4. The Alaskan National Wildlife Refuge (ANWR) on Alaska's North Slope is frequently in the news because petroleum geologists estimate that there are billions of barrels of economically recoverable oil beneath the surface of its frozen tundra. According to a 1998 United States Geological Survey (USGS) estimate, ANWR could contain up to 10 billion barrels of technically recoverable oil. Oil company officials advocate opening the refuge to oil exploration and the subsequent development of its petroleum resources. Environmentalists argue that oil exploration and development will damage this fragile ecosystem and urge Congress to protect ANWR by designating it as a wilderness area.

   (a) The United States consumes approximately 20 million barrels of oil per day. According to the USGS estimate, for how many days would the technically recoverable oil resource in ANWR supply the total United States demand for oil?

   (b) Describe TWO characteristics of arctic tundra that make it fragile and explain how these two characteristics make the tundra particularly susceptible to damage from human impacts.

   (c) Identify TWO activities that would be associated with the development of ANWR petroleum resources and describe a substantial environmental impact of each in ANWR.

   (d) Identify and describe TWO major end uses of the 20 million barrels of oil that the United States consumes each day and for each use describe a conservation measure that would substantially reduce United States consumption.

END OF EXAM

2001 AP® ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTIONS

2. After reading the following excerpt from an article about the interrelationships among organisms in an oak forest, answer parts (a), (b), and (c), which follow.

> **Chain Reactions Linking Acorns to Gypsy Moth Outbreaks and Lyme Disease Risk**
>
> Oak trees (*Quercus* spp.) produce large autumnal acorn crops every two to five years, and produce few or no acorns during intervening years. Acorns are a critical food for white-footed mice (*Peromyscus leucopus*). Mice are important predators of the pupal stage of the gypsy moth (*Lymantria dispar*). This introduced insect periodically undergoes outbreaks that defoliate millions of hectares of oak forests, decreasing tree growth, survival, and acorn crop production. An abundance of acorns provides food for white-tailed deer (*Odocoileus virginianus*). Mice and deer are the primary hosts of the black-legged tick (*Ixodes scapularis*), which carries Lyme disease.

(a) In the space provided below, diagram a food web based on the interrelationships of the organisms identified in the excerpt.

(b) Design a controlled experiment that tests the relationship between acorn production and gypsy moth population. Include the hypothesis that the experiment tests.

(c) Briefly describe a strategy that uses integrated pest management for the control of the black-legged tick population.

2008 AP® ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTIONS

3. For decades, forest fires in the United States have been suppressed. In 2003 legislation was passed under the Healthy Forests Initiative (HFI) in response to the record-breaking wildfires that had occurred in the early 2000s. Some environmental and conservation groups fear that negative impacts could result if timber companies are encouraged to harvest medium- and large-size trees in federally owned forests while clearing away the smaller trees and underbrush.

(a) Identify TWO characteristics of forests that develop when fires are suppressed, and explain why the practice of fire suppression does not reduce, but actually increases, the risk of intense and extensive forest fires.

(b) The effects of the HFI are expected to extend beyond fire reduction. Excluding fire reduction, describe ONE positive and ONE negative effect likely to result from the implementation of the provisions of the HFI.

(c) Describe TWO ecosystem services provided for humans by forests. Explain how clear-cutting would affect each ecosystem service you describe.

(d) Identify a specific type of plant community or biome (other than a forest) that is naturally maintained by fire. Explain how the fire maintains the community or biome.

GO ON TO THE NEXT PAGE.