

Interdependence Review

- 1. What are the parts of an ecosystem?
- 2. How does an ecosystem respond to change?
- 3. What two key factors of climate determine a biome?
- 4. How does energy flow through an ecosystem?
- 5. What happens to energy as it is transferred between trophic levels in a community?
- 6. Why is it important to study populations?
- 7. What is the difference between exponential and logistic growth?
- 8. What factors affect population size?
- 9. How have science and technology affected human population growth?

1. What are the parts of an ecosystem?

- Biotic components include plants, animals, and other organisms- both living *and* their remains.
- Abiotic components include the temperature, amount of precipitation, amount of sunlight, and substrate- soil, rock, sand, etc.- among other factors.

2. How does an ecosystem respond to change?

- Succession describes the different steps an ecosystem experiences as it recovers from a disruption.
- Pioneer species colonize the area first:
 - able to grow in conditions where most other organisms can't (like on bare rock), or
 - move in quickly due to wind carrying their seeds.
- As the ecosystem matures, these plants and animal are replaced by larger, slower-growing organisms until a *climax community* is established.

3. What two key factors of climate determine a biome?

- Temperature
- Amount of precipitation

4. How does energy flow through an ecosystem?

- Energy (usually sunlight) is captured by the 1st trophic level, called *producers*. These are usually photosynthetic organisms.
- These organisms are consumed by organisms in the 2nd trophic level, called *herbivores*.
- Herbivores are consumed by members of the 3rd trophic level, called *carnivores*.

- A single pathway for energy to take in an ecosystem is called a *food chain*.
- All of the possible food chains in an ecosystem make up the *food web* of that ecosystem.

5. What happens to energy as it is transferred between trophic levels in a community?

- Only ~10% of the energy in any one trophic level is passed to the next level up.
- This limits the number of trophic levels in ecosystems, as eventually there will not be enough energy available to support a higher trophic level.
- A diagram illustrating the upwards movement of energy through trophic levels in an ecosystem is called an *energy pyramid*.

6. Why is it important to study populations?

- Populations of species interact with each other, including human populations.
- As one population changes, it will have effects on populations with which it interacts.
- If a zebra population decreases due to disease, then the lion population in that area may decrease due to starvation.
- If the *Anopheles* mosquito population increases, then more humans may contract mosquito-borne diseases such as malaria

7. What is the difference between exponential and logistic growth?

- Exponential growth occurs during ideal environmental conditions- the birth rate exceeds the death rate.
- Logistic growth occurs when the birth rates and death rates are roughly equal, meaning that there is little/no overall growth in a population.
- The number of organisms in a population that can be supported by its ecosystem is called the *carrying capacity* of that population.

8. What factors affect population size?

- Biotic factors include available food, mates, diseases, and predators.
- Abiotic factors include changes in temperature/precipitation, storms, fires, etc.

9. How have science and technology affected human population growth?

- Agriculture and advances in medicine (such as vaccines and antibiotics) reduce the percentage of deaths related to starvation and disease.
- As a result, the death rate of human populations around the world has decreased
- The birth rate has not changed as much.
- As a result, the world human population is experiencing exponential growth, growing from 1 billion people around 1900 to almost 7 billion people in only 100 years.

- 10. How do predator/prey interactions influence both predators and prey?
- 11. What other types of interactions occur in a community?
- 12. How does a species' niche affect other organisms?
- 13. How does competition for resources affect species in a community?
- 14. What factors influence the resiliency of an ecosystem?
- 15. How are humans and the environment connected?
- 16. What is the difference between renewable resources and nonrenewable resources?
- 17. How can the state of the environment affect a person's health and quality of life?
- 18. What are the effects of air pollution?

10. How do predator/prey interactions influence both predators and prey?

- Predators usually catch the most vulnerable (slowest running, least effective camouflage, etc.), which actually improves the surviving population of prey organisms.
- The least effective predators die off as well, which improves the overall performance of the surviving predator population.
- This series of back-and-forth changes in populations is called *coevolution*- evolution that occurs as two populations adapt to the influences of each other.

11. What other types of interactions occur in a community?

- Herbivory- plants are eaten.
- Parasitism- a *parasite* benefits from a *host*, and host is harmed but (usually) not killed (it isn't killed on purpose).
- Competition- two or more populations need the same resource.
- Mutualism- two populations interact in a way that is beneficial to both of them.
- Commensalism- A population benefits from another population, which is not affected by the interaction (no benefit, but also no harm).

12. How does a species' niche affect other organisms?

- A species niche includes its interactions with other organisms.
- It may feed on some members of its community
- It may serve as food for other members of its community
- It may do both!
- It may also alter the environment in a way that affects its community:
 - produce oxygen through photosynthesis
 - dam up a river

13. How does competition for resources affect species in a community?

- An organism's realized niche occurs due to competition with other organisms.
- An organism may have to divide (share) resources with other members of the community.
- It may leave the community altogether through emigration, starvation, etc.

14. What factors influence the resiliency of an ecosystem?

- Biodiversity is the number of populations found in an ecosystem.
- The greater the biodiversity, the more resilient an ecosystem is.
- If one population is negatively impacted, the other members of the community will more likely have alternate food sources or predators to keep their numbers balanced.

15. How are humans and the environment connected?

- We rely on the environment for resources such as food, energy, and materials for clothing and shelter.
- Humans alter the environment by consuming natural resources and releasing waste products back into the environment.

16. What is the difference between renewable resources and nonrenewable resources?

- Renewable resources can be replaced in a relatively short period of time, and include trees for materials and energy, as well as wind and solar power.
- Nonrenewable resources take millions of years to form, so it is not feasible to depend on them as a long-term energy source; once they are gone, they are gone for good. Nonrenewables include *fossil fuels*- oil, coal, and natural gas.

17. How can the state of the environment affect a person's health and quality of life?

- As the environment changes, people can be affected as well.
- Droughts and other climate changes can have negative impacts on availability of food.
- Changes in air and water quality can also impact a person's health.
- A changing environment may also make it easier for diseases to spread among humans and other organisms.

18. What are the effects of air pollution?

- Chemicals released into the air can cause respiratory illnesses such as asthma.
- Other chemicals can react with parts of our atmosphere (such as CFCs' effects on the ozone layer).
- Increases in greenhouse gases such as carbon dioxide and methane can lead to an increases in the average temperature of the Earth, which can affect climates around the world.

- 19. How might burning fossil fuels lead to climate change?
- 20. What are some sources of water pollution?
- 21. Why is soil erosion a problem?
- 22. How does ecosystem disruption affect humans?
- 23. How do conservation and restoration solve environmental issues?
- 24. What are three ways that people can reduce the use of environmental resources?
- 25. How can research and technology affect the environment?
- 26. How do education and advocacy play a part in preserving the environment?
- 27. Why is it important for societies to consider environmental impact when planning for the future?

19. How might burning fossil fuels lead to climate change?

- Burning fossil fuels release carbon dioxide that was not part of the carbon cycle back into the atmosphere, which increases the percentage composition of CO₂ in the atmosphere.
- Carbon dioxide is a greenhouse gas, which traps some the heat released by Earth, preventing it from going back into space.
- It's like wrapping blankets around you to trap your body heat on a cold day- one blanket may be enough to keep you comfortable, but additional blankets can make you too hot...

20. What are some sources of water pollution?

- Fertilizers and pesticides applied to crops and lawns can be washed off during rainfall, which carries the chemicals into streams, rivers, and lakes.
- Water from people's households (toilets, sinks, and showers) can contain chemicals such as cleaners and prescription drugs that end up in water supplies.

21. Why is soil erosion a problem?

- Soil erosion removes material that provides nutrients to food crops and the producers that form the base of every ecosystem's food pyramid.
- As land is cleared for farming, housing, or industry, the plants that hold soil in place are stripped away, which makes it easier for wind and water to remove the topsoil.

22. How does ecosystem disruption affect humans?

- Loss of biodiversity
- Loss of food supplies
- Loss of potential cures for diseases
- Invasive species outcompeting native ones

23. How do conservation and restoration solve environmental issues?

- Conservation prevents or minimizes further loss of resources, habitats, and populations.
- Restoration is the process of correcting damage done to habitats and organisms, which improves the overall resiliency of the environment.

24. What are three ways that people can reduce the use of environmental resources?

- *Reduce* the use of resources by limiting “disposable” items (such as plastic plates, bottles, and utensils) and turning off energy-consuming items when they aren’t being used.
- *Reuse* items when possible:
 - rinse out plastic bottles and wash plastic utensils for later use
 - plastic grocery bags can be used for carrying lunches or as trash bags
- *Recycling* means taking the raw materials found in many products (paper, aluminum from cans, glass from jars and bottles, rubber from tires) and using them to make new products such as clothing or machine parts.

25. How can research and technology affect the environment?

- Larger machinery makes it easier to have larger negative impact on environments such as mountaintop removal for coal mining
- New advances in technology allow us to better clean up pollution, explore cleaner energy sources, and deal with waste products more effectively.

26. How do education and advocacy play a part in preserving the environment?

- Education is important because steps cannot be taken to solve a problem if the problem isn't fully understood. Many people live lifestyles that are harmful to the environment because they simply don't know how their individual actions affect the natural world.
- Advocacy is the act of taking steps to make sure that a problem is addressed. It might include speaking to others, campaigning for politicians who pledge to work towards environmentally responsible solutions, or helping groups of people (such as farmers) adopt more environmentally sound practices.

27. Why is it important for societies to consider environmental impact when planning for the future?

- It is much easier and cost efficient to prevent a problem than to fix it after it occurs:
 - It's easier and cheaper to not smoke than it is to treat lung cancer
 - It's easier and cheaper to drive carefully than to repair the damage to a car after an accident
 - It's easier and cheaper to plan a building or society that is environmentally responsible than to clean up the damage caused by a society that was not planned accordingly.