

## QUESTIONS THAT ARE RED WILL NOT BE ON THE TEST

### Ecology Unit Study Guide – Answers

#### Vocabulary

- |   |   |  |   |
|---|---|--|---|
| <input type="checkbox"/> Biosphere          | <input type="checkbox"/> Detritivore      | <input type="checkbox"/> Invasive Species                | <input type="checkbox"/> Climax Community           |
| <input type="checkbox"/> Biome              | <input type="checkbox"/> Autotroph        | <input type="checkbox"/> Food Chain                      | <input type="checkbox"/> Immigration                |
| <input type="checkbox"/> Ecosystem          | <input type="checkbox"/> Heterotroph      | <input type="checkbox"/> Food Web                        | <input type="checkbox"/> Emigration                 |
| <input type="checkbox"/> Community          | <input type="checkbox"/> Herbivore        | <input type="checkbox"/> Biogeochemical cycle            | <input type="checkbox"/> Carrying Capacity          |
| <input type="checkbox"/> Population         | <input type="checkbox"/> Omnivore         | <input type="checkbox"/> Abiotic Factors                 | <input type="checkbox"/> Exponential Growth         |
| <input type="checkbox"/> Species            | <input type="checkbox"/> Carnivore        | <input type="checkbox"/> Biotic Factors                  | <input type="checkbox"/> Logistic Growth            |
| <input type="checkbox"/> 10% Rule           | <input type="checkbox"/> Competition      | <input type="checkbox"/> Resources                       | <input type="checkbox"/> Density-Dependent Factor   |
| <input type="checkbox"/> Pyramid of Energy  | <input type="checkbox"/> Predator-Prey    | <input type="checkbox"/> Niche                           | <input type="checkbox"/> Density-Independent Factor |
| <input type="checkbox"/> Pyramid of Biomass | <input type="checkbox"/> Symbiotic        | <input type="checkbox"/> Competitive Exclusion Principle |   |
| <input type="checkbox"/> Pyramid of Numbers | <input type="checkbox"/> Parasitism       | <input type="checkbox"/> Primary Succession              |   |
| <input type="checkbox"/> Primary Producer   | <input type="checkbox"/> Mutualism        | <input type="checkbox"/> Secondary Succession            |   |
| <input type="checkbox"/> Primary Consumer   | <input type="checkbox"/> Commensalism     | <input type="checkbox"/> Pioneer Species                 |   |
| <input type="checkbox"/> Decomposer         | <input type="checkbox"/> Keystone Species |  |   |

#### Chapter 3.1

1. What is ecology?
  - The study of the interactions between biotic and abiotic components in an environment. In other words, the interactions between organisms and between organisms and their physical environment.
2. List and describe the levels of organization in ecology.
  - Species/Organism - a specific type of individual organism, species can only interbreed with their own kind
  - Population - all the members of one species in a given area
  - Community - all populations in a given area
  - Ecosystem - the biotic and abiotic components of an environment
  - Biome - areas of the world with similar plants and animals because they have similar climates. Examples: tropical rainforest, savanna, chaparral
  - Biosphere - the layer of Earth that support life
3. Compare and contrast biotic and abiotic factors. Give two examples of each.
  - Biotic factors are living components of an environment. Examples: plants, animals, humans
  - Abiotic factors are nonliving components of an environment. Examples: rocks, air, water
4. What methods do ecologists use in their studies?
  - **Observation – Make observations and ask questions**
  - **Experimentation – Test hypotheses**
  - **Modeling – Create models of phenomena that are too difficult to study directly. Ecologists use the models to test predictions.**

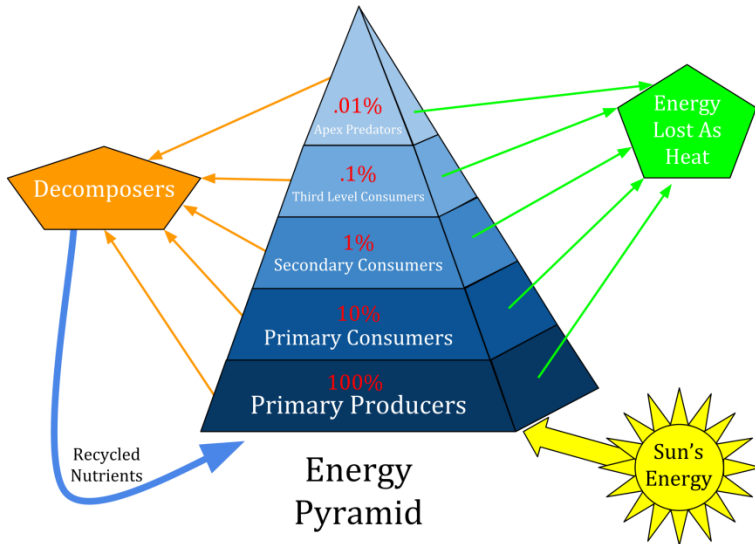
#### Chapter 3.2 & 3.3

5. How does energy flow through ecosystems?
  - What is the Rule of 10%? What happens to the rest of the energy?
  - The rule of 10% states that only 10% of the energy at each trophic level gets passed on to the next trophic level. The remaining 90% is lost during conversion and transfer or is used by the organisms and lost as heat. If there are 10,000 units of energy at the first trophic level, only 1,000 units of energy make it to the second trophic level.
  - Define the following and provide an example of each:
    - i. Autotroph/Producer - uses photosynthesis or chemosynthesis to get food/energy
    - ii. Heterotroph/Consumer - consumes other organisms to get food/energy
      1. Herbivore - eats primary producers or autotrophs, usually plants
      2. Carnivore - eats animals

3. Omnivore - eats both plants and animals
4. Detritivore - consumes dead plants and animals. Have an internal digestion. Ex. earthworms
5. Decomposer - breakdown dead matter and absorb nutrients. No internal digestion. Ex. fungus and bacteria
6. Scavenger – an animal that eats carcasses of other animals. They eat animals that they didn't kill.

- What is a food chain?
- A one way flow of energy through an ecosystem. Always starts with a producer.
- What is a food web?
- A diagram that shows multiple food chains in an ecosystem.

6. Energy pyramids show the relative amount of energy available at each trophic level in a food web or food chain. Draw an energy pyramid and label all of the trophic levels.



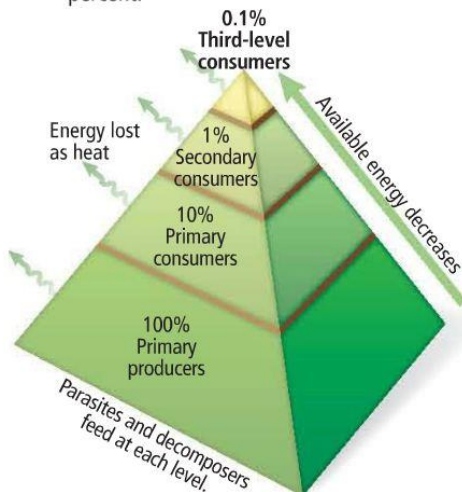
7. What is biomass?

- The mass of living tissue.

8. Compare and contrast pyramids of energy, biomass and numbers.

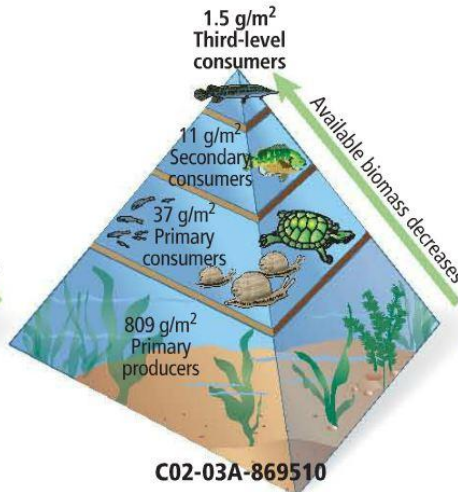
### Pyramid of Energy

In a pyramid of energy, each level represents the amount of energy that is available to that trophic level. With each step up, there is an energy loss of 90 percent.



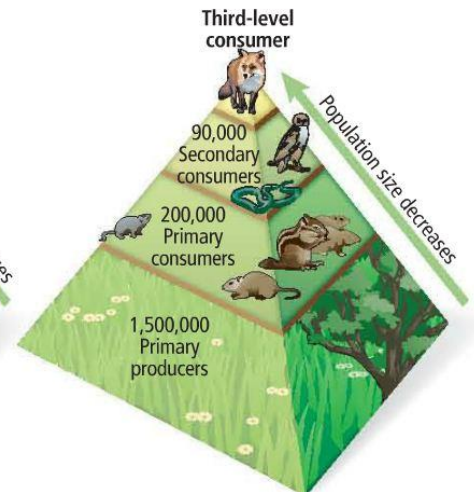
### Pyramid of Biomass

In a pyramid of biomass, each level represents the amount of biomass that is consumed by the level above it.



### Pyramid of Numbers

In a pyramid of numbers, each level represents the number of individual organisms consumed by the level above it.



9. Unlike the one way flow of energy, matter is recycled within and between ecosystems. What is a biogeochemical cycle and why are they important to living things?
  - A biogeochemical cycle is the cycling of an element through the biosphere, atmosphere, hydrosphere and geosphere. Elements important for life (CHONPS) cycle in and out of living things. These elements are stored in different reservoirs, for example the ocean is a reservoir for water and the atmosphere is a reservoir for nitrogen. Elements move from reservoir to reservoir via different pathways and processes. They are important for living things because we need them to live; we need them to build our body and function.
10. Be able to interpret diagrams of the water, carbon, nitrogen and phosphorus cycle.
11. Explain the role of bacteria in the nitrogen cycle.
  - The key role of bacteria is to convert atmospheric nitrogen into a form that plants and animals can use. This process is called **nitrogen fixation**. Once the nitrogen is in the form of ammonium or nitrates in the soil it can be assimilated (taken up) by plants. **Bacteria also do denitrification which converts nitrates back into atmospheric nitrogen. Bacteria also do nitrification which converts ammonia into nitrites and nitrates. Once the nitrogen is in the form of ammonia or nitrates it can be assimilated (taken up) by plants.**
12. Explain the role of humans and plants in the carbon cycle.
  - Plants take up carbon dioxide and convert it into glucose through photosynthesis. Humans eat plants and breakdown the glucose using cellular respiration. A byproduct of respiration is carbon dioxide which we breathe out.
13. Phosphorus and nitrogen are essential elements for plant growth. How do plants get these nutrients?
  - Plants get phosphorus and nitrogen from the soil. The uptake of these nutrients is called assimilation. We get these nutrients from eating plants or by eating animals that ate plants.
14. How is the phosphorus cycle different from the nitrogen cycle?
  - A major reservoir of the nitrogen cycle is the atmosphere. The phosphorus cycle doesn't have an atmospheric component; it stays in the ground and water. The main reservoir of phosphorus is sedimentary rock. Weathering of sedimentary rocks releases phosphorus into the soil and makes it available for plants to take up.

## Chapter 4.2

15. What is a niche?
  - A niche is a combination of an organism's habitat and their role in the ecosystem (what they eat, what they do, how they reproduce, etc.)
16. What is the competitive exclusion principle?
  - If two different species occupy the same niche in the same place at the same time, one will out-compete the other. The superior competitor will become more common and the weaker competitor will be displaced or die out.
17. Describe the following types of community interactions:
  - Competition - organisms compete for limited resources (food, water, shelter, space, etc.)
  - Predation or Predator-Prey - the predator eats the prey for example - the wolf is a predator that eats moose (prey)
  - Symbiosis - two organisms live together
    - i. Mutualism - a symbiotic relationship in which both organisms benefit from the relationship
    - ii. Commensalism - a symbiotic relationship in which one organism benefits and the other is unaffected
    - iii. Parasitism - a symbiotic relationship in which one organism benefits and the other is harmed
18. What is a keystone species?
  - Keystone species have an integral role in maintaining balance in an ecosystem. If a keystone species is removed, the entire ecosystem is affected. For example, the otter is a keystone species. If the otter population decreases, the urchin population increases and the urchins eat all of the kelp, which destroys the kelp forest ecosystem. All of the organisms that live in kelp forests are affected.
19. What is an invasive species?
  - An invasive species is a species that is introduced into a new area where it is not naturally found. The species becomes invasive when it outcompetes the native organisms.

## Chapter 4.3

20. What is succession?

- The changes that occur in an ecosystem over time. After a disturbance, the ecosystem undergoes succession. Plant communities change over time. At first, pioneer species arrive, these species are typically weedy, reproduce quickly, like sunlight and can live in low nutrient soils. Gradually as the ecosystem changes and different conditions exist, different plants will arrive while others will disappear. Eventually a stable climax community will develop.

21. Give two examples of disturbances that are natural and two that are man-made.

- Natural: Hurricanes, Forest Fires, Volcanoes, Floods
- Man-made: Urbanization, Deforestation

22. Compare and contrast primary and secondary succession.

- Primary succession - succession that occurs on land with no existing biological community. Starting from scratch, usually bare rock. Examples: on lava flows, rocks exposed by glacial retreat
- Secondary succession - succession that occurs after a disturbance in an existing biological community. Soil usually still present. Examples: after a forest fire, after logging of trees

23. What is a pioneer species?

- The first species to arrive during succession. The pioneer species facilitate (help) the establishment of other species.

24. What is a climax community?

- A stable community of plants that is reached at the end of succession. Example: tropical rainforest, redwood forest

#### Chapter 4.4

25. What is a biome?

- Areas of the world with similar plants, animals and climates. Because these areas have similar climates, animals and plants end up developing similar adaptations to these similar environments. Examples: desert, tundra, rainforest, savanna

26. Be familiar with the biomes listed on pg. 112-115. You don't need to know all of the details.

#### Chapter 5.1 & 5.2

27. How do birth rate and death rate determine population growth? \*How do immigration and emigration affect population growth?

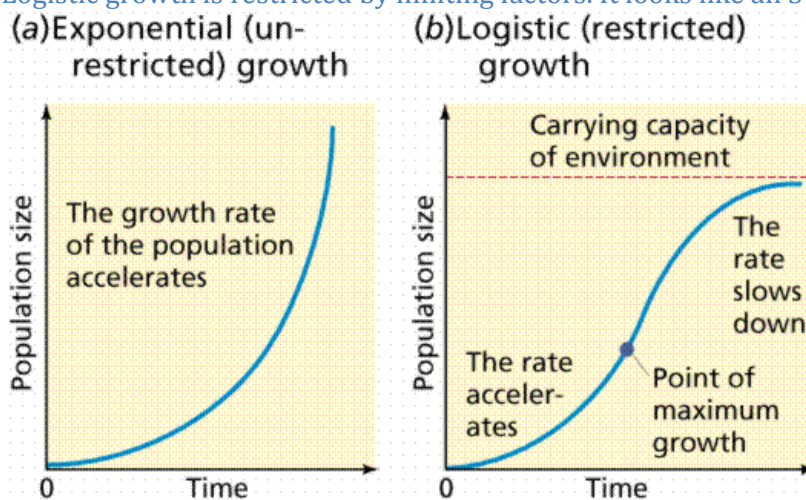
- If births are greater than deaths, the population will increase. If deaths are greater than births, the population will decrease. If there is more immigration than emigration, the population will increase. If there is more emigration than immigration, the population will decrease.

28. What is exponential growth? What does the graph look like?

- Exponential growth becomes faster over time. It is unrestricted. It looks like a J-curve.

29. What is logistic growth? What does the graph look like?

- Logistic growth is restricted by limiting factors. It looks like an S-curve. It levels off at carrying capacity.



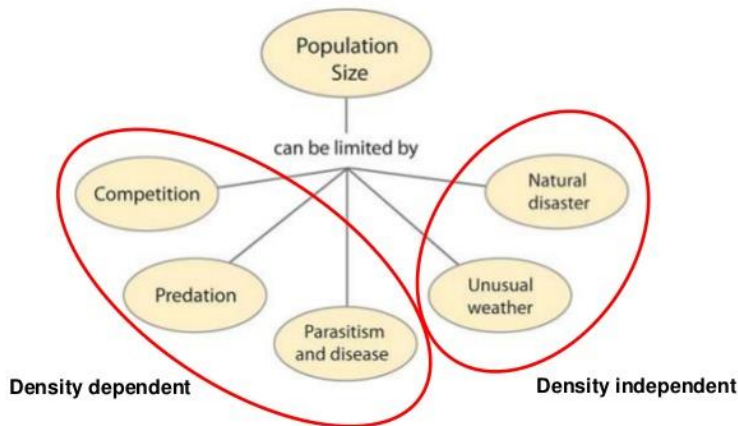
30. What is carrying capacity? Why do populations reach carrying capacity?

- Carrying capacity is the maximum number of individuals that can be supported by an environment. Populations reach carrying capacity because of limiting factors.

31. Limiting factors are factors that control the growth of a population. What is the difference between density-dependent limiting factors and density-independent limiting factors?
- Density dependent factors depend on how densely populated an area is. The population size is affected by these factors more or less if the population is more dense or less dense. For example, predation increases if the moose population is dense. Disease spreads faster and affects more people if the population is dense. Density independent factors don't depend on the density, they affect the population the same regardless of how densely or how sparsely populated. For example, climate change will affect the population the same regardless of density.
32. \*You need to know examples of limiting factors, but you do not need to know if they are density dependent or density independent. Give two examples each of density-dependent limiting factors and density-independent limiting factors.

## Limiting Factors

Limiting factors determine the carrying capacity of an environment for a species.



33. Be able to interpret a graph similar to the Isle Royale moose and wolf population graph. Explain what might cause a population to decrease or increase. For example, if a population gets too large, it could run out of resources and start to decrease in size. Another example, if a disease kills off predators, the prey population will increase.

