

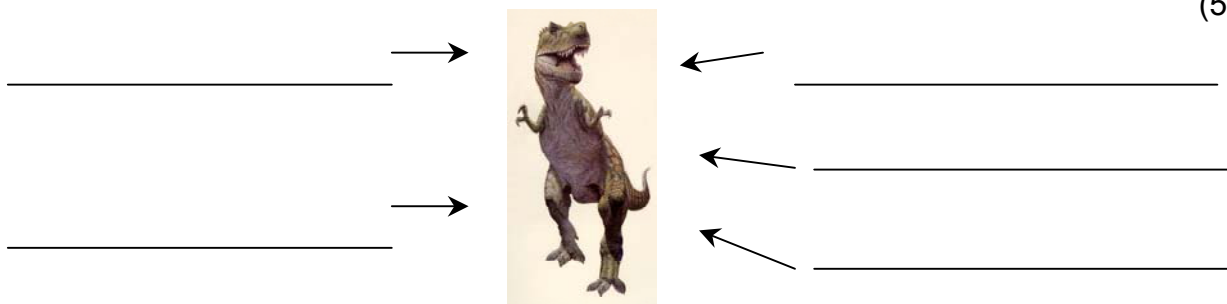
**Please Attempt ALL of the Questions in This Section.**

#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. 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)



#3. Please offer a brief but concise explanation of Evolution and of how Evolution can occur by natural selection (hint: there are several specific conditions).

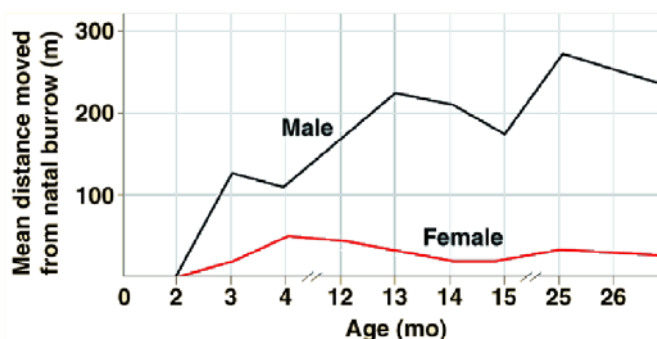
(5 pts)

#4. Please offer a brief but concise definition of altruism AND describe one specific example of altruism in an animal either from lecture or from the text.

(6 pts)

- definition of altruism
- example of altruism (other than Q#5!!!)

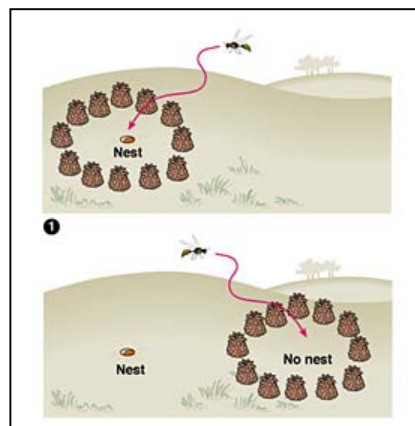
#5. At right is a figure showing the average distance traveled by male and female prairie dogs from their family colony. Based on these data, which sex would you expect to give “alarm calls” to warn the other prairie dogs nearby of an approaching predator (such as a hawk)?



**Please explain your reasoning.**

(5 pts)

#6. Please explain briefly what Niko Tinbergen found with his experiments on digger wasp's nest-locating behavior. Please refer to the figure below from your text.



(5 pts)

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

(a) objective #1 –

(3 pts)

(b) objective #2 –

(3 pts)

#8. According to the CIA Word Fact Book (<http://www.cia.gov/cia/publications/factbook/i>), the human population the birth rate is 21.2 births/1,000 people, and the death rate is 8.9 deaths/1,000 people (as of July 2002).

If the human population is about 6.2 billion now (2002), what will be the size of the population next year? Please set up the equation to calculate the human population for next year (2003). {Note: you do not need a calculator – I have provided a table of useful multiplication facts below. The rest is simple addition}

$$N(\text{next time}) = N(\text{now}) + \text{births} - \text{deaths}$$

**SHOW ALL WORK**

(8 pts)

#9. Please list and briefly define the three major ways in which two populations may interact. (6 pts)

Consider the simple logistic model of single species population growth.

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

#10. **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)

#11. Please offer a concise definition of coevolution.

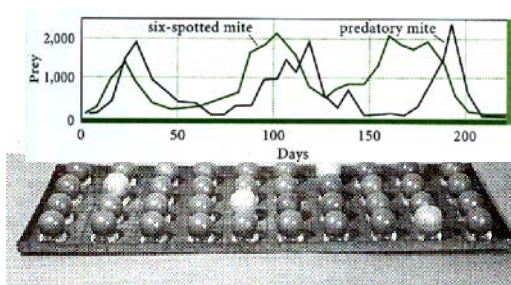
(4 pts)

#12. Please explain how the story of the tarantula and the tarantula hawk wasp might be an example of coevolution of predator and prey.



(4 pts)

#13. One of the most important lab studies of predator prey dynamics was Huffaker's (1957) study of predator and prey mites living in trays of rotting oranges. WHY exactly did the predators coexist with their prey (as opposed to hunting their prey to extinction) and what are the general conclusions we can draw from Huffaker's research?



(5 pts)

#14. Of what economic value is biodiversity to humans? Please list and briefly explain three totally different ways in which biodiversity is of economic value. {Hint: this question is NOT about aesthetics, it's about economics. }

1 –

(6 pts)

2 –

3 –

### Longer Answer Questions.

Question #1. Please use a diagram and briefly explain what is the greenhouse effect?

(6 pts)

What are three of the principal greenhouse gasses?

1 –

(3 pts)

2 –

3 –

Current models predict that +2-5°C warming is likely by 2100 if nothing is done and atmospheric CO<sub>2</sub> 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 -

Question #2. 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 our "modern" culture and way of life are not sustainable. (note: precision is not expected for any numbers you give)

(10 pts)

Question #3. This question will test your understanding of ecological economics. Below is a sketch of the relationships between "natural capital," "human capital," and "human-generated waste" that we used in class to describe the present unsustainable economic system (referred to as the "Neolithic" model).



- (a). List and briefly explain the three basic assumptions under which this economic model operates:  
1 – (6 pts)  
2 –  
3 –
- (b). List and briefly explain the three basic assumptions under which a “sustainable” economic system (or the “post-Neolithic” model) would operate:  
1 – (6 pts)  
2 –  
3 –
- (c). Herman E. Daly, an internationally recognized economist, once wrote that "There is something fundamentally wrong in treating the earth as if it were a business in liquidation..." Please briefly explain what he meant by this comment. Exactly what is being liquidated? (3 pts)

EXTRA CREDIT QUESTION: (max of 10 points)

During the last third of the semester there were four Science Division Seminars:

November 4, Dr. Susan Schiavi, Senior Research Scientist, Title: “Current Topics in Biomedical Research at Genzyme Corporation”

December 2, Dr. Steven Seeholzer, Fox Chase Cancer Center, Title: "Proteomics and Mass Spectrometry in a Research and Clinical Setting"

December 9, Dr. Edward Guinan, Department of Astronomy, Villanova University, Title: "The Young and Restless Sun: Effects on Paleo-Planetary Environments and the Development of Life"

December 13, Dr. Joanna Berrigan, Title: “The Current Health Care Crisis in Iraq.”

In addition, I circulated a newspaper article via email from the December 3 NY Times (Can Global Warming Be Studied Too Much? by Andrew Revkin)

Please choose one of these talks that you attended, or choose the NY Times article that you downloaded and read, and describe in the space below as many aspects and details that you can recall to demonstrate that you attended one of these talks or read the article. Your grade depends on the amount of detail that you can recall, so please don't stop after writing only a few words.

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