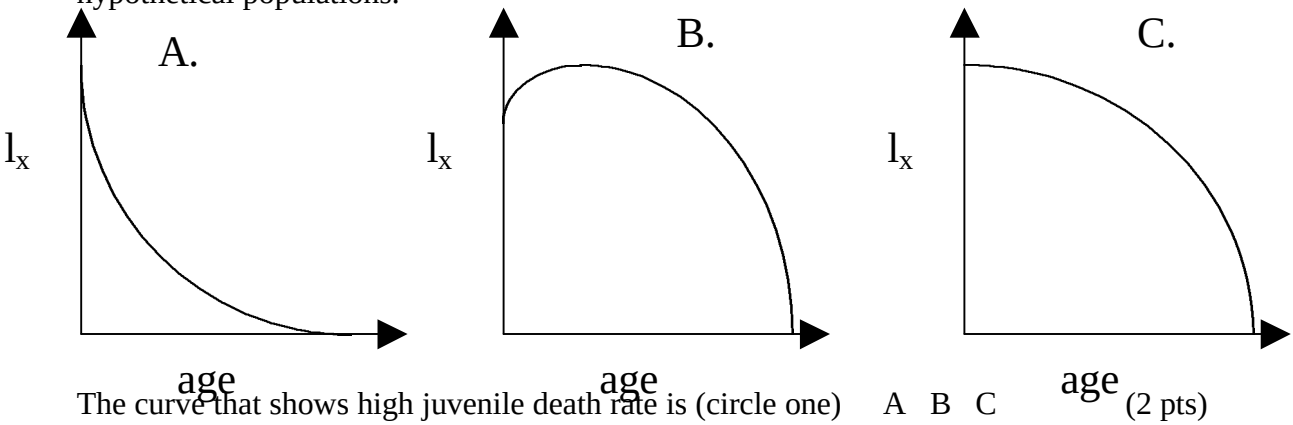
SAQ #1. Please state and BRIEFLY explain the two major objectives of population ecology. Please use a diagram for each, AND write an explanation.
diagram and explain objective 1 - (4 pts)
diagram and explain objective 2 - (4 pts)

SAQ #2. Please define an "emergent property." (3 pts)

SAQ #3. When age-specific survival rates (p_x) and fecundities (m_x) are fixed, there is a fixed survivorship curve, l_x, found from the equation: $l_x = p_0 * p_1 * p_2 * ... * p_{x-1}$. Please briefly explain what the survivorship curve shows. {You may use a sketch if you want to.}

SAQ #4. Examine the three graphs below, A, B, and C, that show the survivorship curves for hypothetical populations.



The curve that shows high juvenile death rate is (circle one) A B C (2 pts)
The curve that shows low juvenile death rate is (circle one) A B C (2 pts)
The curve that is impossible to obtain is (circle one) A B C (2 pts)

SAQ #5. When age-specific survival rates (p_x) and fecundities (m_x) are fixed, there is fixed age structure, c_x, found from a lengthy equation described in lab. Please briefly explain what the age structure curve, c_x , shows. {You may use a sketch if you want to.}

SAQ #6. Please offer a brief, but precise definition of evolution.

SAQ #7. Explain briefly what are the three conditions that are required for evolution to occur by natural selection?

SAQ #8. Please list and very briefly define four ways that evolution can occur besides Natural Selection.

SAQ#9. Explain briefly why the phenomenon of evolution would be an example of an "emergent property" of a population.

SAQ #10. Explain briefly why the phenomenon of extinction would be an example of an "emergent property" of a population.

SAQ #11. Please briefly explain two advantages of using a diversity index, such as the Shannon H', to estimate biodiversity rather than simply using the number of species censused

SAQ #12. Current life history theory maintains that "an organism should always allocate its limited resources to maximize the sum of its present fecundity plus its expected future fecundity." Explain this concept in your own words. PLEASE DIAGRAM YOUR RESPONSE.

LAQ #1. According to your field notes on a population of squirrels in southeastern PA, each female has three female babies per year, five out of ten adult females die each year, two out of ten leave per year, and three out of ten emigrate from elsewhere per year. Assume squirrels can breed as one year olds.

If there are 50 adult females alive and breeding now (N_0), how many would there be in one and two years from now? {Note 1: ignore the problem of males} {Note 2: you do not need a calculator to find the numerical values asked for. The calculations involve only simple arithmetic.}**SHOW ALL OF YOUR WORK!!** how many in one year (N_1)? how many in two years (N_2)?

LAQ #2. This question will assess your understanding of the principal means by which wildlife managers can act - restrict predation or use artificial means to offset losses due to people.

a. What might be the long term effects on the population of fish of a plan to impose minimum catch sizes to reduce the effects of fishing? Please explain three different effects.

b. How "sustainable" is this plan? Please explain.

c. What might be the specific long term effects on a population of fish of a plan to build fish hatcheries to offset the effects of fishing? Please explain three different effects.

d. How "sustainable" is this plan? Please explain.

LAQ #3. This question will test your knowledge of tradeoffs and constraints affecting life history evolution.

a. Assume for a moment that resource supply/demand ratios completely determined the evolution of life history characters. Describe at least 5 individual life history characteristics in a population for which resource supply exceeded demand.

b. Assume for a moment that the environment were variable and unpredictable and that the relationship between juvenile and adult mortality completely determined the evolution of life history characters. Describe at least 5 individual life history characteristics in a population for which juvenile mortality were relatively high and unpredictable.

LAQ #4. Consider the simple logistic model of single species population growth.

$$\frac{1}{N} * \frac{\Delta N}{\Delta t} = r * \left(1 - \frac{N}{K} \right)$$

a. Describe this model by explaining what all of the terms mean to the left and right of the equals sign, and list what are the principal ecologically relevant assumptions?

b. Without using any symbols, what is the main prediction of this model?

c. Draw a little graph below showing the per capita population growth rate vs. the population size for this model. Indicate ALL relevant constants, and LABEL THE AXES!

d. Draw a little graph below showing the population size vs. time beginning with an initially large (N >> K) and with an initially small (N << K) population size for this model. LABEL THE AXES AND ALL CONSTANTS!

LAQ #5. This question will assess your understanding of current life history theory.

a. What are two ways in which increasing present allocation to storage affects future reproduction?

b. What are two ways in which increasing present allocation to growth affects future reproduction?

c. What are two ways in which increasing present allocation to reproduction affects future reproduction?

d. How should the optimal life history phenotype allocate its limited assimilated energy (i.e., its net production) to maximize its fitness?