AP Biology – Spring 2020 Edward R. Murrow High School
Exam 3 Review Sheet Mr. Sprague

Format:

Section I 23 multiple choice questions
Section II 1 essay question and 3 short free response questions

Reading: Hillis chapters 42–46 (and all previous readings, with an emphasis on chapter 6)

Concepts to Review:

- EVERYTHING FROM EXAMS 1 AND 2, AND FROM SEMESTER I

- Ecology
  - Know and be able to put in order the levels of ecological organization: *population*, *community*, *ecosystem*, *biosphere*.
  - Know the difference between *abiotic* and *biotic* factors in an ecosystem.
  - Understand the relationship between water temperature and dissolved gases.
  - Know the difference between *density-dependent* and *density-independent* factors in an ecosystem.
  - Know the difference between *exponential* (*r*) growth and *logistic* (*K*) growth, as well as the life history strategies that are associated with each pattern of growth.
  - Understand the term *carrying capacity* and be able to recognize it in a population growth curve.
  - Be able to analyze a food web or biomass pyramid and apply the terms *producer*, *consumer* (primary, secondary, tertiary, etc.), *decomposer*, *autotroph*, *heterotroph*, *predator*, *prey*, *herbivore*, *carnivore*, *omnivore*.
  - Be able to explain the difference between *net primary productivity* and *gross primary productivity*.
  - Be able to explain why decomposers are necessary in a food web.
  - Understand the roles of *ecological niches*, *competitive exclusion*, and *resource partitioning* in competition.
  - Be able to identify and give examples of symbiotic relationships: *mutualism*, *commensalism*, *parasitism*.
  - Know the difference between *interspecific* and *intraspecific* competition.
  - Be able to explain the role of a *keystone species* in an ecosystem.
  - Be able to explain the process of *ecological succession*, including differences between *primary succession* and *secondary succession* and the terms *pioneer organism* and *climax community*.
  - Be familiar with the following biogeochemical cycles: *hydrolytic* (water), *carbon*, *nitrogen*.
  - Be able to summarize the global trend in human population growth.
  - Be able to explain how human activities such as *eutrophication*, *CO_2 emissions*, *use of CFCs*, *deforestation*, *transportation of species*, *use of pesticides*, etc. impact the biosphere.

- Labs
  - Be able to understand what the terms *population mean*, *sample mean*, *standard deviation*, and *standard error of the mean* represent, as well as how these terms are related.
  - Be able to make inferences about the amount of variation in a population and how much overlap exists between different populations given data on sample means and standard errors.
  - Be prepared to discuss the *Life Histories*, *Allelopathy*, *Dissolved Oxygen*, and *Aquatic Net Primary Productivity* labs.
  - Be able to calculate *Simpson's Diversity Index*.
  - Be able to use the Nomogram of Oxygen Saturation to determine water temperature, oxygen concentration, or percent saturation.
  - Be able to calculate *net primary productivity*, *gross primary productivity*, and *respiration* using the light-dark bottle method.

Overarching Questions to Consider:

Suggestion: Answer all of these questions in writing, then compare answers with a classmate. I promise that taking the time to do so will be well worth it and much more useful then memorizing facts and definitions.

1. How are scientific models used to communicate biological concepts? Why are models needed?
2. Why does population ecology, in particular, lend itself to mathematical models? What are some variables that might reasonably be good predictors of changes in population sizes and/or growth rates over time?
3. Why are exponential and logistic models both useful for describing population dynamics? What are the shortcomings of each of these models? In what circumstances would an exponential model be a better description of population growth? In what circumstances would a logistic model be a better description of population growth?
4. How are the population size, growth rate, and carrying capacity related? How would you find the population growth rate from a graph of population size over time?
5. How do density-dependent factors and density-independent factors work differently to limit population growth? Which types of factors are more related to the carrying capacity? Why?
6. How is the type of growth model that best describes a population (exponential vs. logistic) related to the life histories of organisms in the population? Would you expect *r*-selected (exponential) or *K*-selected (logistic) organisms to have longer lifetimes? produce more offspring? have higher survivorship rate during the first few days of life? Why?
7. How does fecundity fit in with life history theory? Why does Mr. Sprague argue that producing enormously large numbers of offspring does not necessarily mean an organism has a higher evolutionary fitness? What are some different reproductive strategies that an organism can use to maximize evolutionary fitness?
8. How does resource partitioning affect interspecific competition? How does resource partitioning affect intraspecific competition? How do interspecific interactions drive coevolution? Why does Mr. Sprague argue that coevolution between parasite evasion mechanisms and host immune systems is more complex than directional selection?
9. How would you know if a particular species in an ecosystem was a keystone species?
10. Why does the amount of energy available for nutrition change at each tropic level? How does this relate to NPP and GPP? How does this relate to photosynthesis and respiration? Why are mass of carbon fixed, volume of oxygen, and volume of carbon dioxide all useful in estimating the NPP?
11. Why does Hillis argue that energy flows through an ecosystem while matter cycles through an ecosystem? What processes account for the movement of water, carbon, nitrogen, and phosphorous throughout the ecosystem? What mathematical rules can you use to estimate the amount of energy and the amount of matter in different places in the ecosystem?
12. What are some biotic and abiotic changes organisms make to their habitats that make the habitats more suitable for other organisms?

Practice Exam Questions:

Visit the course website and click on the "Multiple Choice Practice" link. Complete all practice questions for the relevant chapters and check your work against the answer key. Note: these items are password protected.

Practice multiple choice and partial versions of free response questions are also available through the College Board by logging into AP Central with the class code.