

Name \_\_\_\_\_

## Ecology Review

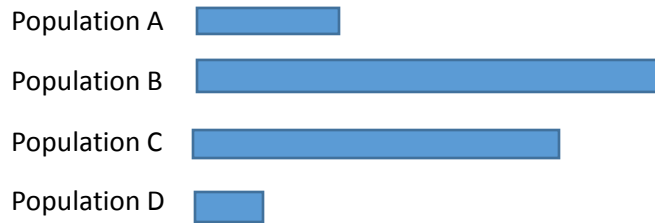
1. Which of the following illustrates a biotic aspect of an ecosystem?
- a) elephants have a low metabolic rate compared to other mammals.
  - b) Pine trees will not grow in seawater.
  - c) Monarch butterflies only live where milkweed plants grow.
  - d) Some conifers will only grow where forest fires scorch their seeds.

Questions 2-4 refer to the following information and graph. A marine ecosystem was sampled in order to determine its food chain. The results of the study are shown below.

Type of organism	Number of organisms
Shark	2
Small crustaceans	400
Mackerel	20
Phytoplankton	1000
Herring	100

2. Which of the following organisms in this community are secondary consumers?
- a) Shark
  - b) mackerel
  - c) herrings
  - d) small crustaceans
3. Which of the following organisms has the largest biomass in the food chain?
- a) phytoplankton
  - b) mackerel
  - c) herring
  - d) sharks
4. If the herring population is reduced by predation, which of the following is most likely to occur in this aquatic ecosystem?
- a) The mackerel will be the largest predator in the ecosystem.
  - b) the small crustacean population will be greatly reduced.
  - c) the plankton population will be reduced over the next year.
  - d) the small crustaceans will become extinct.
5. In most ecosystems, net primary productivity is important because it represents
- a) energy available to producers
  - b) biomass of all producers
  - c) total energy converted to chemical energy by producers
  - d) energy available to heterotrophs

Questions 6 and 7 refer to the bar graph, which shows the relative biomass of four different populations of a particular food pyramid.



6. The largest amount of energy is available to
- a) population A      b) population B      c) population C      d) population D
7. Which of the following would be the most likely result if there was an increase in the number of organisms in population C?
- a) The biomass of population D will remain the same.  
 b) The biomass of population B will decrease.  
 c) the biomass of population C will steadily increase.  
 d) the food source available to population C will increase.

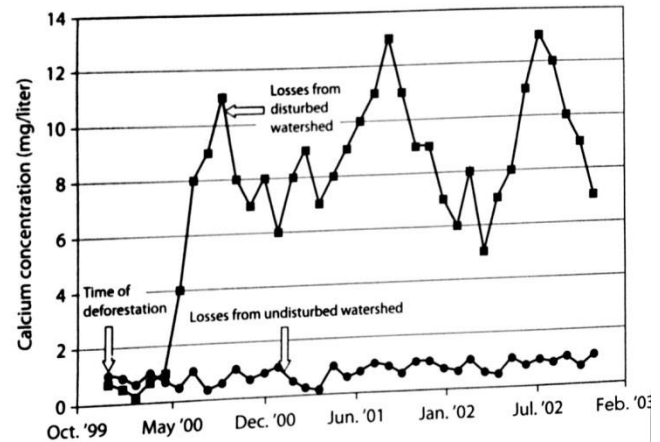
Site	Plants		Amphibians		Reptiles		Mammals		Total	
	Species	Individuals	Species	Individuals	Species	Individuals	Species	Individuals	Species	Individuals
<b>Bluewater Swamp</b>	15	113	2	8	3	8	5	7	25	136
<b>Papago Buttes</b>	5	27	0	0	2	4	2	3	9	34
<b>Beaver's Bend</b>	8	121	2	2	0	0	3	18	13	141
<b>Sherwood Forest</b>	4	159	1	1	0	0	6	24	11	184
<b>Tortilla Flats</b>	4	63	0	0	3	24	1	5	8	92

8. Based on the table above, which site has the greatest species diversity?
- a) Bluewater Swamp      b) Papago Buttes      c) Beavers' Bend      d) Sherwood Forest

9. Most biomass pyramids show a rapid decrease in biomass as trophic level increases. In aquatic systems, however, this pattern may be reversed so that one observes a larger standing crop of consumers compared to producers. What explains this pattern?
- a) Aquatic producers tend to have larger body sizes than terrestrial producers.
  - b) Water is an easier medium to live in and aquatic organisms require less food.
  - c) Biomass in aquatic systems cannot be measured accurately.
  - d) Phytoplankton is rapidly consumed, but it has a high turnover rate.
10. If a toxin is concentrated in a food web and present in primary producers,
- a) the toxin will not be found in organisms at the top of the food web.
  - b) the toxin will be more concentrated in organisms at the top of the food web.
  - c) the toxin will be less concentrated in organisms at the top of the food web.
  - d) the toxin will be found in the same concentration in organisms at the top of the food web.
11. All of the following are true statements about the biomass pyramid except
- a) the base of the pyramid represents primary consumers.
  - b) the amount of biomass at any trophic level is dependent on the trophic level below it.
  - c) Decomposers can feed at several trophic levels.
  - d) The biomass of a trophic level is the dry mass of all of the organisms present in that trophic level.
12. Which of the following best explains why there are typically five or less trophic levels in a food chain?
- a) Each trophic level represents a small fraction of the energy of the trophic level below it.
  - b) The population of tertiary consumers would be too small and would go extinct.
  - c) Ecosystems with more than five trophic levels contain too much biomass.
  - d) If there were more than five trophic levels, the carrying capacity of the environment would be exceeded.

Questions 13-21 refer to the following situation:

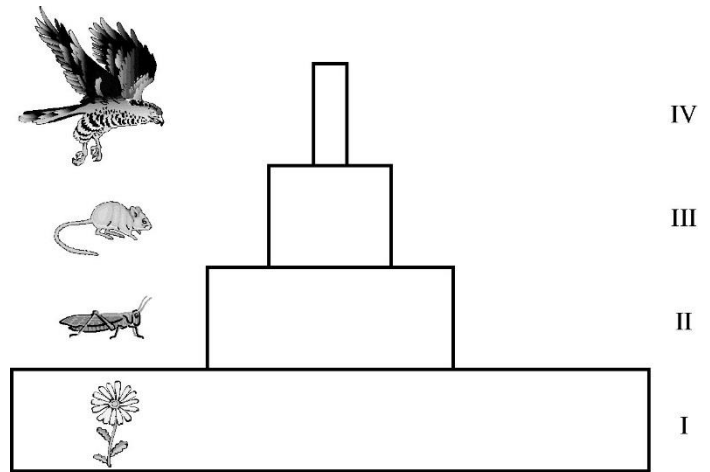
An experiment studied the effects of deforestation on the calcium concentrations in runoff water in a deciduous forest in North America. All the trees from a small mountainside watershed area were removed, and herbicides were applied for three years afterward. Measurements of runoff water of the deforested area as well as a nearby undisturbed area were taken every month for three years. The data collected are summarized below.



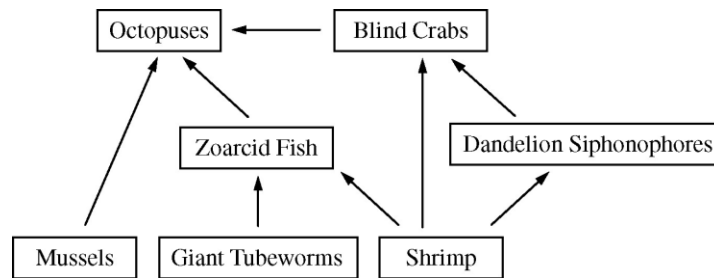
17. Which of the following factors would have the least impact on calcium losses in the disturbed watershed?
  - a) yearly precipitation
  - b) soil porosity
  - c) transpiration
  - d) surface runoff
  
18. According to the graph, which of the following most likely explains why calcium losses in the disturbed watershed did not occur immediately after deforestation?
  - a) deciduous trees had already lost their leaves by the time deforestation occurred.
  - b) calcium is not very soluble and takes months to get leached from the soil.
  - c) mineral losses from soil occur mainly in the spring and summer.
  - d) Other minerals had to be lost from the soil before calcium was made available.
  
19. Which of the following measurements is necessary to calculate the total amount of calcium lost annually?
  - a) yearly precipitation
  - b) volume of runoff flowing out of the watershed each year
  - c) concentration of calcium in the soil
  - d) average calcium concentration each day.
  
20. The purpose of applying herbicides to the disturbed watershed was most likely to
  - a) determine the role of plants in the calcium cycle of the watershed.
  - b) keep herbivores out of the experimental area.
  - c) reduce the interference of plants in the interpretation of experimental data.
  - d) promote plant growth.
  
21. Which of the following can be correctly inferred about calcium loss in watersheds from the data?
  - a) it peaks when temperatures are highest.
  - b) it increases continually with time in the undisturbed watershed.
  - c) It correlates with the seasons.
  - d) It correlates with the application of herbicides in the disturbed watershed.

22. Assume there are 50,000 joules (J) of energy available in trophic level II in the figure. According to the conventional model of energy flow in ecosystems, which of the following statements correctly describes the flow of energy in the system?

- a) Trophic level I generates a maximum of 50,000 J of energy.
- b) Trophic level I has approximately 5,000 J of available energy.
- c) Trophic level III has approximately 50 J of available energy.
- d) Trophic level IV has approximately 500 J of available energy.



Questions 23-24



The food web above represents feeding relationships in a biological community near a deep-sea hydrothermal vent. Hydrothermal vents are geysers on the seafloor that gush super-heated, mineral-rich water. The seawater surrounding hydrothermal vents typically contains carbon dioxide (CO<sub>2</sub>), molecular hydrogen (H<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), and methane (CH<sub>4</sub>). Sunlight, however, fails to reach the seafloor where deep-sea hydrothermal vents are located.

As part of an investigation, researchers collected living specimens from an area near a deep-sea hydrothermal vent. Mussels in the collection were found to be dependent on molecular hydrogen in seawater. Also, the researchers discovered multiple species of bacteria living in the gills of the mussels. Mussels use gills for filter-feeding and gas exchange with the surrounding seawater. On the basis of their experimental results, the researchers hypothesized that some bacteria living in the gills of the mussels are capable of chemosynthesis.

23. Which of the following best explains how biological communities near deep-sea hydrothermal vents can exist in a habitat lacking sunlight?
- a) Environmental conditions on some distant planets resemble those experienced by organisms living near hydrothermal vents.
  - b) Heterotrophs metabolize carbon-containing compounds produced by the photosynthetic organisms that live on the seafloor.
  - c) Some organisms rely on energy captured from inorganic compounds to drive basic biological processes.
  - d) Some organisms that can tolerate high temperatures are single celled, whereas others are multicellular.
24. Based on an analysis of the food web, an observation that deep-sea bacteria consume molecular hydrogen ( $H_2$ ) is most relevant to resolving which of the following apparent contradictions?
- a) Water gushing from deep-sea hydrothermal vents can be as hot as  $400^\circ C$ , which is a lethal temperature for most organisms.
  - b) Some deep-sea organisms appear to be primary consumers, but no plants live near the hydrothermal vents.
  - c) Zoarcid fish are thought to be aggressive predators, but they are frequently described as being lazy swimmers.
  - d) Some tissues of tubeworms contain hemoglobin, which is an oxygen-carrying molecule, but there is little free oxygen at this depth.
25. **Explain** the connection between adaptation and niche
26. **Explain** how eating from a lower trophic level increases efficiency of agricultural land use
27. **Explain** why phosphorus cycles through ecosystems so much slower than other nutrients. **Describe** how phosphate-rich runoff can lead to eutrophication of lakes and ponds.