SYNTHESIZE THE UNIT

In your Evidence Notebook, make a concept map, graphic organizer, or outline using the Study Guides you made for each lesson in this unit. Be sure to use evidence to support your claims.

When synthesizing individual information, remember to follow these general steps:

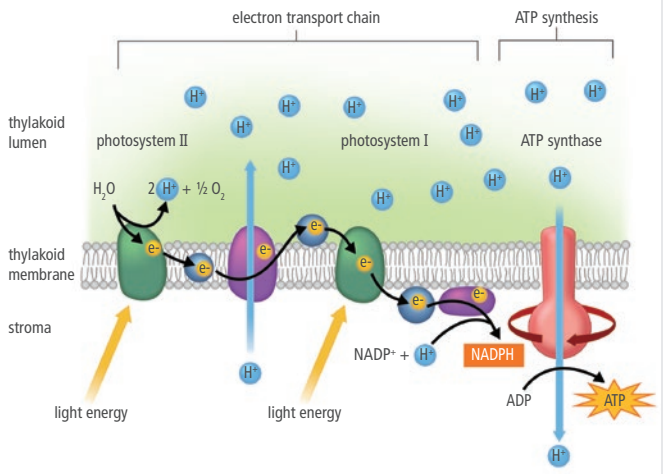
- Find the central idea of each piece of information.
- Think about the relationships between the central ideas.
- Combine the ideas to come up with a new understanding.

DRIVING QUESTIONS

Look back to the Driving Questions from the opening section of this unit. In your Evidence Notebook, review and revise your previous answers to those questions. Use the evidence you gathered and other observations you made throughout the unit to support your claims.

PRACTICE AND REVIEW

FIGURE 4: Energy transferred to electrons moves through the light-dependent reactions.



1. Solar panels capture energy from sunlight and convert it to electricity. As light hits the silicon atoms in a solar cell, the energy is transferred to electrons. The electrons are emitted from silicon atoms, and an electric field organizes the electrons into an electric current. Compare the way a solar cell works to the way a chloroplast works to capture and transfer energy.

2. The cell is a system in which processes such as photosynthesis and cellular respiration take place so that the cell can survive. Although photosynthesis only occurs in certain producers, how does this process contribute to the survival of other organisms, including humans?

3. Describe the relationship between cellular respiration and photosynthesis in terms of energy and matter.

4. In a pyramid of numbers, the highest-order organism has the smallest number of individuals in an ecological community. What might happen if the population of this organism increased significantly? In your Evidence Notebook, develop a model explaining the effect this increase would have on other members of the community.

Use the information in Figure 5 to answer Question 5.

5. If 90% of the energy is lost as heat between trophic levels, approximately how much energy is available to the secondary consumers in this energy pyramid?

FIGURE 5: Energy in trophic levels.

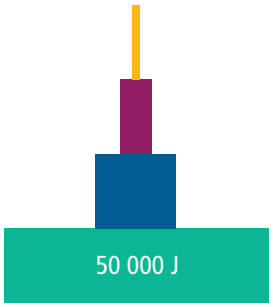


FIGURE 6: Matter and energy cycle through the Earth system.

FIGURE 7: During strenuous or prolonged activity, athletes must sustain the oxygen levels their bodies need.

6. Make a model in your Evidence Notebook to show how a biogeochemical cycle is connected to the transfer of matter and energy through a food chain. In your model, include media and text to convey the concepts of producers, consumers, decomposers, and the cycling of matter and energy.

7. An increase in energy can change the dynamics of a system. Explain how alterations to the carbon cycle result in an increase in the amount of energy contained in the Earth system. Discuss how this addition of energy would affect the cycling of matter in other biogeochemical cycles.

8. Why does the amount of energy in an ecosystem depend on its producers?

9. The nitrogen cycle relies on various organisms carrying out very specific functions. One vital group is the nitrogen-fixing bacteria. Which of the following explains how the nitrogen cycle would be disrupted if there were a sudden population explosion of nitrogen-fixing bacteria?

a. A population explosion of nitrogen-fixing bacteria would lead to a decrease in ammonium levels in the water.

b. A population explosion of nitrogen-fixing bacteria would cause dissolved nitrogen levels in the water to increase.

c. A population explosion of nitrogen-fixing bacteria would cause dissolved oxygen and dissolved carbon dioxide levels to decrease.

d. A population explosion of nitrogen-fixing bacteria would cause ammonia levels to rise, which can be detected by testing the ammonia levels in the water.

10. In your Evidence Notebook, make a model to explain how the energy content of food molecules can be traced back to the sun.

11. A forest fire began after a group of campers failed to extinguish their campfire completely. Forest fires release carbon, nitrogen, phosphorus, and sulfur that was sequestered in the biomass of the trees back into the atmosphere. In your Evidence Notebook, create a model that shows how each of the carbon, phosphorus, and nitrogen cycles in that area will be affected by the forest fire. Then explain how the changes in the biogeochemical cycle will affect the local ecosystem.

12. Hydroelectricity is a form of renewable energy that involves building dams on rivers and streams. Upstream of the dam, lakes are usually formed as the dam restricts the flow of water. Downstream, the amount of water is usually reduced. How does this activity affect the water cycle and the local ecosystems? Is hydroelectricity a sustainable source of energy?

UNIT PROJECT

Return to your unit project. Prepare your research and materials into a presentation to share with the class. In your final presentation, evaluate the strength of your hypothesis, data, analysis, and conclusions.

Remember these tips while evaluating:

- Look at the empirical evidence—evidence based on observations and data. Does the evidence support the explanation?
- Consider if the explanation is logical. Does it contradict any evidence you have seen?
- Think of tests you could do to support and contradict the ideas.

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