

TCE Communication and Expression Techniques

Level: 2nd Year (Licence)

Biological Sciences

Food Sciences

Agricultural Sciences

Ecology and Environmental Sciences

Topic 4. Photosynthesis and respiration

Photosynthesis and respiration are two major biological processes that depend on each other and make life on Earth possible. Photosynthesis takes place in the chloroplasts of green plants, algae, and some bacteria. These chloroplasts contain chlorophyll, a green pigment that captures sunlight. With the energy from sunlight, plants absorb carbon dioxide (CO₂) from the air through small openings in their leaves called stomata, and water (H₂O) from the soil through their roots. Inside the chloroplasts, these raw materials are transformed into glucose (C₆H₁₂O₆), which is a simple sugar that the plant uses as food for growth and energy. During this process, oxygen (O₂) is produced as a by-product and released into the atmosphere.

Respiration, however, is the opposite process. It takes place in the mitochondria of plant and animal cells, which are known as the “powerhouses” of the cell. During cellular respiration, the glucose made during photosynthesis is combined with oxygen to release energy in the form of ATP. This energy is necessary for all living activities such as movement, repair, and cell functions. Carbon dioxide and water are produced as waste products and returned to the environment. Because plants, animals, and even microorganisms use this process to obtain energy, respiration is essential for all living organisms.

Although they work in opposite directions, photosynthesis and respiration are closely connected. Photosynthesis stores energy by creating glucose and releasing oxygen, while respiration releases that energy by breaking down glucose and using oxygen. This creates a natural cycle that keeps the levels of oxygen and carbon dioxide balanced in the atmosphere. Plants carry out both processes, using photosynthesis to make food and respiration to use that food for energy. Animals cannot perform photosynthesis, so they depend entirely on plants for oxygen and food. By working together, these processes make energy available in ecosystems and support the survival of nearly all living organisms.

Questions, critical analysis, and writing skills

1. What are the two main biological processes described in the text, and in what ways do they differ?
2. What role does chlorophyll play in photosynthesis?
3. What substances are produced as by-products during photosynthesis and respiration?
4. Can you write the chemical equations for photosynthesis and respiration?
5. How are photosynthesis and respiration connected or related?
6. Why are photosynthesis and respiration essential for life on Earth?

7. Can animals carry out photosynthesis? Explain why or why not.
8. Which molecule stores the energy released during respiration?
9. How do plants utilize the glucose produced during photosynthesis?
10. How do human activities, such as deforestation or pollution, impact the cycle of photosynthesis and respiration?
11. Why do plants carry out both photosynthesis and respiration, while animals only carry out respiration?
12. Label the following parts/processes:

The green pigment in the leaf that captures sunlight →

Tiny openings in the leaf for gas exchange →

Gas absorbed by plants during photosynthesis →

Gas released by plants during photosynthesis →

Sugar produced by plants →

Organelle where photosynthesis occurs →

Organelle where respiration occurs →

Gas used in respiration →

Molecule produced in respiration to store energy →

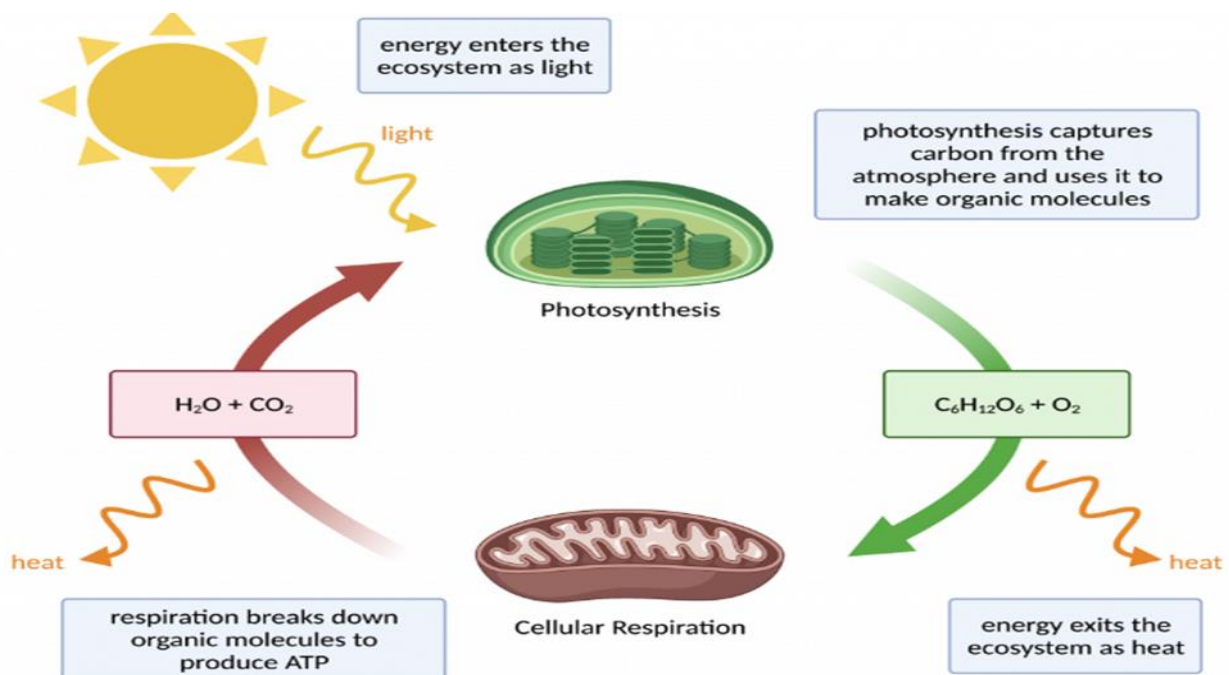
Water absorbed by plant roots →

The source of energy driving photosynthesis →

Organisms that perform photosynthesis →

Organisms that perform respiration →

13. Write a short paragraph explaining the process shown in the figure.



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