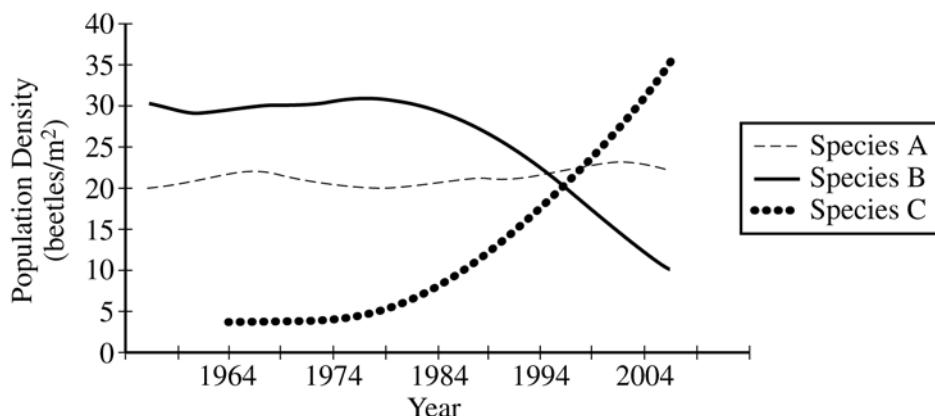


2006 AP® BIOLOGY FREE-RESPONSE QUESTIONS

VARIATION IN POPULATION DENSITY OF BEETLES



2. According to fossil records and recent published observations, two species of leaf-eating beetles (species A and B) have existed on an isolated island in the Pacific Ocean for over 100,000 years. In 1964 a third species of leaf-eating beetle (species C) was accidentally introduced on the island. The population size of each species has been regularly monitored as shown in the graph above.
- Propose** an explanation for the pattern of population density observed in species C.
 - Describe** the effect that the introduction of beetle species C has had on the population density of species A and species B. **Propose** an explanation for the patterns of population density observed in species A and in species B.
 - Predict** the population density of species C in 2014. Provide a biological explanation for your prediction.
 - Explain** why invasive species are often successful in colonizing new habitats.
3. The movement of water through vascular plants is important to their survival.
- Explain** the mechanism of water movement through vascular plants during transpiration. Include a discussion of how the anatomy of vascular plants and the properties of water contribute to this process.
 - Explain** how gas exchange affects transpiration.
 - Describe** TWO adaptations that affect the rate of transpiration in desert plants.
4. The evolution of circulatory systems allowed larger and more-complex animals to arise.
- Describe** the respiratory and digestive systems' specialized structures that facilitate the movement of oxygen and glucose into the circulatory system of mammals.
 - Explain** how oxygen and glucose are transported within the circulatory system of mammals.
 - Explain** the transfer of oxygen and glucose from the blood and into the active cells of mammals.

END OF EXAM

**AP® BIOLOGY
2006 SCORING GUIDELINES**

Question 2

According to fossil records and recent published observations, two species of leaf-eating beetles (species A and B) have existed on an isolated island in the Pacific Ocean for over 100,000 years. In 1964 a third species of leaf-eating beetle (species C) was accidentally introduced on the island. The population size of each species has been regularly monitored as shown in the graph above.

- (a) **Propose** an explanation for the pattern of population density observed in species C. **[3 points]**

1. Description of curve [1 point]: Type of growth is exponential growth (logarithmic or J-shaped curve acceptable).
2. Explanation must describe the growth using an understanding of [1 point each, 2 points maximum]:
 - Lack of limiting factors
 - Low competition
 - Abundant food
 - Low predation
 - Ideal environmental conditions (habitat, temperature, moisture, etc.)
 - Access to mates

- (b) **Describe** the effect that the introduction of beetle species C has had on the population density of species A and species B. **Propose** an explanation for the patterns of population density observed in species A and in species B. **[4 points]**

1. Describe effect [1 point]: Species C has had little or **no effect** on species A; however, as **species C increases, B decreases. Both lines must be addressed for the point.**
2. Explanation for species A or dashed line [1 point]: **No or little competition** (No niche overlap).
3. Explanation for species B or solid line [1 point]: **Competition or Niche overlap.**
4. Identification of the niche "**Competitive Exclusion Principle**" [1 point]: by name or description.

- (c) **Predict** the population density of species C in 2014. Provide a biological **explanation** for your prediction. **[2 points]**

1. Prediction [1 point]: The population will **increase, decrease, or stabilize (level off)**.
2. Explanation [1 point]: Tie a correct explanation to the prediction.
Increase—tie to abundant resources and freedom from competition.
Decrease—tie to exhaustion of a key resource or density-dependent cause.
Stabilize or level off—tie to carrying capacity or a limiting resource.

- (d) **Explain** why invasive species are often successful in colonizing new habitats.

[2 points—from either or both areas below]

1. They have **lost a controlling population factor** from their original habitat: predator, pathogen, or parasite.
2. They **have a novel evolutionary advantage** brought to the island from their original habitat: an aspect that provides an advantage—a chemical defense, flight advantage, novel enzyme, etc.