



**AP<sup>®</sup> Biology**  
**2010 Free-Response Questions**  
**Form B**

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2010 AP<sup>®</sup> BIOLOGY FREE-RESPONSE QUESTIONS (Form B)

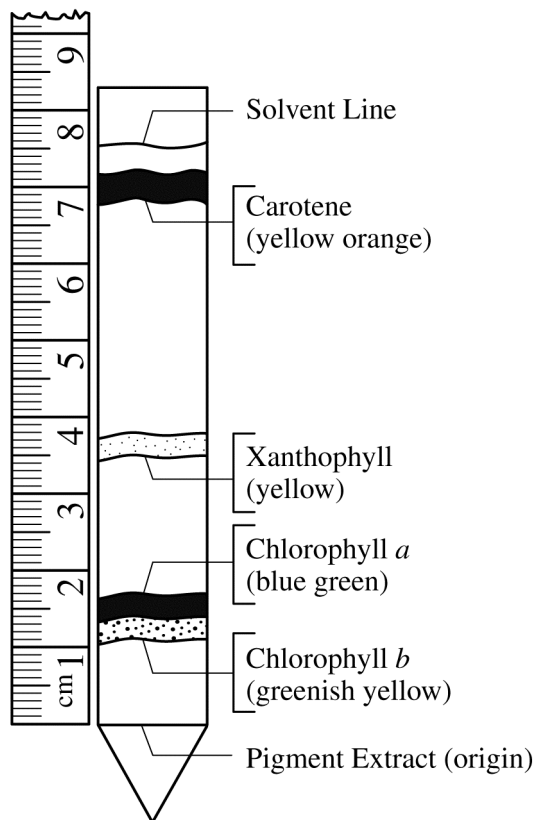
BIOLOGY

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. Biological molecules can be separated by using chromatographic techniques. The diagram above shows the separation of several spinach leaf pigments by paper chromatography. Using the diagram above
  - (a) **Explain** how paper chromatography can be used to separate pigments based on their chemical and physical properties.
  - (b) **Discuss** the role of pigments both in capturing light energy and in converting it to the chemical energy of ATP and NADPH.
  - (c) Use the ruler shown above to **determine** the  $R_f$  value of xanthophyll. **Show** your calculations.

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2. Certain human genetic conditions, such as sickle cell anemia, result from single base-pair mutations in DNA.
- Explain** how a single base-pair mutant in DNA can alter the structure and, in some cases, the function of a protein.
  - Explain**, using a specific example, the potential consequences of the production of a mutant protein to the structure and function of the cells of an organism.
  - Describe** how the frequency of an allele coding for a mutant protein may increase in a population over time.
3. Bacteria play central biological roles.
- Bacteria may act as
    - producers
    - parasites
    - mutualistic symbionts
    - decomposers
- Select THREE of the ecological roles above. For each one you choose, **describe** how bacteria carry out the role and **discuss** its ecological importance.
- Explain** how bacteria can be altered to make genetically engineered products.
4. On a trip to a dense forest, a biologist noticed that millipedes (small invertebrates) were plentiful under logs but were rarely seen in any other location.
- Propose** THREE environmental variables (two abiotic and one biotic) that could explain why millipedes are found more frequently under logs.
  - For ONE of the abiotic environmental variables you chose above, **design** a controlled experiment to test a hypothesis that this factor affects the distribution of millipedes on the forest floor. **Describe** data that would support your hypothesis.
  - Suppose that you were examining the distribution of a plant, instead of the millipede. **Describe** modifications in the experiment that you designed in (b) that would be required to determine whether the abiotic factor you chose affects the distribution of the plant.

**END OF EXAM**