

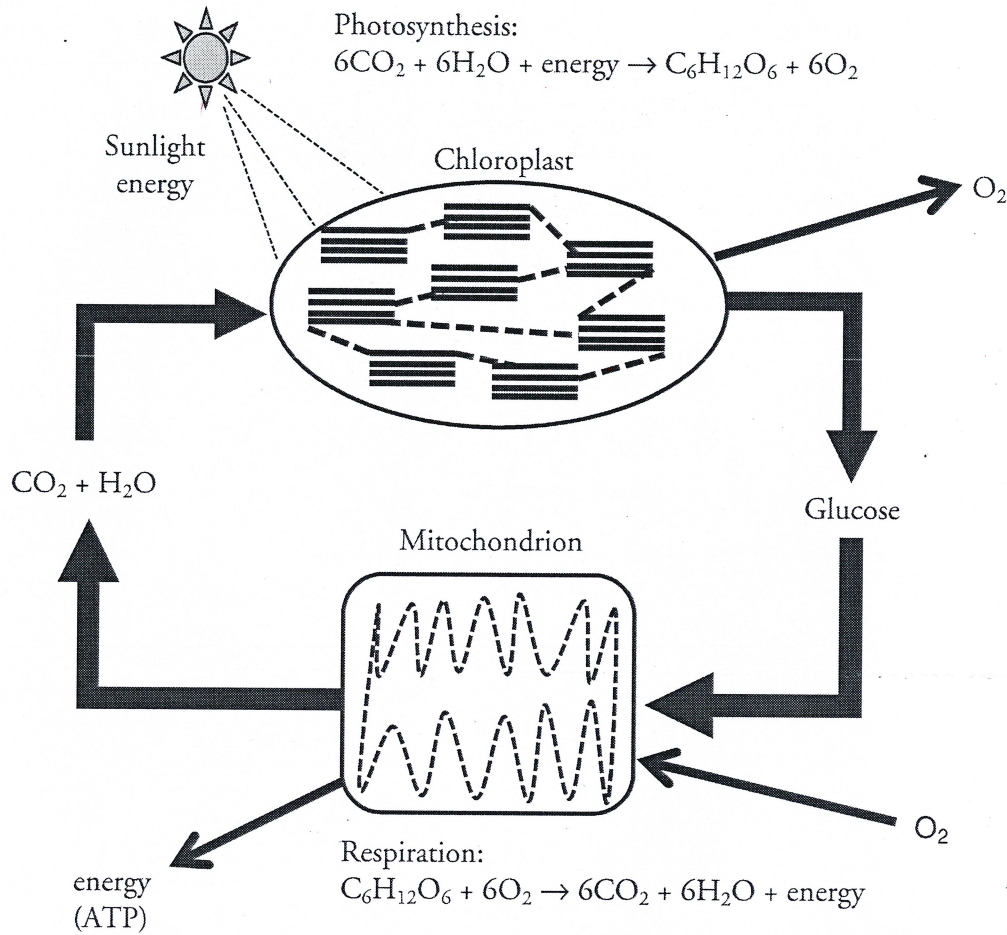
Photosynthesis and Respiration

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?

Chloroplast

b. What are three reactants needed for photosynthesis?

CO₂ + H₂O + sunlight

c. What are two products of photosynthesis?

O₂ & glucose

2. Refer to Model 1.

a. In what cell organelle does cellular respiration occur?

Mitochondria

b. What are two reactants needed for cellular respiration?

glucose & O_2

c. What are three products of cellular respiration?

ATP + CO_2 + H_2O

3. What four substances are recycled during photosynthesis and respiration?

CO_2 + H_2O + glucose + O_2

4. What is the one component in photosynthesis that is not recycled and must be constantly available?

sunlight

5. Are chloroplasts found in most plant cells? Explain.

↳ found in leaves which are most exposed to sunlight.

6. Are mitochondria found in most plant cells? Explain.

yes, plants also have to break down sugar into ATP

7. Are chloroplasts found in animal cells? Explain.

No, animal cells cannot make their own food.

8. Are mitochondria found in animal cells? Explain.

Yes, they metabolize food the animals consume into ATP.



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.

Photosynthesis & cell respiration cycle glucose, CO_2 , O_2 & H_2O between one another

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.

I agree, animals must consume plants or other animals that ultimately rely on plants for food.



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.

granola bar, milk |

The supply of these foods would go down. The grains in the granola bar & the cow's food rely on the sun to grow.

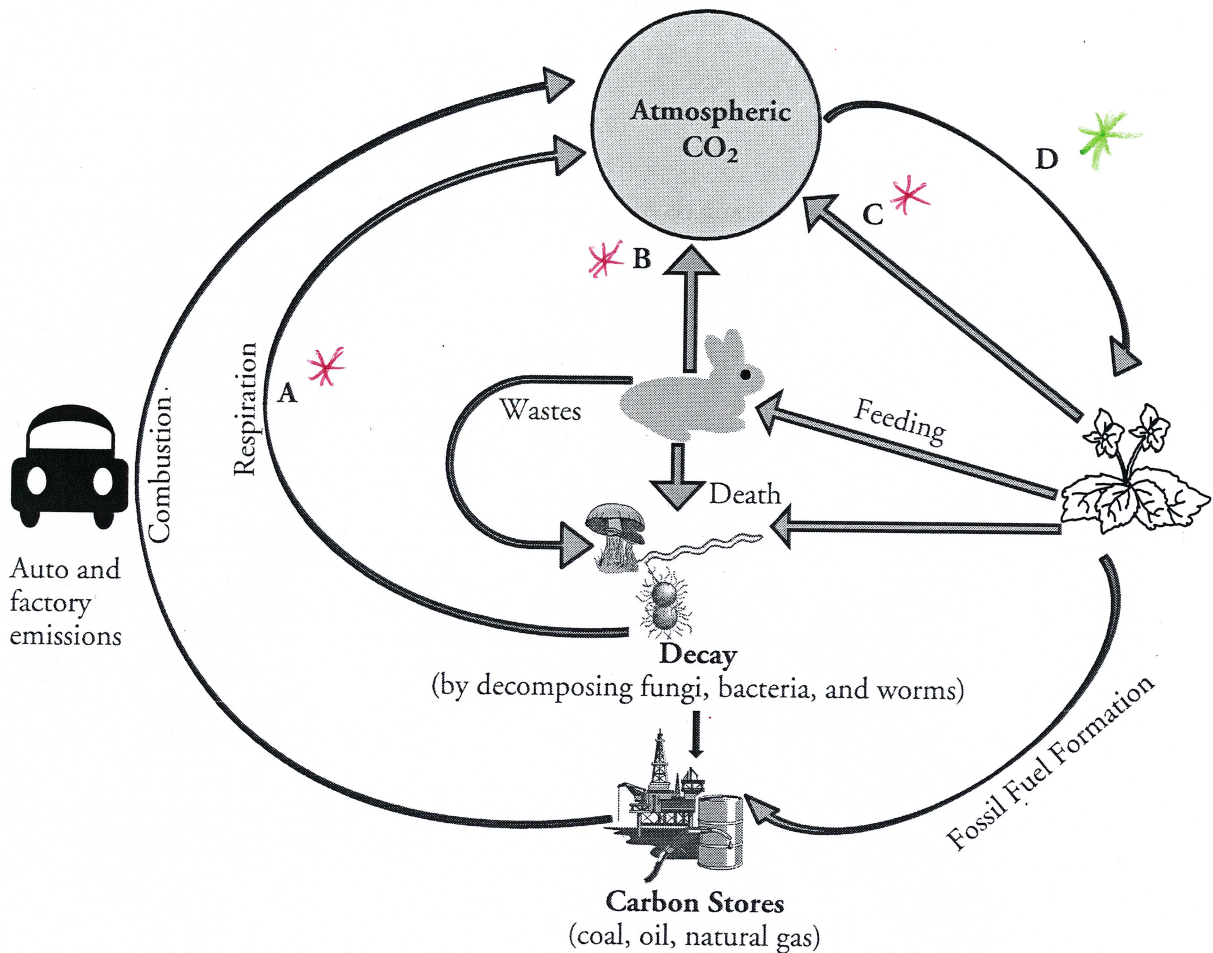
12. Explain how the energy used by an athlete during a football game comes from the energy of sunlight.

Football players consume plant based food or animals that eat plants.

This provides them energy.

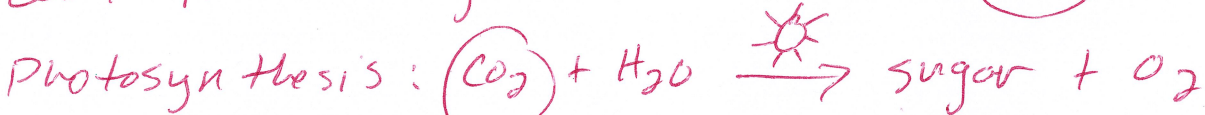
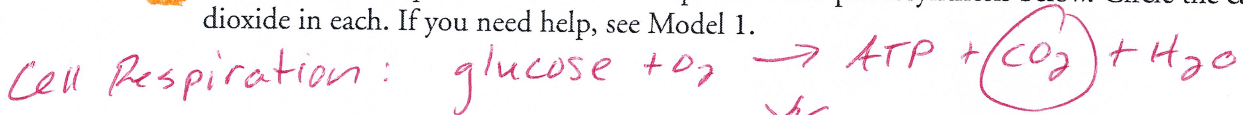
* Plants make all of the Earth's food

Model 2 – The Carbon Cycle



13. 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.

14. Write and label equations for cellular respiration and photosynthesis below. Circle the carbon dioxide in each. If you need help, see Model 1.



15. 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.

A should have a star since bacteria respire as they decay dead plants & animals.



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

Combustion

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

Yes, auto & factory emissions are from humans.

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?

Plants & animals maintain a balance of CO_2 . Plants take in CO_2 by photosynthesis & animals release CO_2 by respiration.

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

Combustion adds more CO_2 to the air.

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.

Fewer trees would take in less CO_2 .

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_2 even though when ethanol is involved in combustion it produces CO_2 . What are the pros and cons of producing and burning ethanol?

Growing the corn would take in CO_2 . The burning process would then release the CO_2 . Traditional coal or petroleum sources do not take in any CO_2 during the production process.

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?

Wind power, hydroelectric power & solar energy

A mixture of energy sources may be the best for the future. Each energy source has advantages & disadvantages.