SAQ #1. Please briefly define what an ecological community is. (5 pts)

SAQ #2. Briefly explain the key reason(s) for why it is that the discipline of ecology has so little ability to predict exactly what the ecological consequences will be of the loss of 25% of the Earth's biodiversity (projected by 2050).

SAQ #3. Some argue that a resource to individuals in a population is anything that can cause an increase in the population size if its supply is increased. By this definition, offer and explain a situation for which temperature would be a resource.

SAQ #4. Consider the simplest possible model of two species **competition** below:

for species 1: for species 2

$$\frac{1}{N_1} * \frac{\Delta N_1}{\Delta t} = r_{1-} a * N_2 \qquad \frac{1}{N_2} * \frac{\Delta N_2}{\Delta t} = r_{2-} b * N_1$$

a. On the axes at right, plot the change in the population size of $\mathbf{N_1}$ using four little arrows corresponding to when N_1 and N_2 are common and rare. (2 pts)

b. On the axes at right, plot the change in the population size of $\mathbf{N_2}$ using four little arrows corresponding to when N_1 and N_2 are common and rare. (2 pts)

c. On the axes at right combine the arrows from the two plots above..... and explain in a phrase in the space below what is the MAIN PREDICTION of this model: (4 pts)

SAQ #5. Consider the full model of two species **competition** below:

species 1: species 2:

$$\frac{1}{N_1} * \frac{\Delta N_1}{\Delta t} = r_1 * \left(1 - \frac{N_1}{K_1} - \frac{a * N_2}{K_1} \right) \qquad \frac{1}{N_2} * \frac{\Delta N_2}{\Delta t} = r_2 * \left(1 - \frac{N_2}{K_2} - \frac{b * N_1}{K_2} \right)$$

Please list what are all of the critical biologically relevant assumptions of this model.(8 pts)

SAQ #6. Please explain in words what is the principal prediction of the competition model above.

SAQ #7. Please explain what is "competitive character displacement"?

SAQ #8. Consider the simplest possible model of two species **predator/prey interaction** below:

for prey: for predator:

$$\frac{1}{\text{Prey}} * \frac{\Delta \text{Prey}}{\Delta t} = r_1 - a * \text{Predator} \qquad \frac{1}{\text{Predator}} * \frac{\Delta \text{Predator}}{\Delta t} = -r_2 + b * \text{Prey}$$

a. In the graph at right, plot the change in the population size of **Prey** using four little arrows corresponding to when Prey and Predators are common and rare. (2 pts)

b. In the graph at right, plot the change in the population size of **Predators** using four little arrows corresponding to when Prey and Predators are common and rare. (2 pts)

c. In the graph at right, combine the arrows from the two plots above...and explain in a phrase below what is the MAIN PREDICTION of this model: (4 pts)

SAQ #9. Consider the simplest possible model of two species **predator/prey interaction** below:

for prey: for predator:

$$\frac{1}{\text{Prey}} * \frac{\Delta \text{Prey}}{\Delta t} = r_1 - a * \text{Predator} \qquad \frac{1}{\text{Predator}} * \frac{\Delta \text{Predator}}{\Delta t} = -r_2 + b * \text{Prey}$$

Please list what are all of the critical biologically relevant assumptions of this model and in particular define the α and β.(8 pts)

SAQ#10. According to the model above, why does the evolution of enhanced predation ability by the predators push the system toward extinction, whereas the evolution of anti-predator tactics by the prey tend to stabilize their interaction? (8 pts)

LAQ #1. Please BRIEFLY explain the two major objectives of community ecology. Please use a diagram in each of your explanations.
1 - 2 -

LAQ #2. It can plainly be observed in the majority of ecological communities throughout the world that a large quantity of plant biomass stands uneaten. Some have asserted that it therefore must be true that herbivore populations must not be food limited, and instead herbivore populations must be predator limited.
a. Please explain the basis of this argument.
b. Please explain the key reasons(s) why this argument is likely to be false in many cases.

LAQ #3. Please BRIEFLY explain how increased biodiversity might confer greater stability to an ecological community of interacting populations. {Hint 1: I would encourage you to consider two communities one with high biodiversity and one with low biodiversity, and relate the loss of say 10% of the species to the ecosystem resiliency and stability. Hint 2: think about generalist vs. specialist predators, too.}

LAQ #4. Describe any one of the field studies of interspecific competition discussed in class. What was/were the observations/evidence for competition? What were the mechanisms of coexistence hypothesized - i.e. why hadn't extinction of one of the competing species resulted a long time ago?

LAQ #5. What did Huffaker find with his lab experiments with predator and prey species of mites in an environment consisting of trays of rotting oranges? Please use diagrams, sketches, etc., in your answer and explain:
a. Huffaker's experimental design?
b. Huffaker's experimental results, i.e. <u>why</u> did these two species coexist?
c. What are the implications of Huffaker's study to ecological interactions in nature that now are occurring in fragmented and isolated sub-populations due to the landscape-level impacts of our human population?