

Name _____ Period _____

Chapter 37: Communities and Ecosystems

Guided Reading Activities

Big idea: Community structure

Answer the following questions as you read modules 37.1–37.13:

1. What is the relationship among an organism, a population, and a community?
A group of organisms of the same species makes up a population. All of the populations in a given area make up a community.
2. When populations of different species compete for limited resources, we call this interspecific competition.
3. Which of the following type of interspecific interaction benefits both organisms?
 - a. Mutualism
 - b. Parasitism
 - c. Predation
 - d. Herbivory
4. Interspecific competition occurs when the niches of two species overlap.
5. True or false: Interspecific competition increases the carrying capacity for competing species within an area. If false, make it a correct statement.
False, interspecific competition reduces the carrying capacity.
6. How does mutualism differ from competition?
Mutualism is different from competition because mutualism benefits both organisms.
7. List three types of defenses that prey species have gained through evolution by natural selection.
Three types of defenses are (1) mechanical defenses, (2) chemical defenses, and (3) camouflage.

8. Consider two populations of organisms: gazelles and cheetahs. Briefly explain how this predator-prey relationship can actually drive adaptations in both species.
Natural selection weeds out the organisms that are unable to compete well in this relationship. It selects for organisms in both populations that have traits best suited for predation or avoiding predation.
9. When two species undergo a series of reciprocal evolutionary adaptations, we call it coevolution.
10. Briefly describe how *Passiflora* and *Heliconius* have driven evolutionary adaptations in each other.
Passiflora produces a toxin that protects it from most insects, but *Heliconius* has enzymes that break down the toxin. Some *Passiflora* plants have developed yellow spots on their leaves that resemble *Heliconius* eggs. In this case, a female butterfly will not leave eggs.
11. Would you expect a fungal pathogen to have more or less of a negative effect on a population of genetically modified corn plants where there was very little genetic diversity? Briefly explain your answer.
You would expect the fungal pathogen to have more of a negative effect. With reduced genetic diversity, the plants will have less variability in their traits to resist the fungus.
12. Every food chain must begin with a _____.
 - a. collection of primary consumers
 - b. quaternary consumer
 - c. group of producers
 - d. group of decomposers
13. What feature is characteristic of all organisms in trophic levels above the producers?
All organisms above producers are heterotrophs.
14. What would happen to an ecosystem if all the decomposers were removed?
Organic matter from dead organisms would not be broken down; thus, organic matter would quickly build up in an ecosystem and soils would be deficient in certain inorganic material.
15. How is an elf owl linked to a brittlebush in this desert food web? Be sure to list all the ways. Refer to Figure on page 745 of your textbook.
Grasshoppers can eat brittlebush, and the owl can eat the grasshoppers. The brittlebush can be eaten by harvester ants, which can be eaten by a praying mantis, which in turn can be eaten by the elf owl.
16. What is the relationship between a food chain and a food web?
A food web is a series of interconnected food chains and is more representative of the actual complexity of energy transfer in an ecosystem.
17. Could an organism like the red-tailed hawk be both a quaternary consumer and a tertiary consumer? Briefly explain your answer either way.
Yes, because the red-tailed hawk can eat organisms at the secondary level or tertiary level. If the owl consumed a kangaroo rat, then it would be considered a tertiary consumer; if the hawk ate a diamondback snake, then it would be a quaternary consumer.

18. Is it possible for two biological communities to have the same species richness but have very different species abundance? Briefly explain your answer.
 Yes, you can have two forests with the same types of tree species, but each one can have different amounts of each of those different tree species.
19. Crops that are grown in monoculture plots would consist of large tracts of land planted with the same plant.
20. Removal of a keystone species from a community will
- have an effect only if the species removed is a predator.
 - likely reduce species richness.
 - have no effect at all.
 - most likely increase species richness.
21. How many years did it take for the number of species to drop to just a couple in Robert Paine's experiment on *Pisaster*? Refer to Figure 37.11B on page 747 of your textbook.
 It took just three years.
22. Complete the following table, which compares primary succession with secondary succession.

	Primary succession	Secondary succession
Description	Primary succession occurs when ecological succession happens in a relatively lifeless area with poor soil.	This type of ecological succession occurs when an event has removed the current biological community from an area but has left the soil relatively intact.
Example	A fresh lava flow	A fire burns down a forest

23. A wildfire swept through parts of Yosemite National Park in the summer of 2013. This type of event would be considered a(n) secondary succession.
24. A grocery store goes out of business. The building and parking lot sit vacant for over 15 years. Over time, you notice the parking lot becoming more and more overgrown with vegetation. What kind of succession is this?
 This would be considered primary succession.

25. A(n) invasive species is a non-native species that was introduced accidentally or intentionally to an ecosystem.
26. You are staying at a campsite that has a lake for boating. A large sign out front asks that, as soon your boat leaves the water, you drain the bilge water on land and wash the outside of the boat with a 5% bleach solution. What are the campsite owners concerned about?
They are concerned with the transfer of aquatic organisms to another body of water. Those transferred aquatic organisms could be considered invasive in another area.

Big idea: Ecosystem structure and dynamics

Answer the following questions as you read modules 37.14–37.23:

1. Which of the following converts inorganic components of the ecosystem into organic substances?
 - a. Producers
 - b. Decomposers
 - c. Consumers
 - d. None of the above
2. What is meant by the following phrase: All organisms “borrow” chemical elements from the earth?
This phrase refers to the fact that the elements in organic matter are eventually returned to the soil because when an organism dies, decomposers in the soil break down its organic matter.
3. The two processes that help to sustain and drive ecosystems are energy flow and chemical cycling.
4. Net primary productivity is explained by which of the following?
 - a. The fact that you have to account for the energy expended by the plant to move water to the leaves
 - b. The fact that plants perform photosynthesis only during the day
 - c. The amount of biomass removed for the plants’ own cellular respiration
 - d. How much energy the plant loses due to the inefficiency of photosynthesis

5. True or false: Even though the open ocean has a low net primary productivity, it still accounts for the majority of Earth's total net primary productivity because of its sheer size. If false, make it a correct statement.
True
6. Ecosystems vary in their energy efficiency, but as a general rule, 10% of the energy available at one level is transferred to the next trophic level.
7. Why do ecosystems tend to have very few tertiary and quaternary predators while having an abundance of different producers and primary consumers?
Only a fraction of the energy in biomass is available to consumers in subsequent trophic levels. For example, it takes a lot of mice to maintain a population of owls. As such, the population of tertiary and quaternary consumers is limited.
8. Humans can learn something about our own sustainability from the fact that available energy decreases as you go up in trophic levels. What is a simple solution (that would require no new technology) for how humans could feed more of our species?
We could eat at a lower trophic level (vegetarianism) and have more energy available to us.
9. A quote by a scientist reads: "Three hundred trout are needed to support one man for a year. The trout, in turn, must consume 90,000 frogs that must consume 27 million grasshoppers that live off 1,000 tons of grass." What is this quote trying to make us aware of?
The quote is trying to make us aware of the idea that less energy is available at successive trophic levels.
10. True or false: Certain elements are continuously cycled between biotic and abiotic portions of an ecosystem. If false, make it a correct statement.
True
11. List four components of the biogeochemical cycles that replenish the abiotic reservoir. Refer to Figure 37.18 on page 753 of your textbook.
- Nutrients available to consumers
 - Consumers feed on producers
 - Release of chemicals into the environment by producers and consumers
 - Breakdown of organic matter by decomposers
12. List the sources of carbon in the abiotic reservoirs.
It exists as CO₂ in the atmosphere and in fossil fuels and sedimentary rocks. It is also dissolved in water as various carbon compounds that include CO₂.
13. Briefly explain the roles of cellular respiration and photosynthesis in the carbon cycle.
They are chemical opposites of each other: photosynthesis removes carbon from the abiotic reservoir and incorporates it into organic matter, and cellular respiration removes carbon from the biotic reservoir and returns it to the abiotic reservoir.
14. Would clear cutting massive expanses of forests affect the carbon cycle? If so, what aspect of the carbon cycle would be altered? Refer to Figure 37.19 on page 753 of your textbook.
Yes, because the ability to remove carbon from the abiotic reservoir would be hindered now that the trees are gone and they are no longer performing photosynthesis.

15. List three uses for phosphorous in organisms.
Its uses include: a component of teeth and bones, a component of nucleic acids, and a component of phospholipids.
16. The weathering of rock releases inorganic phosphate ions to the soil.
17. In general, what would a human need to eat in order to get phosphorous?
Humans need to eat plants.
18. True or false: Plants cannot absorb atmospheric nitrogen gas. As such, plants require bacteria to convert atmospheric nitrogen to a form they can readily uptake. If false, make it a correct statement.
True
19. Nitrogen is made available to plants by the action of soil bacteria in a process called nitrogen fixation.
20. What is the natural increase in a lake's primary productivity over time called?
This is known as eutrophication.
21. List three sources of phosphate pollution.
They are found in pesticides, fertilizers, and runoff from livestock feedlots.
22. Which of the following explains why nitrate-heavy fertilizers are problematic?
 - a. Bacteria convert it to N_2 .
 - b. It is easily washed out by rain or irrigation.
 - c. Bacteria convert it to NH_3 .
 - d. It combines with oxygen in the soil, which increases the soil acidity.
23. The goal of developing and managing Earth's natural resources so that current and future generations can benefit from them is known as sustainability.

CONNECTING THE BIG IDEAS

Use your knowledge of the information contained within this chapter's "Big Ideas" to answer this question.

You are discussing conservation with your neighbor. He tells you that saving biodiversity in polar regions is pointless because most biodiversity is found in the tropics. What would your response be? Do you agree or disagree?