

4. Which of the following is *not* an example of coevolution?
  - a. adaptations of flowers and their exclusive pollinators
  - b. passion-flower vines and the butterfly *Heliconius*
  - c. a parasite that is specific for one host
  - d. a brood parasite's eggs that mimic the host species' eggs
  - e. aposematic coloration of monarch butterflies and predators that learn not to eat them
5. Through resource partitioning,
  - a. two species can compete for the same prey item.
  - b. slight variations in niche allow closely related species to coexist in the same habitat.
  - c. two species can share the same realized niche in a habitat.
  - d. competitive exclusion results in the success of the superior species.
  - e. two species undergo character displacement that allows them to compete.
6. A species may be restricted to a particular range because
  - a. it cannot tolerate environmental conditions outside that range.
  - b. it has never dispersed beyond that range.
  - c. it has retracted from a former range due to local extinctions.
  - d. it would outcompete native species if it were transplanted to their habitat.
  - e. a, b, and c are all true.
7. Aposematic coloring is most commonly found in
  - a. prey whose body morphology is cryptic.
  - b. predators who are able to sequester toxic plant compounds in their bodies.
  - c. prey species that have chemical defenses.
  - d. good-tasting prey that evolve to look like each other.
  - e. prey species that are camouflaged to match their environment.
8. A palatable (good-tasting) prey species may defend against predation by
  - a. Müllerian mimicry.
  - b. Batesian mimicry.
  - c. secondary compounds.
  - d. aposematic coloration.
  - e. either a or b.
9. When one species was removed from a tidepool, the species richness became significantly reduced. The removed species was probably
  - a. a strong competitor.
  - b. a potent parasite.
  - c. a resource partitioner.
  - d. a keystone species.
  - e. the species with the highest relative abundance.
10. A highly successful parasite
  - a. will not harm its host.
  - b. may benefit its host.
  - c. will be able to feed without killing its host.
  - d. will kill its host fairly rapidly.
  - e. will have coevolved into a commensalistic interaction with its host.
11. The most important factor(s) in determining community structure
  - a. may change from one community to another.
  - b. is predation.
  - c. is competition.
  - d. is mutualism.
  - e. are structural diversity and environmental patchiness.
12. During succession, inhibition
  - a. may prevent the achievement of a climax community.
  - b. is evidence for the equilibrium theory of succession.
  - c. is one of the factors that determines the most tolerant species in an area.
  - d. may interfere with the successful colonization of other species.
  - e. may involve changes in soil pH or accelerated accumulation of humus.
13. According to the nonequilibrium model of succession,
  - a. chance events such as dispersal and disturbance play major roles in succession, and species composition remains in flux.
  - b. species diversity is greatest in the climax community.
  - c. when succession reaches a climax community, only extinctions make room for new colonists.
  - d. the communities with the greatest diversity have the greatest resistance to change.
  - e. early colonizers are *r*-selected and later community members are *K*-selected.

14. An island that is small and far from the mainland, as compared to a large island close to the mainland,
- would be expected to have a lower species diversity.
  - would be expected to be in an earlier successional stage.
  - would have a smaller species diversity but a larger abundance of organisms.
  - would have a higher rate of colonization but a higher rate of extinction.
  - would have a lower rate of colonization and a lower rate of extinction.
15. The island recolonization experiment of Simberloff and Wilson showed that
- species diversity returns very slowly to an island after a disturbance.
  - the species diversity was highest when disturbances were intermediate in frequency and severity.
  - whereas approximately the same numbers of species of arthropods returned to each island, the species composition was different, indicating the importance of chance events.
  - islands closest to the mainland had the greatest numbers of arthropods recolonize, and their community composition and diversity were the same as prior to fumigation.
  - the largest islands had the greatest species richness but the least species diversity.
16. Two species of finches have similar beak sizes and eat a similar selection of foods. Where their ranges overlap, however, the beak of one species is found to be larger than that of the other. What is the ecological explanation for these different beak sizes?
- coevolution
  - competitive exclusion
  - exploitative competition
  - interference competition
  - character displacement
17. Two species of *Anolis* lizards are often found perched and feeding in the same trees. Species I is usually found in the upper and outer branches, species II usually occupies shady inner branches. An ecologist removes one or the other species and observes changes in the remaining species's distribution in the trees. Species I is found throughout the branches of trees in which it is now the sole occupant. Species II is still found in the shady interior when it is the sole occupant. What does the ecologist conclude from these experimental results?
- Species I is the better competitor.
  - Species I is not a shade-tolerant species.
  - The fundamental niche of species II is identical to its realized niche.
  - The fundamental niche of species II is larger than its realized niche.
  - The fundamental niche of species I is identical to its realized niche.

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## TEST YOUR KNOWLEDGE

**MULTIPLE CHOICE:** Choose the one best answer.

- Which of the following is *not* part of Gleason's individualistic concept of communities?
  - Communities are chance collections of species that are in the same area because of similar environmental requirements.
  - There should be no distinct boundaries between communities.
  - The consistent composition of a community is based on interactions that cause it to function as an integrated unit.
  - Species are distributed independently along environmental gradients.
  - Most plant communities studied meet the predictions made by this concept.
- Two species, A and B, occupy adjoining environmental patches that differ in several abiotic factors. When species A is experimentally removed from a portion of its patch, species B colonizes the vacated area and thrives. When species B is experimentally removed from a portion of its patch, species A does not successfully colonize the area. What might you conclude from these results?
  - Both species A and species B are limited to their range by abiotic factors.
  - Species A is limited to its range by competition and species B is limited by abiotic factors.
  - Both species are limited to their range by competition.
  - Species A is limited to its range by abiotic factors and species B is limited to its range because it cannot compete with species A.
  - Species B is K-selected and species A is r-selected.
- The species richness of a community refers to
  - the relative numbers of individuals in each species.
  - the number of different species found in a community.
  - the feeding relationships or trophic structure within the community.
  - the species diversity that is characteristic of that community.
  - the ability to persist through disturbances.

3. In an ecosystem,
  - a. energy is recycled through the trophic structure.
  - b. energy is usually captured from sunlight by primary producers, passed to secondary producers in the form of organic compounds, and lost to detritivores in the form of heat.
  - c. chemicals are recycled between the biotic and abiotic sectors, whereas energy makes a one-way trip through the food web.
  - d. there is a continuous process by which energy is lost as heat, and chemical elements leave the ecosystem through runoff.
  - e. a food chain shows that all trophic levels may feed off each other.
4. Primary productivity
  - a. is equal to the standing crop of an ecosystem.
  - b. is greatest in freshwater ecosystems.
  - c. is the rate of conversion of light to chemical energy in an ecosystem.
  - d. is inverted in some aquatic ecosystems.
  - e. is all of the above.
5. The open ocean and tropical rain forest are the two largest contributors to Earth's net primary productivity because
  - a. both have high rates of net primary productivity.
  - b. both cover huge surface areas of the Earth.
  - c. nutrients cycle fastest in these two ecosystems.
  - d. the ocean covers a huge surface area and the tropical rain forest has a high rate of productivity.
  - e. both a and b are correct.
6. Productivity in terrestrial ecosystems is affected by
  - a. temperature.
  - b. light intensity.
  - c. availability of nutrients.
  - d. availability of water.
  - e. all of the above.
7. Secondary productivity
  - a. is measured by the standing crop.
  - b. is the rate of biomass production in consumers.
  - c. is greater than primary productivity.
  - d. is 10% less than primary productivity.
  - e. is the gross primary productivity minus the energy used for respiration.
8. Which of the following is *not* true of a pyramid of productivity?
  - a. Only about 10% of the energy in one trophic level is passed into the next level.
  - b. Because of the loss of energy at each trophic level, most food chains are limited to three to five steps.
  - c. The pyramid of productivity of some aquatic ecosystems is inverted because of the large zooplankton primary-consumer level.
  - d. Eating grain-fed beef is an inefficient means of obtaining the energy trapped by photosynthesis.
  - e. A pyramid of numbers is usually the same shape as a pyramid of productivity.
9. Biogeochemical cycles are global for elements
  - a. that are found in the atmosphere.
  - b. that are found mainly in the soil.
  - c. such as carbon, nitrogen, and phosphorus.
  - d. that are dissolved in water.
  - e. in the nonavailable reservoirs.
10. Which of these processes is *incorrectly* paired with its description?
  - a. nitrification—oxidation of ammonium in the soil to nitrite and nitrate
  - b. nitrogen fixation—reduction of atmospheric nitrogen into ammonia
  - c. denitrification—removal of nitrogen from organic compounds
  - d. ammonification—decomposition of organic compounds into ammonia
  - e. evaporation of ammonia—loss of ammonia to the atmosphere from nonacidic soils
11. Carbon cycles relatively rapidly except when it is
  - a. dissolved in freshwater ecosystems.
  - b. released by respiration.
  - c. converted into sugars.
  - d. stored in petroleum, coal, or wood.
  - e. part of the bicarbonate reservoir in oceans.
12. The ecological timescale of phosphorus cycling involves
  - a. the uptake of phosphate from drinking water.
  - b. the weathering of rock to add  $\text{PO}_4^{3-}$  to the soil.
  - c. sedimentation to form rocks in the sea bed.
  - d. the incorporation of phosphorus into organisms that become fossils.
  - e. both a and b.
13. Which of the following was *not* shown by the Hubbard Brook Forest study?
  - a. Most minerals recycle within a forest ecosystem.
  - b. Deforestation results in a large increase in water runoff.
  - c. Mineral losses from a valley were great following deforestation.
  - d. Nitrate was the mineral that showed the greatest loss.
  - e. Acid rain increased as a result of deforestation.

14. The finding of harmful levels of DDT in grebes (fish-eating birds) in Clear Lake, California, following years of trying to eliminate bothersome gnat populations, is an example of
  - a. eutrophication.
  - b. biological magnification.
  - c. the biomass pyramid.
  - d. chemical cycling.
  - e. increasing resistance to pesticides.
15. The greenhouse effect
  - a. could change global weather and lead to the flooding of coastal areas.
  - b. could result in more C<sub>4</sub> plants in plant communities that were previously dominated by C<sub>3</sub> plants.
  - c. causes an increase in temperature when CO<sub>2</sub> absorbs more sunlight entering the atmosphere.
  - d. could increase precipitation in central continental areas.
  - e. could do all of the above.
16. What do primary producers have available to convert into biomass?
  - a. 10% of secondary productivity
  - b. energy used for respiration
  - c. gross primary productivity
  - d. net primary productivity
  - e. 100% of the solar energy they absorb
17. Which of the following trophic levels would have the largest numbers of individuals?
  - a. primary producers
  - b. omnivores
  - c. primary consumers
  - d. opportunistic feeders
  - e. tertiary consumers
18. A serious effect of the thinning of the ozone layer is
  - a. a reduction in species diversity.
  - b. global warming.
  - c. acid precipitation.
  - d. an increase in UV radiation reaching Earth.
  - e. cultural eutrophication.

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## TEST YOUR KNOWLEDGE

**MULTIPLE CHOICE:** Choose the one best answer.

1. Which of the following organisms and trophic levels is mismatched?
  - a. algae—producer
  - b. phytoplankton—primary consumer
  - c. fungi—detritivore
  - d. bobcat—secondary consumer
  - e. eagle—tertiary or quaternary consumer
2. Chemosynthetic bacteria found around deep-sea vents are examples of
  - a. producers.
  - b. decomposers.
  - c. chemical cycling.
  - d. secondary productivity.
  - e. upwellings that make nutrients available.

Answers to Test Your Knowledge 53

Multiple Choice:

- 1. c      5. b      9. d      13. a      17. c
- 2. d      6. e      10. c     14. a
- 3. b      7. c      11. a     15. c
- 4. e      8. b      12. d     16. e

Answers to Test Your Knowledge 54

Multiple Choice:

- 1. b      5. d      9. a      13. e      17. a
- 2. a      6. e      10. c     14. b      18. d
- 3. c      7. b      11. d     15. a
- 4. c      8. c      12. b     16. d

Answers to Test Your Knowledge 53

Multiple Choice:

- 1. c      5. b      9. d      13. a      17. c
- 2. d      6. e      10. c     14. a
- 3. b      7. c      11. a     15. c
- 4. e      8. b      12. d     16. e

Answers to Test Your Knowledge 54

Multiple Choice:

- 1. b      5. d      9. a      13. e      17. a
- 2. a      6. e      10. c     14. b      18. d
- 3. c      7. b      11. d     15. a
- 4. c      8. c      12. b     16. d

Answers to Test Your Knowledge 53

Multiple Choice:

- 1. c      5. b      9. d      13. a      17. c
- 2. d      6. e      10. c     14. a
- 3. b      7. c      11. a     15. c
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Answers to Test Your Knowledge 54

Multiple Choice:

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- 2. a      6. e      10. c     14. b      18. d
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- 3. c      7. b      11. d     15. a
- 4. c      8. c      12. b     16. d