

Ecosystems Review #2  
(Biomagnification, Bioaccumulation, Population Dynamics)

**Part A – Multiple Choice Questions**

1. The concentration of PCBs in a fish living in lake increases over time. This is called
  - (A) bioaccumulation.
  - (B) biomagnification.
  
2. Organisms at the top of the food chain have a higher concentration of a toxin than organisms at the bottom of the food chain. This occurs due to
  - (A) bioaccumulation.
  - (B) biomagnification.
  
3. Consider the following food chain.

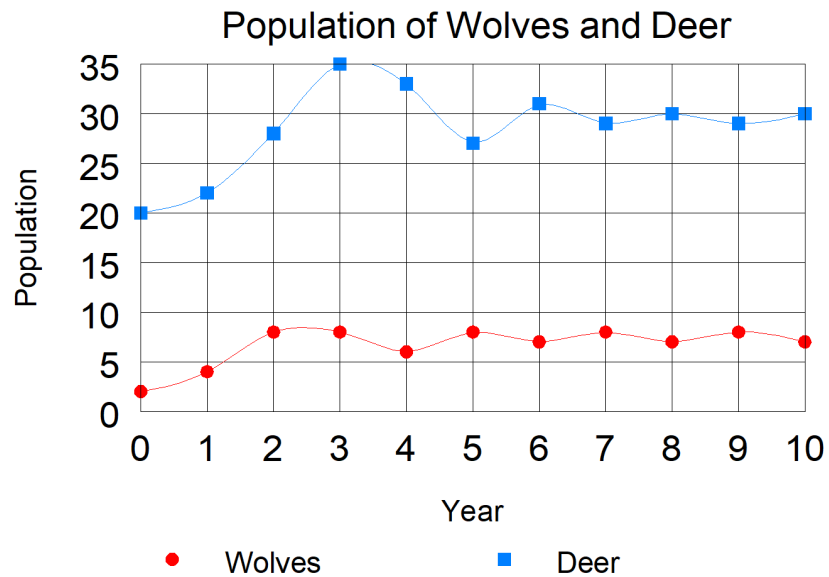
wolf ← rabbit ← grass

A toxin, which can biomagnify, is introduced into this environment. Which organism would you expect to have the highest concentration of the toxin after a year?

  - (A) wolf
  - (B) rabbit
  - (C) grass
  
4. Which of the following could increase a population?
  - (A) births and immigration
  - (B) births and emigration
  - (C) deaths and immigration
  - (D) deaths and emigration.

5. The maximum number of individuals that can be supported over long periods of time in an environment is known as
- (A) population limit.
  - (B) **carrying capacity.**
  - (C) sustainable development.
  - (D) biodiversity level.

Questions 6 and 7 refer to the following material.



6. The best estimate for the carrying capacity of wolves is
- (A) 2
  - (B) 5
  - (C) 7
  - (D) 10
7. The best estimate for the carrying capacity of deer is
- (A) 35
  - (B) 30
  - (C) 26
  - (D) 20

8. Interspecific competition occurs between
- (A) members of the same species.
  - (B) members of different species.
9. In a predator-prey relationship between foxes and rabbits, if the number of foxes increases, then the number of rabbits will most likely
- (A) increase due to decreased predation.
  - (B) decrease due to increased predation.
  - (C) decrease due to increased competition for grass.
  - (D) increase due to more available shelter.
10. All of the following are biotic factors except:
- (A) Soil
  - (B) A fallen-down tree
  - (C) Fungus
  - (D) Insects

## Part B – Free Response Questions

1. Cargo ships traveling to the Great Lakes from the Caspian Sea in Eurasia often carry water in tanks known as ballast tanks. This water helps the ships to be more stable while crossing the ocean. Upon arrival in the Great Lakes, this water is pumped out of the ships. Often this water contains species that are not native to the Great Lakes environment. The zebra mussel is one species that was introduced into the Great Lakes in this way. Although large numbers of zebra mussels often clog water intake pipes of power plants and other industries, the mussels have a benefit. Each mussel filters about a quart of water per day, absorbing cancer-causing PCB's from lake water in the process.

The goby, a bottom-feeding fish from Europe, was introduced into the Great Lakes in a similar way a few years later. The gobies have become a dominant species in the Great Lakes, eating small zebra mussels and the eggs and young of other fish. Gobies are eaten by large sport fish. These sport fish have been tested and PCB's have been found in their tissues. Recommendations have been made that people limit the number of sport fish they eat.

Describe how both zebra mussels and gobies contribute to increasing the concentration of PCB's in sport fish.

***Sample response:***

***Zebra mussels absorb PCB's through the filtering process that they perform. Since PCB's bioaccumulate, the concentration in the Zebra mussels will increase over time.***

***The gobies eat the Zebra mussels. Each time a goby eats a Zebra mussel, it absorbs the PCB's that were in the fat of the Zebra mussel. Gobies eat a large number of Zebra mussels resulting in a higher concentration of PCB's than in each Zebra mussel.***

***The sport fish eat multiple gobies when feeding. This means that the sport fish absorb the PCB's from multiple gobies each time. Over time, this results in a concentration of PCB's higher than the gobies.***

2. List the four properties necessary for a compound to bioaccumulate.

*Long-lived*  
*Mobile*  
*Soluble in fats*  
*Biologically active*

3. While elephants are primary consumers, their carrying capacity is much lower than for other primary consumers. Explain why this might be.

*Sample response:*

*Elephants are large and therefore require more food, water, and space than other primary consumers. Therefore an environment with limited resources will be able to support less elephants than other primary consumers.*

4. What effect could a natural disaster like a fire have on the carrying capacity of an ecosystem?

*Sample response:*

*A forest fire will reduce the space available for habits for some organisms. For these organisms, the carrying capacity will decrease. However, more sunlight and rain will now make it to the forest floor, allowing grass and small plants to grow. As such, there will be an increase in carrying capacity for these plants.*

5. List three density-dependent factors and three density-independent factors that could affect population growth.

Density-dependent	Density-independent
<p><i>Sample responses:</i></p> <p><i>Amount of available food</i> <i>Number of predators</i> <i>Mating opportunities</i> <i>Disease</i> <i>Amount of available space</i></p>	<p><i>Sample responses:</i></p> <p><i>Flood</i> <i>Fire</i> <i>Earthquake</i></p>