AP® Biology

About the Advanced Placement Program® (AP®)

The Advanced Placement Program® has enabled millions of students to take college-level courses and earn college credit, advanced placement, or both, while still in high school. AP Exams are given each year in May. Students who earn a qualifying score on an AP Exam are typically eligible, in college, to receive credit, placement into advanced courses, or both. Every aspect of AP course and exam development is the result of collaboration between AP teachers and college faculty. They work together to develop AP courses and exams, set scoring standards, and score the exams. College faculty review every AP teacher's course syllabus.

AP Biology Course Overview

The AP Biology course is an introductory college-level biology course. Students cultivate their understanding of biology through inquiry-based investigations as they explore the following topics: evolution, cellular processes, energy and communication, genetic information transfer, ecology, and interactions.

RECOMMENDED PREREQUISITES

Students should have successfully completed high school courses in biology and chemistry.

LABORATORY REQUIREMENT

This course requires that 25 percent of the instructional time will be spent in hands-on laboratory work, with an emphasis on inquiry-based investigations that provide students with opportunities to apply the science practices.

Inquiry-based laboratory experiences support the AP Biology course and AP Course Audit curricular requirements by providing opportunities for students to engage in the science practices as they design plans for experiments, make predictions, collect and analyze data, apply mathematical routines, develop explanations, and communicate about their work.

AP Biology Course Content

The AP Biology course is organized into commonly taught units of study that provide a suggested sequence for the course. These units comprise the content and skills colleges and universities typically expect students to master to qualify for college credit and/or placement.

- **Unit 1:** Chemistry of Life
- **Unit 2:** Cells
- **Unit 3:** Cellular Energetics
- **Unit 4**: Cell Communication and Cell Cycle
- **Unit 5:** Heredity
- **Unit 6:** Gene Expression and Regulation
- **Unit 7:** Natural Selection
- **Unit 8:** Ecology

This content is grounded in big ideas, which are crosscutting concepts that build conceptual understanding and spiral throughout the course. The following are the big ideas of the course and a brief description of each:

- **Big Idea 1: Evolution**
  - The process of evolution drives the diversity and unity of life.
- **Big Idea 2: Energetics**
  - Biological systems use energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis.
- **Big Idea 3: Information Storage and Transmission**
  - Living systems store, retrieve, transmit, and respond to information essential to life processes.
- **Big Idea 4: Systems Interactions**
  - Biological systems interact, and these systems and their interactions exhibit complex properties.

Science Practices

The following are the science practices that students should develop during the AP Biology course. These practices and skills form the basis of the tasks on the AP Biology Exam.

- Concept Explanation
  - Explain biological concepts and processes presented in written format.
- Visual Representations
  - Analyze visual representations of biological concepts and processes.
- Questions and Methods
  - Determine scientific questions and methods.
- Representing and Describing Data
  - Represent and Describe Data.
- Statistical Tests and Data Analysis
  - Perform statistical tests and mathematical calculations to analyze and interpret data.
- Argumentation
  - Develop and justify scientific arguments using evidence.

AP Biology Exam Structure

AP BIOLOGY EXAM: 3 HOURS

Assessment Overview

The AP Biology Exam assesses student understanding of the science practices and learning objectives outlined in the course framework. The exam is 3 hours long and includes 60 multiple-choice questions and 6 free-response questions. A four-function, scientific, or graphing calculator is allowed on both sections of the exam.

Format of Assessment

Section I: Multiple Choice | 60 Questions | 90 Minutes | 50% of Exam Score

- Questions appear either individually or in sets of typically four to five questions per set.
- All six AP Biology science practices are assessed in the multiple-choice section.
- Modify an argument that addresses the question.

Section II: Free Response | 6 Questions | 90 Minutes | 50% of Exam Score

The free response section includes two long questions and four short-answer questions. Each of the four short-answer questions will focus on a different big idea and a different unit of instruction.

- Question 1: Interpreting and Evaluating Experimental Results
- Question 2: Interpreting and Evaluating Experimental Results with Graphing
- Question 3: Scientific Investigation
- Question 4: Conceptual Analysis
- Question 5: Analyze Model or Visual Representation
- Question 6: Analyze Data

Exam Components

Sample Multiple-Choice Question

In the early 1970s, researchers hypothesized that carbon was the limiting nutrient in many aquatic ecosystems. To test this hypothesis, the researchers divided a small lake in two roughly equal halves with an impermeable curtain that was fastened and sealed to the bedrock of the lake (Figure 1). Beginning in 1971 the researchers treated one side of the lake with sucrose and the other side with both sucrose and phosphate. From 1971 to 1983 the researchers monitored the phytoplankton biomass in both parts of the lake. The results are shown in Figure 2.

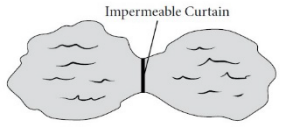


Figure 1. Lake with an impermeable curtain

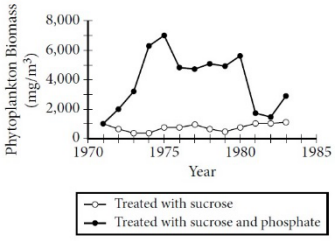


Figure 2. Phytoplankton biomass in two sides of a small lake that is divided by an impermeable curtain

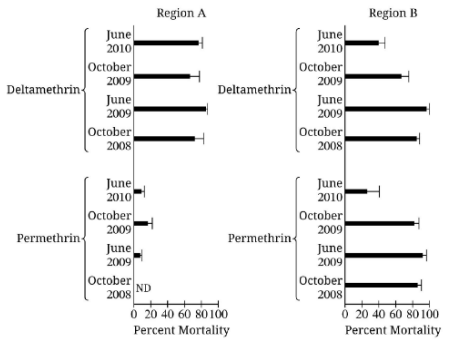
Which of the following claims is best supported by the data?

(A) Carbon was a limiting factor for phytoplankton in the lake.
(B) Phosphate was a limiting factor for phytoplankton in the lake.
(C) Both carbon and phosphate were limiting factors for phytoplankton in the lake.
(D) Neither carbon nor phosphate was a limiting factor for phytoplankton in the lake.

The average growth rate of the phytoplankton population from 1971 to 1975 in the side of the lake treated with sucrose and phosphate is closest to which of the following?

(A) 125 (mg/m3)/year
(B) 1,000 (mg/m3)/year
(C) 1,500 (mg/m3)/year
(D) 6,000 (mg/m3)/year

Figure 2. Susceptibility of *A. gambiae* mosquitoes from two regions to the pyrethroids deltamethrin and permethrin. A mosquito strain that is susceptible to the insecticides displayed at least 95% mortality in all experiments, and mosquitoes exposed to untreated filter paper displayed less than 10% mortality. Error bars represent standard deviation. "ND" means no data are available.



Sample Excerpt from a Long Free-Response Question

Interpreting and Evaluating Experimental Results (Question 1 on AP Exam)

To investigate pyrethroid resistance, mosquitoes were collected four times over a two-year period from the following two regions.

- Region A: a southern vegetable-growing region where large amounts of insecticide are applied for crop protection
- Region B: a northern rice-growing region where very little insecticide is applied for rice protection

Scientists exposed the collected mosquitoes to filter papers soaked in two different pyrethroid insecticides, deltamethrin and permethrin, and the percent mortality of the mosquitoes was determined after 24 hours (Figure 2).

B.
i. **Identify** the dependent variable in the experiment whose data are graphed in Figure 2.
ii. **Identify** the positive control in the experiment.
iii. **Justify** exposing some mosquitoes to untreated filter paper each time the experiment was performed.

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