

## CHAPTER 20—COMMUNITY ECOLOGY

---

### MULTIPLE CHOICE

1. The relationship between a predator and its prey is best illustrated by
- a snake eating a bird.
  - a fox eating a mouse.
  - a lion eating a zebra.
  - a zebra eating grass.

ANS: D                      DIF: 1                      OBJ: 20-1.1

2. Parasites
- coevolve with their hosts.
  - are usually smaller than their hosts.
  - rarely kill their hosts.
  - All of the above

ANS: D                      DIF: 1                      OBJ: 20-1.3

3. A tick feeding on a human is an example of
- parasitism.
  - mutualism.
  - competition.
  - commensalism.

ANS: A                      DIF: 1                      OBJ: 20-1.3

4. Which of the following is an example of mimicry?
- a poisonous species that looks frightening
  - coloration that causes an animal to blend in with its habitat
  - a harmless species that resembles a poisonous species
  - similarly colored body parts on two poisonous species

ANS: C                      DIF: 1                      OBJ: 20-1.1

5. Characteristics that enable plants to protect themselves from herbivores include
- thorns and prickles.
  - sticky hairs and tough leaves.
  - chemical defenses.
  - All of the above

ANS: D                      DIF: 1                      OBJ: 20-1.1

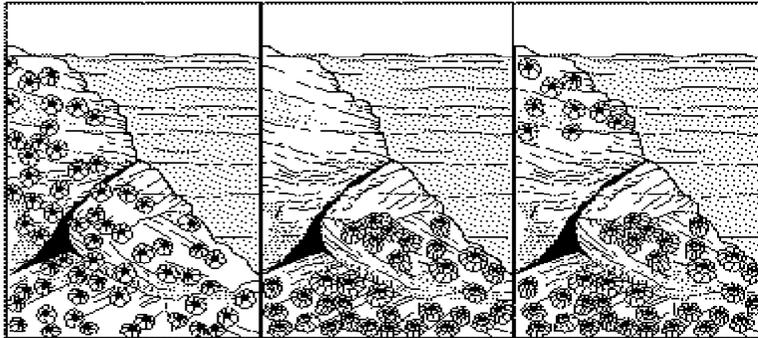
6. Which of the following usually results when members of different species require the same food and space?
- primary succession
  - primary competition
  - secondary succession
  - interspecific competition

ANS: D                      DIF: 1                      OBJ: 20-1.2

7. Competitive exclusion occurs when
- a species is eliminated from a community because of competition.
  - new species enter an ecosystem because one of the original species died off.
  - species reproduce in increasing numbers because more food is available.
  - All of the above

ANS: A                      DIF: 1                      OBJ: 20-1.2

8.



1. The barnacle *Chthamalus stellatus* can live in both shallow and deep water on a rocky coast.

2. The barnacle *Balanus balanoides* prefers to live in deep water.

3. When the two live together, *Chthamalus* is restricted to shallow water.

Refer to the illustration above. Because the two species of barnacles attempt to use the same resources, they are

- in a parasitic relationship.
  - in competition with one another.
  - in a mutualistic relationship.
  - in symbiosis with one another.
9. Sea stars are strong predators of marine organisms such as clams and mussels. An ecologist studying an ocean ecosystem performed an experiment in which the sea stars were removed from the ecosystem. After the removal of the sea stars,
- the ecosystem became more diverse.
  - food webs in the ecosystem became more complex.
  - the size of the ecosystem was reduced.
  - the number of species in the ecosystem was reduced.

ANS: B                      DIF: 2                      OBJ: 20-1.2

10. In his experiments with two species of paramecia, George F. Gause proved that two competitors cannot coexist on the same limited resources. This outcome demonstrated the principle of
- competitive exclusion.
  - secondary succession.
  - intraspecific competition.
  - symbiosis.

ANS: A                      DIF: 1                      OBJ: 20-1.2

11. The relationship between flowering plants and the bees that pollinate them is an example of
- commensalism.
  - competition.
  - mutualism.
  - parasitism.

ANS: C                      DIF: 1                      OBJ: 20-1.3

12. Cattle egrets are birds that mostly feed on insects that have been disturbed by grazing cattle. The cattle are neither helped nor harmed by the presence of the egrets. This relationship is an example of
- commensalism.
  - competition.
  - mutualism.
  - parasitism.

ANS: A                      DIF: 1                      OBJ: 20-1.3

The diagrams below show different kinds of interactions between species.

The ant keeps predators away from the acacia tree.



The acacia provides shelter and food for the ant.

**1**

The cow eats grass.



The sheep eats the same grass.

**2**



The tree provides nutrients and a sunlit location for the orchid living on it.

**3**



The dog provides nutrients and shelter for the tapeworm living in its intestines.

**4**

13. Refer to the illustration above. The relationship shown in diagram 4 is
- commensalism.
  - competition.
  - mutualism.
  - parasitism.

ANS: D                      DIF: 2                      OBJ: 20-1.3

14. Refer to the illustration above. The relationship shown in diagram 2 is
- commensalism.
  - competition.
  - mutualism.
  - parasitism.

ANS: B                      DIF: 2                      OBJ: 20-1.2

15. Refer to the illustration above. The relationship shown in diagram 1 is
- commensalism.
  - competition.
  - mutualism.
  - parasitism.

ANS: C                      DIF: 2                      OBJ: 20-1.3

16. Refer to the illustration above. The relationship shown in diagram 3 is
- commensalism.
  - competition.
  - mutualism.
  - parasitism.

ANS: A                      DIF: 2                      OBJ: 20-1.3

<b>1</b>	<b>Both organisms benefit from the activity of each other.</b>
<b>2</b>	<b>One organism benefits, and the other organism neither benefits nor suffers harm.</b>
<b>3</b>	<b>One organism obtains its nutrients from another, and the other organism may weaken due to deprivation.</b>

17. Refer to the chart above. The table represents three types of
- competition.
  - rhythmic patterns.
  - symbiosis.
  - secondary succession.

ANS: C                      DIF: 2                      OBJ: 20-1.3

18. Refer to the chart above. Which pair of organisms generally exhibits the type of relationship described in line 1 of the table?
- coyotes and the sheep that the coyotes eat
  - bats that eat fruit and birds that eat the same fruit
  - parasitic worms and the white-tailed deer that the worms infect
  - hummingbirds that drink flower nectar and the flowering plants that produce the nectar

ANS: D                      DIF: 2                      OBJ: 20-1.3

19. Refer to the chart above. The relationship described in line 2 in the table is called
- parasitism.
  - commensalism.
  - mutualism.
  - predation.

ANS: B                      DIF: 2                      OBJ: 20-1.3

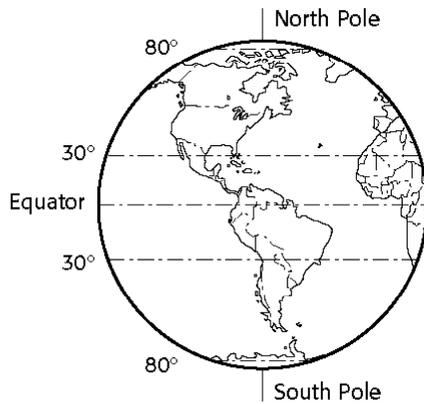
20. commensalism : one organism ::
- parasitism : both organisms
  - predation : neither organism
  - mutualism : one organism
  - mutualism : both organisms

ANS: D                      DIF: 2                      OBJ: 20-1.3

21. Species evenness is a measure of
- the number of different species in a community.
  - the total number of individuals in a community.
  - the number of plant species relative to the number of animal species in a community.
  - the relative abundance of different species in a community.

ANS: D                      DIF: 1                      OBJ: 20-2.1

22.



- Refer to the illustration above. An ecosystem located along the equator would probably
- have a shorter growing season than an ecosystem at 30° north or south latitude.
  - contain fewer species than an ecosystem at 30° north or south latitude.
  - have higher species richness than an ecosystem at 30° north or south latitude.
  - have less rainfall than an ecosystem at 30° north or south latitude.

ANS: C                      DIF: 2                      OBJ: 20-2.1

23. Generally, the closer an ecosystem is to the equator,
- the longer its growing season.
  - the greater its species richness.
  - the warmer its temperature.
  - All of the above

ANS: D                      DIF: 1                      OBJ: 20-2.1

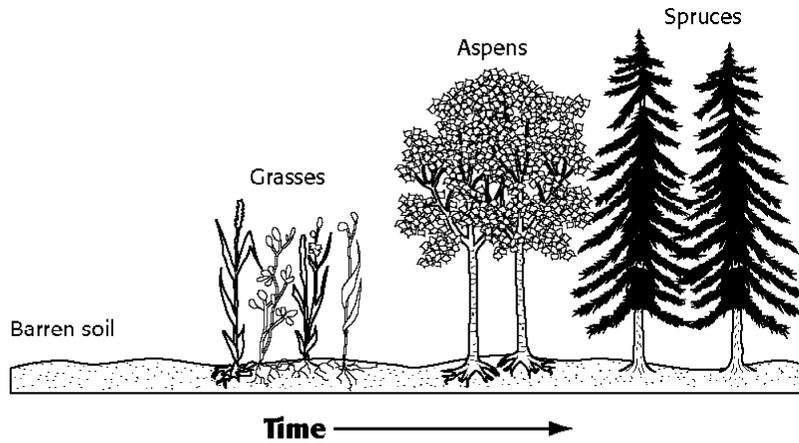
24. Following are the latitudes of four cities. Near which city would you predict to find the greatest number of wild species?
- Berlin, Germany (52°32' N)
  - Montreal, Canada (45°0' N)
  - Denver, Colorado (39°44' N)
  - Brisbane, Australia (27°30' S)

ANS: D                      DIF: 1                      OBJ: 20-2.1

25. Which of the following is *not* a characteristic of a stable community?
- resistance to outbreaks of insect pests
  - the ability to recover rapidly from a drought
  - a high species richness
  - the absence of disturbances

ANS: D                      DIF: 2                      OBJ: 20-2.2

26.



Refer to the illustration above. The transformation over time shown in the diagram is known as

- a. stability.
- b. succession.
- c. symbiosis.
- d. species richness.

ANS: B                      DIF: 2                      OBJ: 20-2.3

27. Succession is

- a. an organism's ability to survive in its environment.
- b. the number of species living in an ecosystem.
- c. the regular progression of species replacement in an environment.
- d. the transfer of energy through a food chain.

ANS: C                      DIF: 1                      OBJ: 20-2.3

28. Which of the following types of succession would most likely occur after a forest fire?

- a. primary succession
- b. old field succession
- c. secondary succession
- d. climax succession

ANS: C                      DIF: 1                      OBJ: 20-2.3

29. Secondary succession occurs

- a. as one generation of organisms replaces the previous one.
- b. as a previously existing community is replaced.
- c. after a new food web is established.
- d. All of the above

ANS: B                      DIF: 1                      OBJ: 20-2.3

30. When settlers arrived in New England, many forests were turned into agricultural fields. Eventually, some fields were abandoned and then grew back into forests. This is best described as

- a. primary succession.
- b. coevolution.
- c. secondary succession.
- d. niche realization.

ANS: C                      DIF: 1                      OBJ: 20-2.3

31. secondary succession : cleared forest ::
- pile of rock and gravel : secondary succession
  - secondary succession : bare soil
  - primary succession : new volcanic island
  - succession : the absence of plants

ANS: C                      DIF: 2                      OBJ: 20-2.3

32. primary succession : areas of no previous plant growth ::
- secondary succession : abandoned farm fields
  - rain forest : a desert
  - farm field : a desert
  - secondary succession : bare rock

ANS: A                      DIF: 2                      OBJ: 20-2.3

33. Which of the following is *not* a characteristic of pioneer species?
- They are small.
  - They grow quickly.
  - They reproduce slowly.
  - They disperse many seeds.

ANS: C                      DIF: 1                      OBJ: 20-2.3

34. The end stage of primary succession in a northern latitude would be characterized by the predominance of
- lichens.
  - needle-leaved evergreen trees.
  - small plants and shrubs.
  - All of the above

ANS: B                      DIF: 1                      OBJ: 20-2.3

35. An area that is in the early stages of secondary succession will typically contain
- perennial shrubs.
  - rock lichens.
  - annual grasses.
  - evergreen trees.

ANS: C                      DIF: 1                      OBJ: 20-2.3

36. Area that is in the early stages of primary succession will typically contain
- perennial shrubs.
  - rock lichens.
  - annual grasses.
  - evergreen trees.

ANS: B                      DIF: 1                      OBJ: 20-2.3

## COMPLETION

1. In a parasitic relationship, the organism that provides a benefit to another organism at its own expense is called the \_\_\_\_\_.

ANS: host

DIF: 1                      OBJ: 20-1.3

2. The general term for the relationship in which one organism eats another is \_\_\_\_\_.
- ANS: predation
- DIF: 1                      OBJ: 20-1.1
3. A symbiotic relationship in which one organism benefits and another is often harmed but not killed is called \_\_\_\_\_.
- ANS: parasitism
- DIF: 1                      OBJ: 20-1.3
4. A close relationship between two dissimilar organisms is called \_\_\_\_\_.
- ANS: symbiosis
- DIF: 1                      OBJ: 20-1.3
5. The presence of colored bands on the body of a harmless king snake that resemble the bands on a poisonous coral snake is an example of \_\_\_\_\_.
- ANS: mimicry
- DIF: 1                      OBJ: 20-1.1
6. To protect themselves from predators, some plants produce chemicals called \_\_\_\_\_ compounds as a byproduct of their metabolism.
- ANS: secondary
- DIF: 1                      OBJ: 20-1.1
7. The struggle among organisms for the same limited natural resources is called \_\_\_\_\_.
- ANS: competition
- DIF: 1                      OBJ: 20-1.2
8. The symbiotic relationship in which one organism benefits and the other neither benefits nor suffers harm is called \_\_\_\_\_.
- ANS: commensalism
- DIF: 1                      OBJ: 20-1.3

9. A fish called a cleaner wrasse eats the tiny parasites that cling to and feed upon much larger fish. This activity benefits both kinds of fish. Therefore, the cleaner wrasse has a(n) \_\_\_\_\_ relationship to the larger fish.

ANS: mutualistic

DIF: 1                      OBJ: 20-1.3

10. The sequential establishment of populations in an area that has not previously supported life is called \_\_\_\_\_.

ANS: primary succession

DIF: 1                      OBJ: 20-2.3

11. \_\_\_\_\_ species are adapted for growing well in habitats where other species are not yet present.

ANS: Pioneer

DIF: 1                      OBJ: 20-2.3

12. Secondary succession is typically completed in less time than primary succession because there is already \_\_\_\_\_ present in the habitat.

ANS: soil

DIF: 1                      OBJ: 20-2.3

13. The tendency of a community to maintain relatively constant conditions is called \_\_\_\_\_.

ANS: stability

DIF: 1                      OBJ: 20-2.2

14. Stable communities are less likely to be greatly affected by \_\_\_\_\_.

ANS:  
disturbances  
disturbance

DIF: 1                      OBJ: 20-2.2

## PROBLEM

1. The data in the table below were gathered during a study of an abandoned agricultural field. Scientists counted the number of different kinds of herbs, shrubs, and trees present in the field 1, 25, and 40 years after it had been abandoned.

	Time after abandonment of agricultural field		
	1 year	25 years	40 years
Number of herb species	31	30	36
Number of shrub species	0	7	19
Number of tree species	0	14	22
Total number of species	31	51	77

- a. In the space below, write three conclusions that you can draw from these data.
- b. Predict the relative numbers of herbs, shrubs, and trees and the total number of plant species that you would expect to see 100 years after abandonment of the field.

ANS:

- a. The following are some valid conclusions: (1) The total number of plant species present in the field increased over the 40-year time period. (2) The plants that grew initially in the field were all herbs. (3) Over the 40-year time period, the relative proportions of herbs, shrubs, and trees changed. The relative number of herbs decreased while the relative number of shrubs and trees increased. (4) The total number of herbs present did not change significantly over the 40-year time period.
- b. It is possible that the total number of species present would be even greater 100 years after abandonment, although at some point the community would probably reach a stable stage. There would probably be relatively fewer herbs and relatively more trees.

DIF: 1

OBJ: 20-2.1

## ESSAY

1. Describe the relationship called competition. Write your answer in the space below.

ANS:

Competition occurs when two or more organisms seek to use the same limited resource, such as food, water, space, sunlight, or other resources. One type of competition occurs between members of the same species, and another type of competition occurs between different species.

DIF: 2

OBJ: 20-1.2

2. Can two species occupy exactly the same niche? Explain. Write your answer in the space below.

ANS:

No, two species cannot occupy the exact same niche. The principle of competitive exclusion states that if two species are competing for the same resource, the species that uses the resource more efficiently will eventually eliminate the other.

DIF: 2

OBJ: 20-1.2

3. Some species of orchids grow high in the trees of tropical forests. The trees provide the orchids with the support to grow and allow them to capture more sunlight than they would on the forest floor. The orchids have little effect on the trees. What form of symbiosis is illustrated by this relationship? Explain your answer. Write your answer in the space below.

ANS:

Commensalism is the form of symbiosis illustrated here. In commensalism, one organism benefits and the other organism neither benefits nor suffers harm. In this example, the orchids benefit from the presence of the trees, but the orchids have little effect on the trees.

DIF: 2                      OBJ: 20-1.3

4. Why might species evenness be considered a more informative measure than species richness? Write your answer in the space below.

ANS:

Species richness takes into consideration only the number of different species in a community. Species evenness, on the other hand, takes into consideration both the number of species in a community and the relative abundance of each. Thus, species evenness provides more information about the ecological relationships within a community.

DIF: 2                      OBJ: 20-2.1

5. What is the difference between primary and secondary succession? Write your answer in the space below.

ANS:

Primary succession is the replacement of species in an area that had not previously supported life, such as bare rock or sand dunes. Secondary succession is the replacement of species in a habitat that has been disrupted due to natural disaster or human activity but still possesses a small amount of soil and vegetation.

DIF: 2                      OBJ: 20-2.3

6. Describe the steps by which primary succession progressed in Glacier Bay, Alaska, over a period about two hundred years. Write your answer in the space below.

ANS:

The process of primary succession in Glacier Bay, Alaska, began when the ground consisted of pulverized bare rock. The rock was likely first colonized by lichens that secreted acids that slowly broke down some of the rock into smaller pieces. Eventually, a thin layer of soil formed from the accumulation of small fragments of rock and dead lichens. Grasses were then able to colonize the area. As these plants died, their decomposing bodies added organic matter to the soil, and the soil became able to support the growth of larger plants. Shrubs began to grow in the area, and then trees were finally able to grow. After about two hundred years, the area became dominated by large, slow-growing trees that can grow on thin soil.

DIF: 3                      OBJ: 20-2.3