MULTIPLE CHOICE.—For the following multiple choice questions circle the letter in front of the response that best answers the question or completes the sentence. (20%, 2% each)

1. Which of the following is NOT an assumption of scientific philosophy?
   a. Different events can have the same cause.
   b. Experimental observations can prove hypotheses to be true.
   c. Sense experience reflects reality.
   d. There is order in the universe.
   e. None of the above. (All are assumptions of scientific philosophy)

2. Which of the following is deriving a generalization from separate observations?
   a. Deduction
   b. Induction
   c. Rejection
   d. Support
   e. None of the above

3. Which of the following best describes your ecological relationship to a sunflower seed as you eat it?
   a. Commensalist
   b. Ectoparasite
   c. Grazer
   d. Parasitoid
   e. Predator

4. What occurs at 30º North and South latitude that causes deserts to form there?
   a. Air blows off of the oceans there.
   b. Sunlight hits the earth most directly there.
   c. The earth's axis is tilted 30º.
   d. Warm air rises and cools there.
   e. None of the above

5. Which of the following can fix nitrogen?
   a. Some animals
   b. Some bacteria
   c. Some plants
   d. All organisms can fix nitrogen
   e. No organisms can fix nitrogen

6. Currently, what is the most-significant cause of species becoming endangered?
   a. Commercial overexploitation
   b. Effects of exotic organism
   c. Habitat alteration (destruction)
   d. Recreational disturbance & overexploitation
   e. None of the above

7. Which of the following best describes the coloration of a bright venomous snake?
   a. Aposematic
   b. Commensal
   c. Cryptic
   d. Cyanotic
   e. None of the above

8. If a population of 100 is undergoing exponential growth with a yearly intrinsic rate of increase of 0.1, then what is the size of the population after 2 years?
   a. 101
   b. 110
   c. 120
   d. 220
   e. None of the above

9. Which of the following is TRUE about human endoparasites?
   a. Most have complex nervous systems.
   b. Most are closely related to ocean living or tidal mud-flat organisms.
   c. They always kill unmedicated hosts.
   d. They are usually smaller than their free-living relatives.
   e. None of the above

10. Which of the following is required to avoid extinction of a sink population?
    a. Immigration
    b. Emigration
    c. Seasonal variability
    d. Very high quality habitat
    e. None of the above
MATCHING.—For the following exercise match the characteristics in the right column with the corresponding biome or environment in the left column. Each letter may be used more than once or not at all. The space on the left indicate the number of correct answers. (9%, 1% each)

1. Coniferous forest
2. Savanna
3. Temperate forest
4. Temperate grassland
5. Tropical forest

A. Canopy
B. Hot and wet climate
C. Large herds of large animals
D. Leaf litter forms deep nutrient-rich soil
E. Seasonal fires common

FILL-IN-THE-BLANK.—For the following exercises write the appropriate word or words in the available space. (21%)

1. Label the two zones of the ocean indicated in the figure below. (2%)

A. ______________
B. ______________
C. ______________

2. Sketch and correctly label the Carbon cycle (C). Be certain to indicate where carbon is obtained at each stage, label the kinds of organisms involved, and indicate where fixation occurs. (6%)

3. Label the three survivorship curves below with the appropriate type. (3%)

4. Give an example of an organism that approximately exhibits each type of survivorship. (Identify the type of survivorship for each example.) (3%)

5. Sketch and correctly label a typical biomass "pyramid" for a surface-water, oceanic ecosystem. Include the names of at least 3 trophic levels. (6%)
DEFINITIONS.—For the following BIOLOGICAL words or phrases define them as accurately and concisely as possible. (20%, 4%)

1. Science:

2. Biodiversity Crisis:

3. Biological Succession:

4. Estuary:

5. Population:

SHORT ANSWER/PROBLEMS.— Address each question in as concise and lucid a manner as possible. (10%)

1. A population of 100,000 individuals is growing **logistically** and has a yearly intrinsic rate of increase of 0.4. The carrying capacity is 200,000. What is the size of this population after one year? After two years? (Be sure to write down any equations you used.) (6%)

2. **Briefly** explain how the human population has grown in the last 1000 years. What occurrence most seriously reduced the human population size in the last 1000 years? Why haven't other events such as World War Two resulted in equally dramatic population reductions? (Feel free to sketch a graph showing human population growth.) (4%)
**SHORT ESSAYS.**—For the following essays, address each question in as concise and lucid a manner as possible. Do NOT exceed the space provided. (20%)

1. The antibiotic penicillin is known to kill the bacterium *Staphylococcus aureus*. Design a rigorous experiment to **test the hypothesis that penicillin will kill Escherichia coli** (AKA. E. coli). Be certain to include the two types of control discussed in class. The penicillin you will use is dissolved in a water solution and the bacteria are grown on semi-solid nutrient medium in Petri plates. (Feel free to include drawings to SUPPLEMENT your answer.) (10%)

2. Explain why having a parasite does not necessarily mean a person has a disease. What types of parasites are **least** likely to cause disease and **why**? What types of parasites are **most** likely to cause disease and **why**? (10%)