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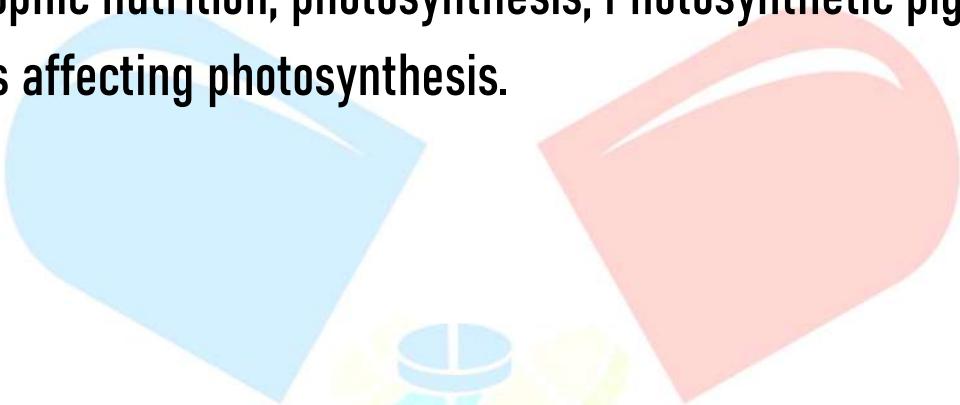
REMEDIAL BIOLOGY

UNIT 4

TOPIC :

- **Photosynthesis**

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



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PHOTOSYNTHESIS

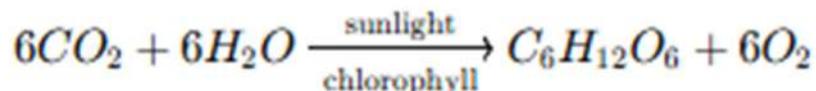
Autotrophic Nutrition

- Autotrophic nutrition is the mode of nutrition in which organisms prepare their own food using simple inorganic materials like 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 (CO_2) and water (H_2O) are converted into glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) and oxygen (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⁺, O₂, and electrons** (Photolysis).
- Formation of:
 - ATP (via photophosphorylation)
 - NADPH
 - O₂ 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 **CO₂** into **glucose**.
- Main enzyme: **RuBisCO** (Ribulose bisphosphate carboxylase-oxygenase)

Factors Affecting Photosynthesis

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

External Factors

Factor	Effect
Light intensity	Increases photosynthesis up to a point; too much can damage pigments.
CO₂ concentration	Rate increases with CO ₂ ; limiting factor in many cases.
Temperature	Optimal range is 25–35°C; very high or low temp inhibits enzymes.
Water availability	Essential for photolysis; deficiency causes stomatal closure.

Internal Factors

- Age of leaf
- Type of plant (C₃ vs C₄)
- 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.