Name_____Period_____

Chapter 55: Ecosystems

Overview:

1. What is an *ecosystem*?

2. Where does energy enter most ecosystems? How is it converted to chemical energy and then passed through the ecosystem? How is it lost? Remember this: *energy cannot be recycled*.

3. Besides the energy flow that you described in question 2, chemicals such as carbon and nitrogen *cycle* through ecosystems. So energy _____ through an ecosystem and matter _____.

Concept 55.1 Physical laws govern energy flow and chemical cycling in ecosystems

4. Both energy and matter can be neither _____ nor

   _____.

5. We can measure the efficiency of energy conversion in an ecosystem, as well as whether a given nutrient is being gained or lost from an ecosystem. Let us take a second look at *trophic levels*. What trophic level supports all others?

6. List three groups of organisms that are *photosynthetic autotrophs*.

7. What are the *primary producers* of the deep-sea vents?

8. This concept reviews trophic relationships. Know all terms in your textbook that are bolded. What are *trophic levels*? What is always at the first trophic level?

9. What are *detritivores*? What is their importance in chemical cycling? Give some examples of detritivores.

10. State the trophic level of each of the following:

cow _____ grass _____ man _____ mushroom _____

Concept 55.2 Energy and other limiting factors control primary production in ecosystems

11. What is *primary production*? Distinguish between *gross primary production* and *net primary production*.

12. Write an equation here that shows the relationship between gross and net primary production.

13. You may recall from Chapter 54 that *biomass* is the total mass of all individuals in a trophic level. Another way of defining net primary production is as the amount of *new* biomass added in a given period of time. Why is net primary production, or the amount of new biomass/unit of time, the key measurement to ecologists?

14. Which ecosystem would tend to have a greater biomass/unit area, a prairie or a tropical rain forest? Explain.

15. Describe a technique for measuring net primary production in an aquatic environment. (We will use this technique for AP Lab 12, *Dissolved Oxygen and Aquatic Primary Productivity*.)

16. What are some factors that limit primary productivity in aquatic ecosystems?

17. What is a *limiting nutrient*? What is the limiting nutrient off the shore of Long Island, New York? In the Sargasso Sea?

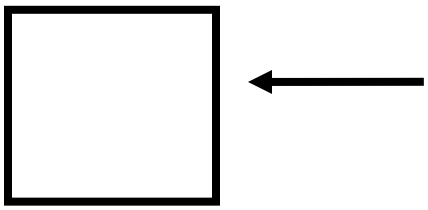
18. Phytoplankton growth can be increased by additional nitrates and phosphates. What are common sources of each of these?

19. What is *eutrophication*? What are factors that contribute to eutrophication?

Concept 55.3 Energy transfer between trophic levels is typically only 10% efficient

20. What is *trophic efficiency*?

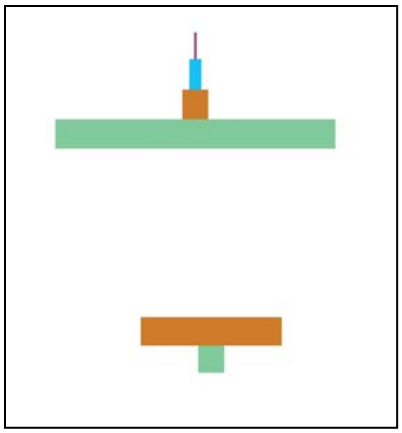
21. Generally, what percentage of energy available at one trophic level is available at the next?



This is important! Remember it.

22. Consider a food chain with 1,000 *joules* (an energy unit) available at the producer level. If this food chain is grass → grasshopper → lizard → crow, how much energy is found at the level of the crow? (See answer at the end of this Reading Guide.) Show your work here.

23. Notice that most biomass pyramids have greatest biomass on the bottom of the pyramid. Label the trophic levels on the figure. Explain why the second pyramid of biomass is inverted.



24. Why do people who have limited diets in overpopulated parts of the world eat low on the food chain?

Concept 55.4 Biological and geochemical processes cycle nutrients between organic and inorganic parts of an ecosystem

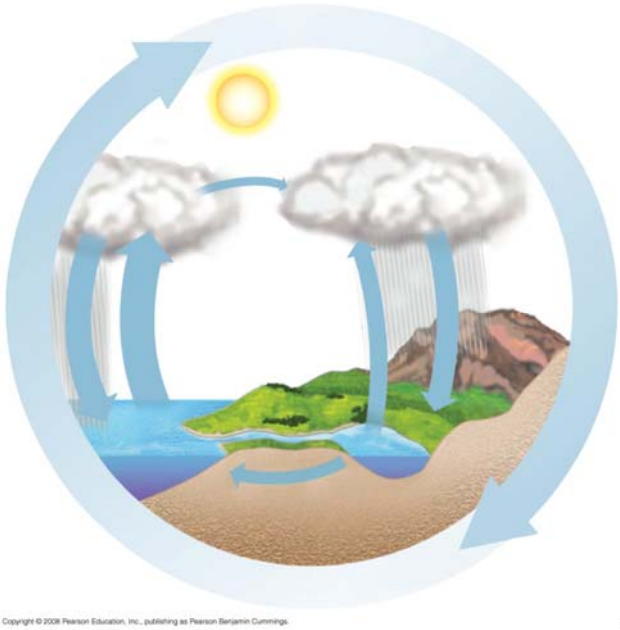
Pay particular attention to the nutrient cycles in Figure 55.14. Note the key processes in each cycle.

25. Use the figure below to describe the water cycle. Specify the roles of *evaporation*, *transpiration*, and *rainfall*.

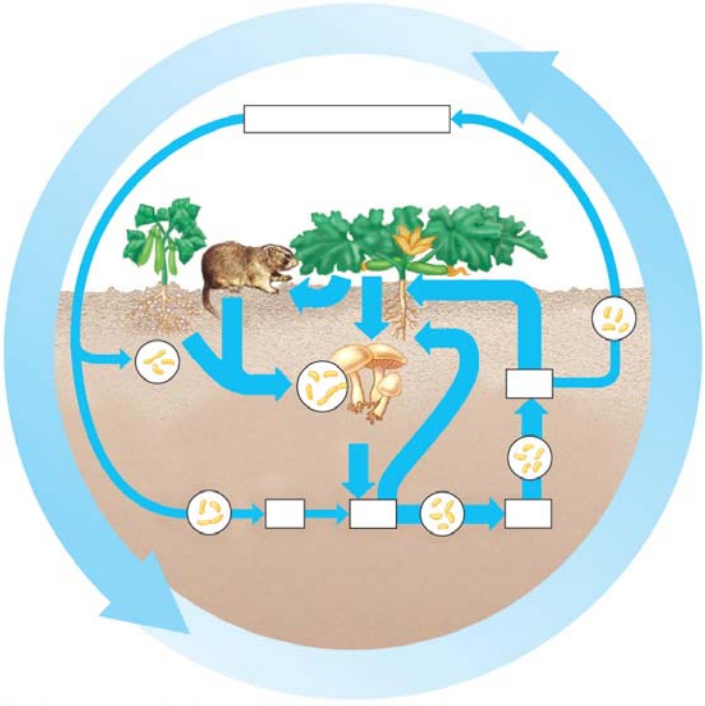
26. Use the second figure on the following page to describe the carbon cycle. In doing so, explain how carbon enters the living system and how it leaves, indicate the role of microorganisms in the cycle, and identify the reservoir for carbon.

Write the equation for photosynthesis here: _____

Write the equation for cellular respiration here: _____



27. Use the diagram below to describe the nitrogen cycle. In doing so, indicate the role of microorganisms in *nitrogen fixation*, *nitrification*, and *denitrification*.



28. Review the *Case Study*: *Nutrient Cycling in the Hubbard Brook Experimental Forest*. What effect has deforestation been shown to have on chemical cycling?

Concept 55.5 Human activities now dominate most chemical cycles on Earth

This section looks at human impact on ecosystems.

29. How has agriculture affected nitrogen cycling? What are some negative consequences of nutrient enrichment?

30. In what ways have human activities contributed to acid precipitation? What are some negative consequences of acid precipitation?

31. Explain the process of biological magnification. Discuss at least one example.

32. What is meant by the *greenhouse effect*? What would life on Earth be like without this effect?

33. What is contributing to the great increase in atmospheric carbon dioxide? What are potential effects of this increase?

34. How is atmospheric ozone depleted? What are projected effects of this depletion?

Testing Your Knowledge: Self-Quiz Answers

Now you should be ready to test your knowledge. Place your answers here:

1._____2._____3._____4._____5._____6._____7._____

Solution to Question 22: Grass (1,000 J) → grasshopper (100 J) → lizard (10 J) → crow (1 J)