

## 2009-2010 AP BIOLOGY SUMMER ASSIGNMENT

- **Answer each free response question (FRQ) on separate paper!**
- **Write your name & the subject of the free response question on top of page 1 of your response.**
- **Please hand write response neatly or type your response.**

### **Behavior**

Describe releasers (sign stimuli), imprinting, and communication, as each of these terms relates to animal behavior. You may include in your answer a discussion of the classical studies of Nikolas Tinbergen, Konrad Lorenz, and Karl von Frisch.

### **Ecology**

Using an example of each, discuss the following ecological concepts.

- a. Succession
- b. Energy flow between trophic levels
- c. Limiting factors
- d. Carrying capacity

- **Answer every question thoroughly & completely on separate paper.**
- **Indicate Chapter # and question # for each question.**
- **Be sure to include diagrams, graphs, or other figures as requested by the question. Feel free to search the web for pictures or more information about a particular concept.**

### **Chapter 50: An Introduction to Ecology and the Biosphere**

1. Define population, community, ecosystem and biosphere. Indicate how each is related to the others, and suggest one question that an ecologist studying each might seek to answer.
2. Distinguish between biotic and abiotic factors. Describe 6 abiotic factors, including an example of how each may influence a living organism.
3. Explain 6 factors affecting the distribution and ecology of organisms. (At least 3 of these should be biotic).
4. What is an introduced species? Cite 2 examples of introductions, and briefly explain their effects on the native species.
5. Explain how the earth's curvature and axis of rotation influence the amount of sunlight reaching a given area, and how this influences the temperature and precipitation in that area.
6. What is microclimate? Why might variations in microclimate have a greater effect on some species than on others?
7. What abiotic factors seem to be the greatest determinants of biome locations.

8. Describe the primary characteristics of the major types of aquatic biomes, citing typical organisms. Discuss the factors that divide each into zones, and describe each zone.
9. Distinguish between each of the following pairs of terms: benthic/pelagic, photic/aphotic, neritic/oceanic.
10. Describe each major terrestrial biome with respect to climate, location, and representative flora and fauna.
11. What is a species geographic range? Explain the difference between a species potential and actual range.

## **Chapter 51: Behavioral Biology**

1. Explain the differences between the proximal and ultimate causes of behavior.
2. What is ethology?
3. Define and give an example of a fixed action pattern.
4. What is a sign stimulus? Give at least 2 examples.
5. What is explained by optimal foraging theory?
6. Distinguish between innate behaviors, learned behaviors, and habituation.
7. Describe the processes of parental and sexual imprinting and explain what is meant by the critical period.
8. Distinguish between classical conditioning and operant conditioning.
9. Explain the significance of “play” behavior.
10. What is cognition? Explain each of the following: kinesis, taxis, cognitive maps.
11. Discuss 3 navigational strategies used by birds to navigate on long flights.
12. For each of the following, explain the behavior and its ultimate cause (evolutionary significance):  
agonistic behavior, dominance hierarchy, territoriality, courtship. (HINT: evolutionary significance implies the behavior increases survival and reproduction for members of a population possessing the behavior.)
13. Distinguish between monogamy and polygamy, and explain the role of parental investment in determining the evolution of these systems.
14. Use a diagram to describe the honeybee’s waggle dance, and the information it conveys. Given the position of a food source in relation to the hive, predict the angle at which a waggle dance would be performed.
15. Define “inclusive fitness” and explain the evolutionary advantage to a population which has members who exhibit altruistic behavior. Contrast kin selection and reciprocity as explanations of altruistic behavior. Which one of them is generally more applicable?
- 16 Describe a research project of each of the following ethologists: Konrad Lorenz, Nicholas Tinbergen, Karl von Frisch.
17. Explain what is meant by a biological clock and by circadian rhythms, and state the role the clock plays in effecting drives and changing behavioral programs.

## Chapter 52: Population Ecology

1. Give two methods biologists use to estimate population densities. Distinguish between uniform, clumped, and random dispersions, and indicate the conditions under which each occurs, and which one is the most common.
2. Study a graph of the general types of survivorship curves. Sketch:
  - a. A survivorship curve for a population in which the death rate is the same at every age, label it by type.
  - b. A survivorship curve that reflects the loss of large quantities of young, such as would be seen in most plant species and label it by type.
3. Explain in detail the characteristics that make up the life history of any species. Describe the life history of humans.
4. What are survival and reproduction considered to be “conflicting demands?”
5. Sketch an exponential growth curve. Describe at least one situation in which exponential growth could occur.
6. Sketch a logistic growth curve and label the carrying capacity, the inflection point, the portion of the curve showing an accelerating rate of population growth, and the portion showing a decelerating rate.
7. Draw an exponential growth curve with a sudden crash, and list factors that might cause the crash. Distinguish between those that are density-dependent, and those that are density-independent.
8. Distinguish between an r-selected species and a K-selected species with respect to body size, life-span, number of offspring, relative time of reproduction (earlier or later in life) type of survivorship curve, type of environment (stable or unstable), and type of growth curve (S-shaped or boom-and bust). Use a chart format to answer this question.
9. What is the Allee effect? How might this apply to endangered species?
10. Discuss several ways in which negative feedback mechanisms affect population growth. Include in your discussion at least one example of physiological stress caused by overcrowding.
11. Describe the snowshoe hare/lynx relationship. Explain the changes in the hare population in at least two ways.
12. What information can be gained from examining the age structure pyramids for human populations? What is meant by ecological footprint?

## Chapter 53: Community Ecology

1. Differentiate between the individualistic and the interactive hypotheses of community structure.
2. Explain G.F. Gause's competitive exclusion principle. Give one example.
3. Define ecological niche. What is the difference between the fundamental niche and the realized niche?
4. “Coexistence” is the term given to a situation in which 2 closely related species are found in the same habitat. Explain how resource partitioning and character displacement might allow this to occur.
5. Distinguish between intraspecific competition and interspecific competition. Give an example of each.

6. Describe several strategies that prey species have adopted for survival. Include plant and animal examples.
7. Compare and contrast Batesian and Mullerian mimicry.
8. Define and give an example of each of the following species interactions: predation, parasitism, commensalism, mutualism, symbiosis (see p. 540), coevolution.
9. What is the difference between a food chain and a food web?
10. The energetic hypothesis and the dynamic stability hypothesis both attempt to answer what question? How are these hypotheses different from each other?
11. Differentiate between a dominant species and a keystone species. Give an example of each.
12. The “top-down model” and the “bottom-view model” are views of community structure. Explain how each would answer this question: What has caused a decrease in the population size of primary consumers?
13. What is a disturbance? Give an example of a natural and of an anthropogenic (human-caused) disturbance. Are disturbances always bad? Explain.
14. Define the following terms: succession, primary succession, secondary succession.
15. What are 3 possible ways in which early arriving and late arriving species may interact during succession?
16. Describe the steps and name some representative organisms that would be characteristic of succession if the Legacy grounds crew stopped mowing the football field.
17. What is biodiversity? Explain the latitudinal gradient of species diversity.
18. Explain the concept of heterogeneity. How does it relate to species richness and relative abundance?
19. What information can be gained from interpreting a species-area curve?
20. What is predicted by the theory of island biogeography?

## **Chapter 54: Ecosystems**

1. Define ecosystem. Where does the flow of energy in an ecosystem begin?
2. What are trophic levels? What is always at the first trophic level? State the trophic level of each of the following: cow, grass, man.
3. What are detritivores? Give some examples.
4. What is primary productivity? Distinguish between gross primary productivity and net primary productivity.
5. How could primary productivity be increased?
6. What is meant by biomass? Which ecosystem would tend to have a greater biomass/unit area, a prairie or a deciduous forest? Explain.
7. What are the major limiting nutrients in aquatic ecosystems?
8. What is eutrophication?
9. Sketch and explain a pyramid of energy and a pyramid of biomass.
10. Use a diagram to describe the water cycle. Specify the roles of evaporation, transpiration and precipitation.

11. Use a diagram to describe the carbon cycle. In doing so, explain how carbon enters the living system, and how it leaves, indicate the role of microorganisms in the cycle, and identify the reservoir for carbon.
12. Use a diagram to describe the nitrogen cycle. In doing so, discuss nitrogen fixation, nitrification, and denitrification. Indicate the role of microorganisms in the cycle, and identify the reservoir for nitrogen.
13. Explain the effects of deforestation on chemical cycling as demonstrated by the Hubbard Brook experiment. (google this!)
14. Explain the process of biological magnification. Cite at least one example.
15. What is contributing to the great increase in atmospheric carbon dioxide? What are potential effects of this?
16. What is the greenhouse effect? What contributes to it? Explain.

## **Chapter 55: Conservation Biology**

1. Distinguish between genetic diversity, species diversity, and ecosystem diversity.
2. What are ecosystem services? Why might ecologists be attempting to assign dollar values to them?
3. Explain 4 threats to biodiversity, and give an example of each.
4. Why is a vortex used to explain the course of extinction in a small population?
5. Explain the idea of an "MVP."
6. There are some members of the general public who question the value of conducting basic ecological research. In the context of the "declining population approach," explain the value of knowing, for any given population, its: life history, fundamental and realized niche, relative abundance, dispersal, distribution.
7. What are edges and corridors? How does each affect dispersal?
8. What is restoration ecology? Distinguish between bioremediation and augmentation.
9. What is biophilia?
10. Distinguish between monogamy and polygamy, and explain the role of parental investment in determining the evolution of these systems.
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