

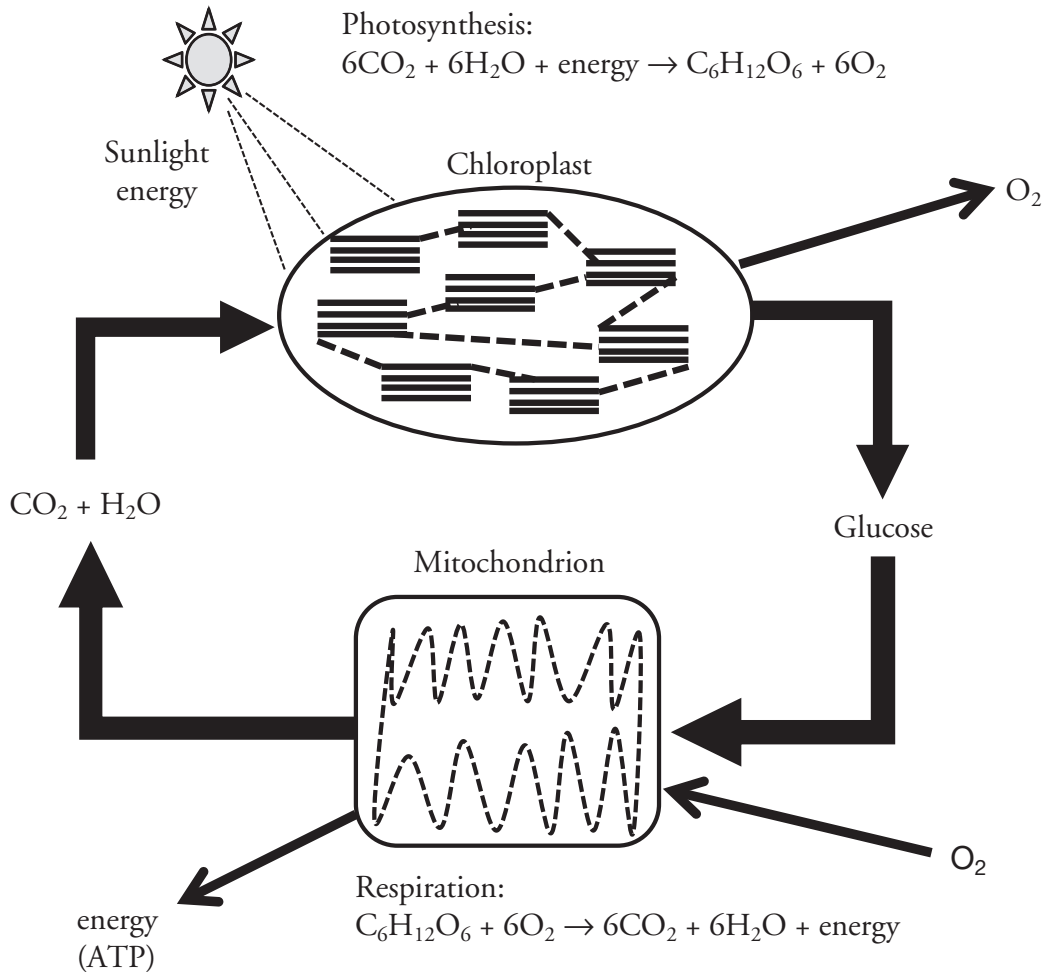
# Photosynthesis and Respiration

What is the relationship between photosynthesis and cellular respiration?

## Why?

Photosynthesis and cellular respiration are important cell energy processes. They are connected in ways that are vital for the survival of almost all forms of life on earth. In this activity you will look at these two processes at the cellular level and explore their interdependence.

## Model 1 – Comparison of Photosynthesis and Respiration



1. Refer to Model 1.
  - a. In what cell organelle does photosynthesis occur?
  - b. What are three reactants needed for photosynthesis?
  - c. What are two products of photosynthesis?

2. Refer to Model 1.
  - a. In what cell organelle does cellular respiration occur?
  - b. What are two reactants needed for cellular respiration?
  - c. What are three products of cellular respiration?
3. What four substances are recycled during photosynthesis and respiration?
4. What is the one component in photosynthesis that is not recycled and must be constantly available?
5. Are chloroplasts found in most plant cells? Explain.
6. Are mitochondria found in most plant cells? Explain.
7. Are chloroplasts found in animal cells? Explain.
8. Are mitochondria found in animal cells? Explain.



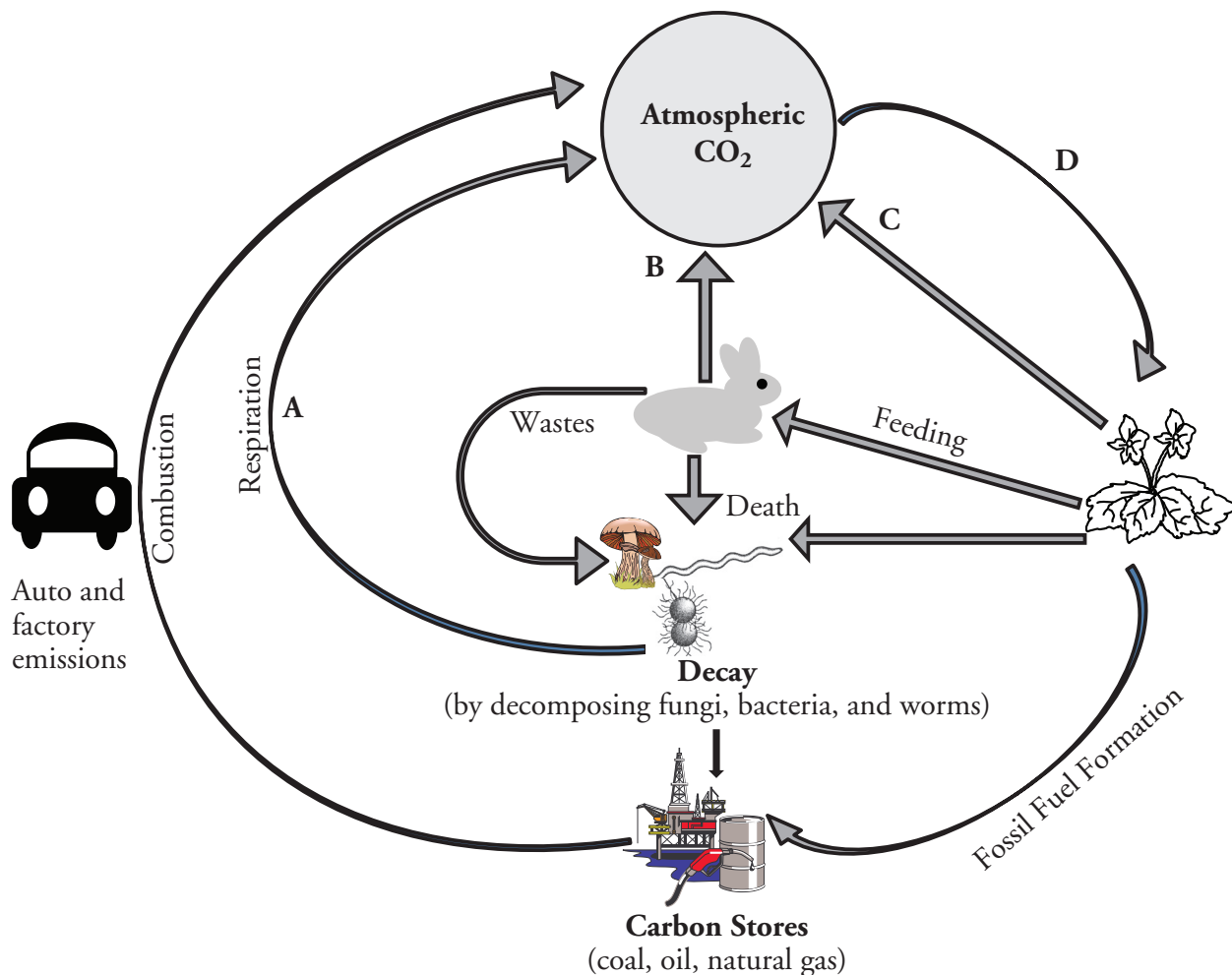
9. Write a grammatically correct sentence that compares the reactants and products of photosynthesis with the reactants and products of respiration. Be ready to share your sentence with the class.
  
10. As a group carefully consider and discuss the following statement: *“Plants can survive on their own, because they make their own food. Animals can’t survive on their own but need plants for survival.”* Do you agree with this statement? Why or why not? Can you come to a consensus as a group? Be ready to discuss your group’s response to this statement.



11. As a group, make a quick list of the foods that you ate during your last meal. Hypothesize what would happen to the supply of those foods if the sun's energy was no longer available.

12. Explain how the energy used by an athlete during a football game comes from the energy of sunlight.

## Model 2 – The Carbon Cycle



- In the Model 2 diagram, place a green star by each process (A, B, C, or D) that represents photosynthesis, and a red star by each process (A, B, C, or D) that represents cellular respiration.
- Write and label equations for cellular respiration and photosynthesis below. Circle the carbon dioxide in each. If you need help, see Model 1.
- When matter from plants and animals decay (rot), microorganisms responsible for the decomposition process respire. Knowing this information, do you need to add any red stars to Model 2? Explain and add the stars if needed.



16. List any chemical processes other than photosynthesis and respiration that are taking place in Model 2.

17. Are any of your answers from Question 16 due to human activity? Explain.



18. Ignoring the human actions of auto and factory emissions, what generalization can you make about the balance of carbon dioxide in Model 2 over a long period of time?



19. How would the burning of fossil fuels upset the balance of the carbon dioxide cycle?

20. Deforestation is another example of human activities that affects the carbon dioxide cycle. Explain how the cutting down and burning of trees would affect this cycle.

## Extension Questions

21. Ethanol is one example of alternative fuels for powering our cars and trucks. Ethanol can be produced in different ways, but most often by microorganisms acting on plant materials such as corn. Advocates argue that burning ethanol would not alter the net emission of CO<sub>2</sub> even though when ethanol is involved in combustion it produces CO<sub>2</sub>. What are the pros and cons of producing and burning ethanol?
  
  
  
  
  
  
  
  
  
  
22. Electricity consumption is a huge producer of atmospheric carbon dioxide because much of the USA's electricity is produced in coal burning power plants. What are three other ways that electricity can be produced that would NOT increase atmospheric carbon dioxide? Which of these does your group think holds the most promise for the future?