

Name: \_\_\_\_\_

AP Biology  


## **Chapter 42 Active Reading Guide** **Ecosystems and Energy**

### **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 \_\_\_\_\_.

### **Section 1**

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: \_\_\_\_\_

## **Section 2**

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 41 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 the Old 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?

### **Section 3**

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 chapter.) Show your work here.
23. Notice that most biomass pyramids have greatest biomass on the bottom of the pyramid. Label the trophic levels on both figures below. 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?

### **Section 4**

Pay particular attention to the nutrient cycles in Figure 42.13. Note the key processes in each cycle.

25. Use the following figure to describe the water cycle. Specify the roles of evaporation, transpiration, and rainfall.
26. Use Figure 42.13 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.
27. Use the following diagram 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?

### **Section 5**

29. What is the goal of restoration ecology?
30. Restoration ecology uses two key strategies. Explain how each strategy works:  
bioremediation:

biological augmentation:

#### **Solution to Question 22:**

Grass (1,000 J) → grasshopper (100 J) → lizard (10 J) → crow (1 J)