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# REMEDIAL BIOLOGY

## UNIT 4

TOPIC :

- **Photosynthesis**

Autotrophic nutrition, photosynthesis, Photosynthetic pigments,  
Factors affecting photosynthesis.



# PHOTOSYNTHESIS

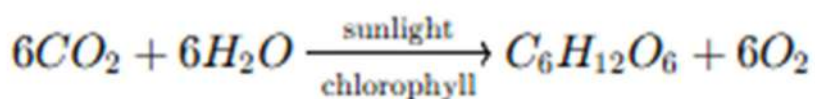
## Autotrophic Nutrition

- Autotrophic nutrition is the mode of nutrition in which organisms prepare their own food using simple inorganic materials like  $\text{CO}_2$  and water, in the presence of sunlight.
- Organisms using this method are called autotrophs.
- Green plants, algae, and some bacteria (cyanobacteria) perform autotrophic nutrition via photosynthesis.

## Photosynthesis

- Photosynthesis is the process by which green plants, algae, and certain bacteria convert light energy into chemical energy.
- In this process, carbon dioxide ( $\text{CO}_2$ ) and water ( $\text{H}_2\text{O}$ ) are converted into glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) and oxygen ( $\text{O}_2$ ) in the presence of sunlight and chlorophyll.

## General Equation



## Site of Photosynthesis

- Photosynthesis occurs in **chloroplasts**, which are mainly found in the **mesophyll cells** of leaves.
- Inside the chloroplast:
  - **Thylakoids** contain pigments and are the site of **light reactions**.
  - **Stroma** is the site of **dark reactions (Calvin cycle)**.



## Photosynthetic Pigments

- These are molecules that absorb light energy for photosynthesis. They are located in the thylakoid membranes of chloroplasts.

### Major Pigments

Pigment	Color	Function
Chlorophyll-a	Blue-green	Main pigment; essential for light absorption
Chlorophyll-b	Yellow-green	Accessory pigment; broadens absorption spectrum
Xanthophylls	Yellow	Accessory pigment; absorbs blue light
Carotenes	Orange	Accessory pigment; protects from photooxidation

## Phases of Photosynthesis

### 1. Light Reaction (Photochemical Phase)

Occurs in: **Thylakoids**

- Light is absorbed by chlorophyll.
- Water is split into  $H^+$ ,  $O_2$ , and **electrons** (Photolysis).
- Formation of:
  - **ATP** (via photophosphorylation)
  - **NADPH**
  - **$O_2$  is released**

### 2. Dark Reaction (Biosynthetic Phase / Calvin Cycle)

Occurs in: **Stroma**

- Does not require light directly.

- Uses **ATP and NADPH** from light reactions to convert **CO<sub>2</sub> into glucose**.
- Main enzyme: **RuBisCO** (Ribulose biphosphate carboxylase-oxygenase)

### Factors Affecting Photosynthesis

- Photosynthesis is affected by both internal and external (environmental) factors.

#### External Factors

Factor	Effect
<b>Light intensity</b>	Increases photosynthesis up to a point; too much can damage pigments.
<b>CO<sub>2</sub> concentration</b>	Rate increases with CO <sub>2</sub> ; limiting factor in many cases.
<b>Temperature</b>	Optimal range is 25–35°C; very high or low temp inhibits enzymes.
<b>Water availability</b>	Essential for photolysis; deficiency causes stomatal closure.

#### Internal Factors

- Age of leaf
- Type of plant (C<sub>3</sub> vs C<sub>4</sub>)
- Chlorophyll content

### Importance of Photosynthesis

- ✓ Main source of oxygen in the atmosphere.
- ✓ Basis for all food chains on Earth.
- ✓ Converts solar energy into chemical energy.
- ✓ Removes carbon dioxide from the atmosphere, reducing global warming.