



**AP<sup>®</sup> Biology**  
**2008 Free-Response Questions**  
**Form B**

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**2008 AP<sup>®</sup> BIOLOGY FREE-RESPONSE QUESTIONS (Form B)**

**BIOLOGY**

**SECTION II**

**Time—1 hour and 30 minutes**

**Directions:** Answer all questions.

Answers must be in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write. Write all your answers on the pages following the questions in the goldenrod booklet.

1. Measurements of dissolved oxygen (DO) are used to determine primary productivity in bodies of water.
  - Explain the relationship of dissolved oxygen to primary productivity.
  - How would the predicted levels of DO differ in each of the following pairs of water samples? Provide support for your prediction. Be sure to include a discussion of net productivity and gross productivity in your answer.
    - I. Pond water at 25°C vs. pond water at 15°C
    - II. Pond water placed in the dark for 24 hours vs. pond water placed in light for 24 hours
  
2. Many biological structures are composed of smaller units assembled into more complex structures having functions based on their structural organization.

For THREE of the following complex structures, describe the smaller units, their assembly into the larger structures, and one major function of these larger, organized structures.

  - (a) A eukaryotic chromosome
  - (b) A mature angiosperm root
  - (c) A colony of bees
  - (d) An inner membrane of a mitochondrion
  - (e) An enzyme

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3. Evolution is one of the unifying themes of biology. Evolution involves change in the frequencies of alleles in a population. For a particular genetic locus in a population, the frequency of the recessive allele ( $a$ ) is 0.4 and the frequency of the dominant allele ( $A$ ) is 0.6.
- (a) What is the frequency of each genotype ( $AA$ ,  $Aa$ ,  $aa$ ) in this population? What is the frequency of the dominant phenotype?
  - (b) How can the Hardy-Weinberg principle of genetic equilibrium be used to determine whether this population is evolving?
  - (c) Identify a particular environmental change and describe how it might alter allelic frequencies in this population. Explain which condition of the Hardy-Weinberg principle would not be met.
4. Scientists use the concept of homology in identifying evolutionary relationships among organisms. Features shared by two groups of organisms are said to be homologous if the similarities reflect shared ancestry. Homology is found in comparisons of structural, molecular, biochemical, developmental, physiological, and behavioral characteristics of organisms. Select **THREE** of the following hypotheses and explain **TWO** examples of homology that support each hypothesis.
- (a) Chloroplasts are related to photosynthetic prokaryotes.
  - (b) Spiders and insects are closely related.
  - (c) Echinoderms (sea stars and their relatives) are closely related to the chordates (the phylum that includes vertebrates).
  - (d) Reptiles and birds are closely related.
  - (e) Humans and chimpanzees are closely related primates.

**STOP**

**END OF EXAM**