

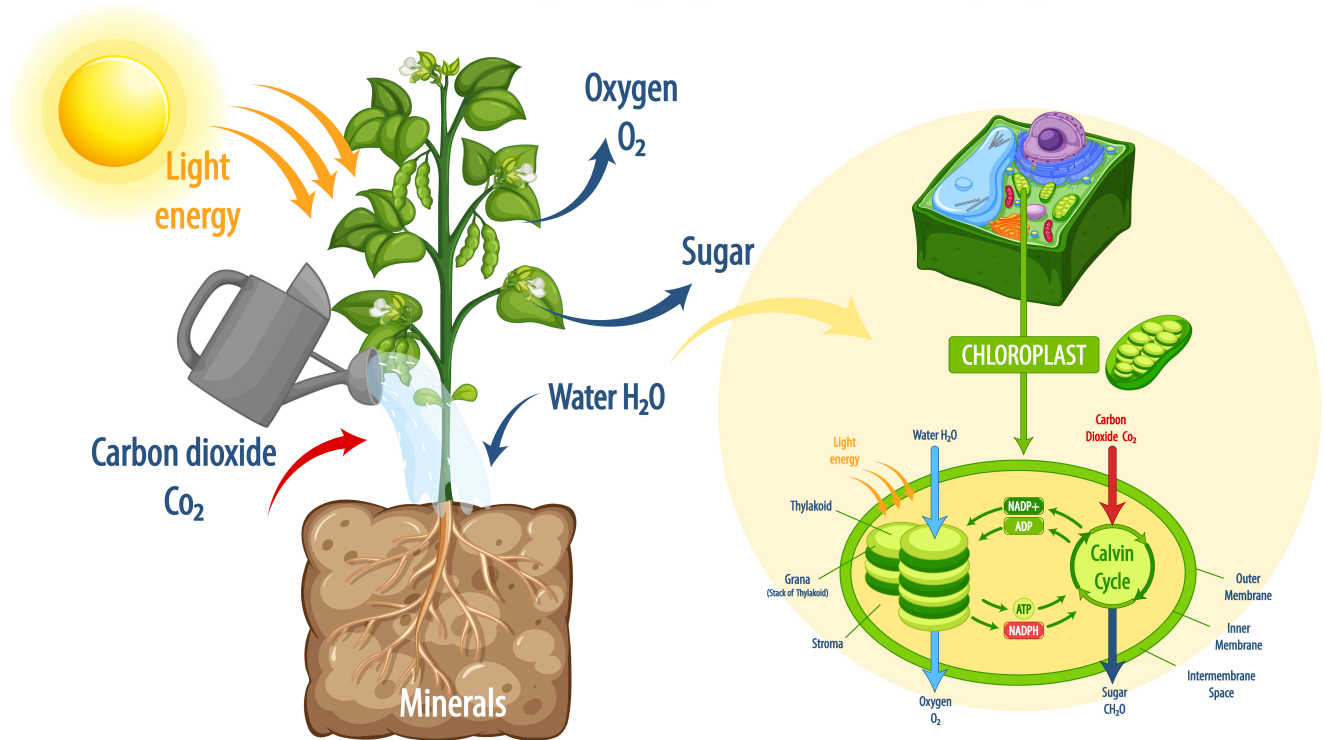
# Biological Processes

Name:

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## PHOTOSYNTHESIS



### The Marvel of Photosynthesis: Nature's Energy Conversion

Photosynthesis is a remarkable biological process that enables plants to convert light energy into chemical energy, fundamentally sustaining life on Earth. This process takes place in the chloroplasts of plant cells, where light energy, water, and carbon dioxide are transformed into oxygen and glucose. The significance of photosynthesis extends beyond the plant kingdom, as it replenishes the oxygen in our atmosphere and forms the foundation of the food chain.

The process of photosynthesis can be divided into two main stages: the light-dependent reactions and the Calvin cycle. The light-dependent reactions occur in the thylakoid membranes of the chloroplasts. Here, chlorophyll and other pigments absorb sunlight, which excites electrons and splits water molecules ( $H_2O$ ) into oxygen ( $O_2$ ), protons, and electrons. The oxygen is then released into the atmosphere as a byproduct, while the energy from the excited electrons is used to generate ATP (adenosine triphosphate) and NADPH (nicotinamide adenine dinucleotide phosphate), which are essential energy carriers for the next phase.

The Calvin cycle, also known as the light-independent reactions, takes place in the stroma of the chloroplasts. During this phase, the ATP and NADPH produced in the light-dependent reactions are used to convert carbon dioxide ( $CO_2$ ) into glucose ( $C_6H_{12}O_6$ ), a simple sugar that plants use as a source of energy and as a building block for growth. This cycle involves a series of enzyme-driven steps that incorporate carbon dioxide into organic molecules, eventually producing glucose through a process called carbon fixation.

In essence, photosynthesis not only provides the energy necessary for plant growth and development but also maintains the balance of gases in the Earth's atmosphere. By converting light energy into a

usable chemical form, plants play an indispensable role in sustaining life, making photosynthesis one of nature's most extraordinary and vital processes.

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## Sort the paragraphs.

- Sunlight is absorbed by chlorophyll and other pigments in the thylakoid membranes of the chloroplasts.
- The energy from the excited electrons is used to generate ATP and NADPH.
- The absorbed sunlight excites electrons and splits water molecules ( $\text{H}_2\text{O}$ ) into oxygen ( $\text{O}_2$ ), protons, and electrons.
- Glucose is used by the plant as a source of energy and as a building block for growth.
- ATP and NADPH are used in the Calvin cycle to convert carbon dioxide ( $\text{CO}_2$ ) into glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ).
- Oxygen is released into the atmosphere as a byproduct of the light-dependent reactions.

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**Name the two main stages of photosynthesis and where they occur in the chloroplast.**

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**Describe the role of chlorophyll in the light-dependent reactions of photosynthesis.**

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**Explain how the Calvin cycle contributes to the production of glucose during photosynthesis.**

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**Tick the right answer:**

**What is the primary purpose of the light-dependent reactions in photosynthesis?**

- To convert carbon dioxide into glucose    To produce chlorophyll  
 To absorb water from the soil    To generate ATP and NADPH for use in the Calvin cycle

**Why is the Calvin cycle also known as the light-independent reactions?**

- It occurs only at night    It does not directly require light to proceed  
 It generates light energy    It takes place outside the chloroplasts

**How does photosynthesis contribute to the balance of gases in the Earth's atmosphere?**

- By producing oxygen and consuming carbon dioxide  
 By consuming methane and producing oxygen  
 By producing carbon dioxide and consuming methane  
 By consuming oxygen and producing nitrogen

**In which part of the chloroplast do the light-dependent reactions occur?**

- Nucleus    Stroma    Thylakoid membranes    Mitochondria

**What role does chlorophyll play in the process of photosynthesis?**

- It absorbs sunlight to excite electrons    It releases oxygen into the atmosphere  
 It converts glucose into ATP    It transports water to the leaves