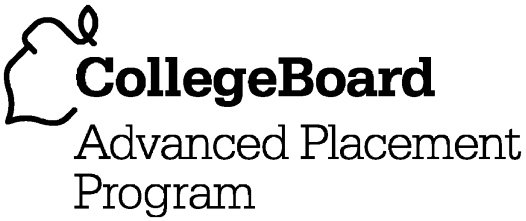

AP® Biology
2010 Free-Response Questions

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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 pink booklet.

1. Homeostatic maintenance of optimal blood glucose levels has been intensively studied in vertebrate organisms.
   (a) Pancreatic hormones regulate blood glucose levels. **Identify** TWO pancreatic hormones and **describe** the effect of each hormone on blood glucose levels.
   (b) For ONE of the hormones you identified in (a), **identify** ONE target cell and **discuss** the mechanism by which the hormone can alter activity in that target cell. **Include** in your discussion a description of reception, cellular transduction, and response.
   (c) **Compare** the cell-signaling mechanisms of steroid hormones and protein hormones.

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2. An experiment was conducted to measure the reaction rate of the human salivary enzyme α-amylase. Ten mL of a concentrated starch solution and 1.0 mL of α-amylase solution were placed in a test tube. The test tube was inverted several times to mix the solution and then incubated at 25°C. The amount of product (maltose) present was measured every 10 minutes for an hour. The results are given in the table below.

Time (minutes)	Maltose Concentration (μM)
0	0
10	5.1
20	8.6
30	10.4
40	11.1
50	11.2
60	11.5

   (a) **Graph** the data on the axes provided and **calculate** the rate of the reaction for the time period 0 to 30 minutes.
   (b) **Explain** why a change in the reaction rate was observed after 30 minutes.
   (c) **Draw** and **label** another line on the graph to predict the results if the concentration of α-amylase was doubled. **Explain** your predicted results.
   (d) **Identify** TWO environmental factors that can change the rate of an enzyme-mediated reaction. **Discuss** how each of those two factors would affect the reaction rate of an enzyme.

3. A new species of fly was discovered on an island in the South Pacific. Several different crosses were performed, each using 100 females and 100 males. The phenotypes of the parents and the resulting offspring were recorded.

Cross I: True-breeding bronze-eyed males were crossed with true-breeding red-eyed females. All the F_1 offspring had bronze eyes. F_1 flies were crossed, and the data for the resulting F_2 flies are given in the table below.

F_2 Phenotype	**Male**	**Female**
Bronze eyes	3,720	3,800
Red eyes	1,260	1,320

Cross II: True-breeding normal-winged males were crossed with true-breeding stunted-winged females. All the F_1 offspring had stunted wings. F_1 flies were crossed, and the data for the resulting F_2 flies are given in the table below.

F_2 Phenotype	**Male**	**Female**
Normal wings	1,160	1,320
Stunted wings	3,600	3,820

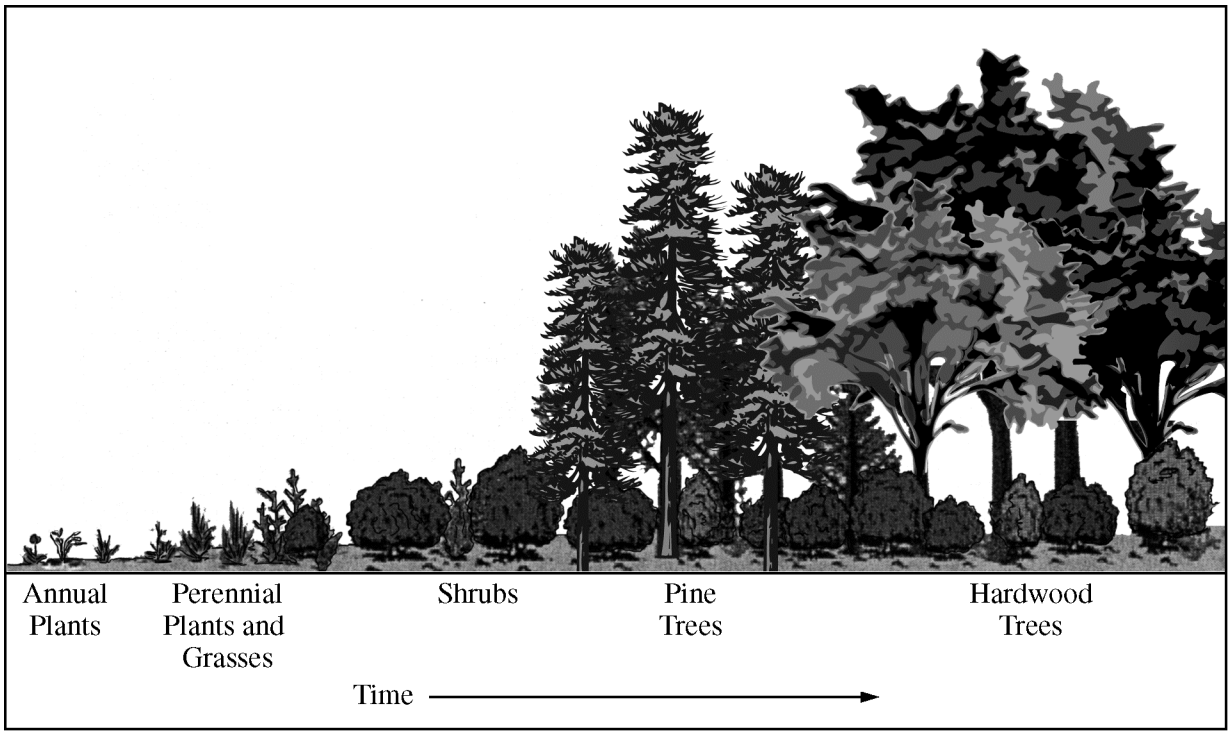
Cross III: True-breeding bronze-eyed, stunted-winged males were crossed with true-breeding red-eyed, normal-winged females. All the F_1 offspring had bronze eyes and stunted wings. The F_1 flies were crossed with true-breeding red-eyed, normal-winged flies, and the results are shown in the table below.

Phenotype	**Male**	**Female**
Bronze eyes, stunted wings	2,360	2,220
Bronze eyes, normal wings	220	300
Red eyes, stunted wings	260	220
Red eyes, normal wings	2,240	2,180

(a) What conclusions can be drawn from cross I and cross II? **Explain** how the data support your conclusions for each cross.

(b) What conclusions can be drawn from the data from cross III? **Explain** how the data support your conclusions.

(c) **Identify** and **discuss** TWO different factors that would affect whether the island's fly population is in Hardy-Weinberg equilibrium for the traits above.



4. The diagram above shows the succession of communities from annual plants to hardwood trees in a specific area over a period of time.

   (a) **Discuss** the expected changes in biodiversity as the stages of succession progress as shown in the diagram above.

   (b) **Describe** and **explain** THREE changes in abiotic conditions over time that lead to the succession, as shown in the diagram above.

   (c) For each of the following disturbances, **discuss** the immediate and long-term effects on ecosystem succession.

      (i) A volcano erupts, covering a 10-square-kilometer portion of a mature forest with lava.

      (ii) A 10- square-kilometer portion of a mature forest is clear-cut.

END OF EXAM