Please Attempt ALL of the Questions in This Section.

#1. Please briefly explain what are the major objectives of this third unit of the course according to the syllabus (print copy or on the course web site).

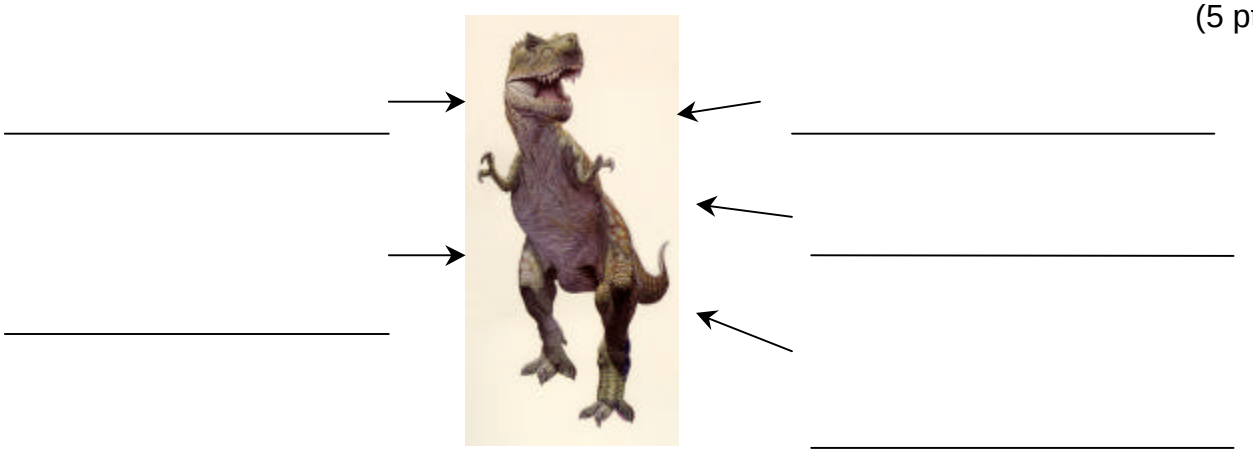
(3 pts.)

#2. I mentioned in class that the discipline of ecology is hierarchical. Please list AND briefly describe some of the details of each of the four principal levels of ecology.

(4 pts.)

#3. Please write on the lines below what are the five environmental types that directly affect the day to day lives of individual organisms?

(5 pts)



#4. Please concisely state what are the objectives of individual ecology?

(3 pts)

#5. Please offer a brief but concise definition of altruism.

(3 pts)

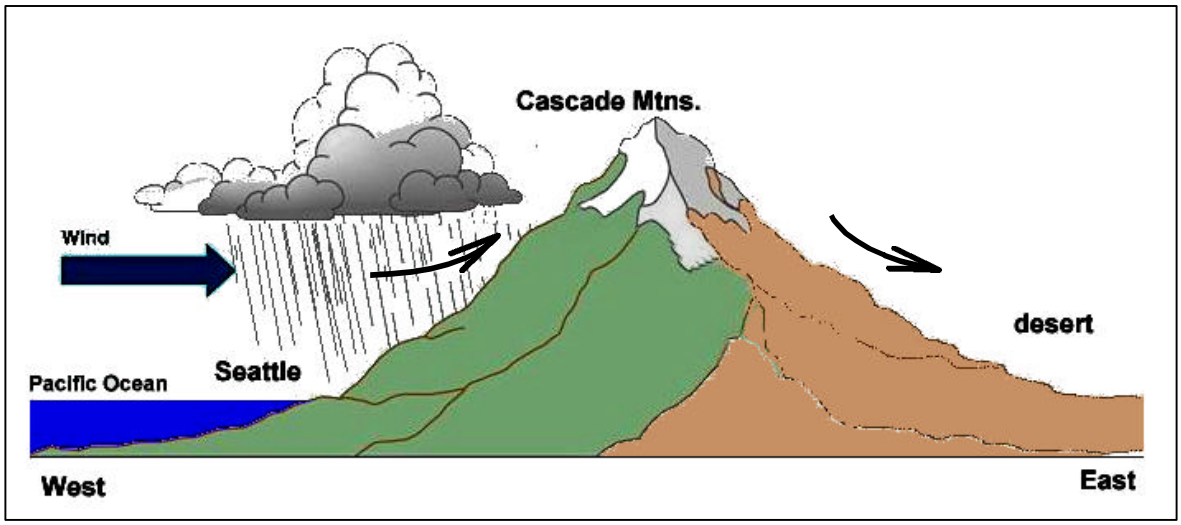
#6. Are coevolutionary mutualisms, such as the example of the acacia tree and the acacia ants, examples of “altruism”?

YES or NO ← {circle one} (1 pt}

Please explain how the relationship between the acacia and the acacia ant **IS** or **IS NOT** an example of altruism.

(3 pts)

FIGURE 53.15 • Mutualism between acacia trees and ants.



#7. Above is a diagram (similar to one from your textbook) showing the prevailing wind, and the effect of the Cascade Mountains on the west to east pattern of rainfall in Washington State. Please explain why is it so rainy in Seattle and why is it desert-like on the other side of the Cascades to the east?

(8 pts.)

#8. Please offer a brief but concise definition of "evolution."

(4 pts)

#9. Please offer a brief but concise explanation of how "evolution" can occur by natural selection (hint: there are three conditions).

(4 pts)

#10. Please use a diagram and briefly describe the two principal objectives of **population ecology**.

(a) objective #1 –

(2 pts)

(b) objective #2 –

(2 pts)

#11. According to your studies of a population of head lice on a randomly chosen seat in Kirkbride 108, each female louse has 10 female baby lice per week, and 1 out of 3 adult females are killed each week. Assume head lice can breed after only one week of life.

If there are 300 adult females alive and breeding now (N_0), how many would there be in one week from now? {Note 1: ignore the males} {Note 2: you do not need a calculator to find the numerical values asked for. The calculations involve only simple arithmetic.}

how many in one week (N_1)? (6 pts)

Consider the simple logistic model of single species population growth.

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

#12. **Without using any math symbols or notation**, please briefly explain IN WORDS what do we mean by "density-dependent" population regulation, and how does the equation above include "density-dependence"?

(4 pts)

#13. Please use a diagram and briefly explain what is the greenhouse effect?

(8 pts)

#14. What are four of the principal greenhouse gasses and what are their main sources?

Greenhouse gas: its main source:

1 – (1 pt)
2 – (1 pt)
3 – (1 pt)
4 – (1 pt)

#15. Current models predict that +2-5^{o}C warming is likely by 2100 if nothing is done and atmospheric CO_2 concentration is allowed to double. Please list at least three of the principal predictions for what is likely if global warming on this magnitude were to occur.

1 - (6 pts)
2 -
3 -

Part 2.

Question #1. (a) Please offer a brief definition of an ecological community.

(4 pts)

(b). Please diagram and briefly explain the two major objectives of community ecology.

objective #1 - (4 pts)
objective #2 - (4 pts)

(c). Please list and briefly define the three major ways in which two populations may interact.

(3 pts)

Question #2. This question will assess your understanding of biogochemical cycles.

(a). Please diagram the global carbon cycle. Include in your diagram, air, soil, water, algae, plants, animals, industry, deforestation, and all of the necessary arrows to connect what needs to be connected.

(7.5 pts)

(b). Please diagram the cycle of lead, which is a toxic metal, in urban ecosystems. Include in your diagram, air, soil, water, algae, plants, animals, people, industry, and other important boxes, as well as all of the necessary arrows to connect what needs to be connected.

(7.5 pts)

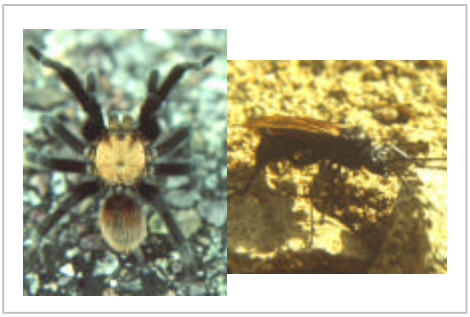
Question #3. This question will assess your understanding of the predator prey interaction
. According to the mathematical model of the interaction of predators and prey,

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

(a). In the equation at left above, what is the biological interpretation of the "alpha"?
(5 pts)

(b). Please briefly explain IN WORDS what is the principal prediction of this model, and using the axes below please illustrate the principal prediction of this model:
(5 pts)

(c). Please explain how the story of the tarantula and the tarantula hawk wasp might be an example of coevolution of predator and prey.



(5 pts)

Question #4. According to archeologist Gary Rollefson, the dramatic abandonment of the Neolithic settlements such as the 'Ain Ghazal at 6000 b.c. was due to anthropogenic degradation of the fragile Jordan Valley ecosystem.

Imagine yourself as one of the members of this community at about 6100 b.c., just prior to its abandonment. What were the major environmental signposts that the 'Ain Ghazal culture and way of life were nearing a collapse?
(5 pts)

Please list 5 major global environmental signposts that <u>our</u> "modern" culture and way of life are not sustainable. (note: precision is not expected for any numbers you give)
(10 pts)