

Photosynthesis in Plants

Photosynthesis is a biological process that occurs in plants, algae, and some bacteria, where light energy is

converted into chemical energy in the form of glucose (a sugar) and oxygen. This process is vital for the survival

of life on Earth, as it provides the base for the food chain and releases oxygen into the atmosphere.

The Process of Photosynthesis

Photosynthesis takes place primarily in the leaves of plants, within specialized organelles called chloroplasts.

The process can be broken down into two main stages: the light-dependent reactions and the Calvin cycle

(light-independent reactions).

1. **Light-dependent reactions (Occurs in thylakoid membranes of chloroplasts)**

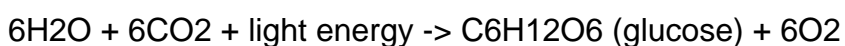
These reactions occur when light is absorbed by chlorophyll pigments in the thylakoid membranes.

Water molecules are

split into oxygen, protons (H⁺), and electrons through photolysis. The electrons move through the electron

transport chain, creating ATP and NADPH as energy carriers.

Chemical Reaction:



- **Inputs**: Light energy, water, and carbon dioxide
- **Outputs**: Glucose, oxygen, and ATP

2. **Calvin Cycle (Occurs in the stroma of chloroplasts)**

The Calvin cycle is where carbon dioxide from the air is used to produce glucose using ATP and NADPH from the light-dependent reactions. This process occurs in the stroma of chloroplasts and does not require light.

Key Steps:

- **Carbon fixation**: Carbon dioxide is attached to a five-carbon sugar molecule, RuBP, with the help of the enzyme RuBisCO.
- **Reduction**: ATP and NADPH convert the fixed carbon into G3P, a three-carbon molecule.
- **Regeneration of RuBP**: Some G3P is used to regenerate RuBP, allowing the cycle to continue.

The Importance of Photosynthesis

- **Oxygen Production**: Photosynthesis is the primary source of oxygen in the Earth's atmosphere.
- **Energy Storage**: Plants store energy in the form of glucose, which can be used for cellular respiration or stored as starch for later use.
- **Foundation of Food Chains**: As producers, plants form the base of the food chain and provide energy for herbivores, which are then consumed by carnivores.

Factors Affecting Photosynthesis

Several factors influence the rate of photosynthesis:

- **Light intensity**: Higher light intensity increases the rate up to a point.
- **Carbon dioxide concentration**: Higher concentrations can enhance the process.
- **Temperature**: Optimal temperature range ensures enzymes function properly.

The Human Nervous System

The human nervous system is a highly complex network responsible for controlling and coordinating bodily functions,

from the simplest reflexes to the most sophisticated cognitive processes. It consists of two major parts:

the central nervous system (CNS) and the peripheral nervous system (PNS).

Central Nervous System (CNS)

1. **Brain**: The brain is the control center of the nervous system, processing information and sending signals to

the body. It consists of the cerebrum, cerebellum, and brainstem.

- **Cerebrum**: The largest part of the brain, responsible for cognitive functions like thinking, memory, and

emotion.

- **Cerebellum**: Involved in coordination of movement, balance, and posture.

- **Brainstem**: Controls basic life functions like heartbeat, breathing, and sleep.

2. **Spinal Cord**: The spinal cord connects the brain to the peripheral nervous system and is involved in

reflex actions. It is protected by the vertebrae.

Peripheral Nervous System (PNS)

The PNS includes all the nerves outside the CNS and is divided into two main systems:

- **Somatic Nervous System**: Controls voluntary movements by connecting the CNS to the muscles.
- **Autonomic Nervous System**: Regulates involuntary functions like heart rate and digestion. It is further divided into:
 - **Sympathetic Nervous System**: Prepares the body for stressful situations ("fight or flight").
 - **Parasympathetic Nervous System**: Conserves energy and restores the body to a calm state.

Nerve Cells (Neurons)

The nervous system is made up of specialized cells called neurons, which transmit signals throughout the body.

A neuron consists of three main parts:

- **Cell Body (Soma)**: Contains the nucleus and organelles.
- **Dendrites**: Receive incoming signals.
- **Axon**: Transmits signals away from the cell body to other neurons or muscles.

Nerve Impulse Transmission

Neurons communicate with each other via electrical signals called action potentials. When a neuron is activated,

an action potential travels down its axon to the synapse, where neurotransmitters are released to send the signal to the next neuron.

Table: Key Components of the Human Nervous System

Component	Function
Brain	Control center for processing information
Spinal Cord	Relays signals between the brain and the body
Neurons	Transmit electrical signals across the body
Sympathetic Nervous System	Prepares body for stress ("fight or flight")
Parasympathetic Nervous System	Restores calm and conserves energy

The Importance of the Nervous System

- **Coordination**: The nervous system coordinates every action the body performs, ensuring proper functioning of organs and muscles.
- **Reflexes**: It helps in automatic responses to certain stimuli, such as pulling a hand away from a hot surface.
- **Homeostasis**: The autonomic nervous system maintains internal stability by regulating heartbeat, breathing, and body temperature.