Photosynthesis

Lecture 1: Introduction & Fundamentals

1. What is Photosynthesis?

Photosynthesis is the process by which green plants, algae, and some bacteria convert sunlight into chemical energy stored in glucose. It takes place mainly in the chloroplasts of plant cells.

2. Importance of Photosynthesis

- Produces oxygen for living organisms.
- Creates glucose, the energy source for plants.
- Maintains atmospheric balance.
- Forms the base of food chains.

3. Where Photosynthesis Occurs

- **Leaves** are the primary site.
- **Chloroplasts** contain chlorophyll.
- **Stomata** regulate gas exchange.
- **Mesophyll cells** carry out most of the process.

4. Raw Materials Needed

- **Sunlight**
- **Carbon dioxide (CO_2)**
- **Water (H_2O)**

Lecture 2: The Process of Photosynthesis

1. Photosynthesis Equation

$6CO_2 + 6H_2O + \text{sunlight} \rightarrow C_6H_{12}O_6 + 6O_2$

2. Stages of Photosynthesis

Photosynthesis has two major stages:

A. Light-Dependent Reactions

- Occur in thylakoid membranes.
- Sunlight is absorbed by chlorophyll.
- Water splits into oxygen, electrons, and protons.

- Produces ATP and NADPH.

B. Calvin Cycle (Light-Independent Reactions)

- Takes place in the stroma.
- Uses ATP and NADPH to convert CO_2 into glucose.
- Glucose is used or stored as starch.

3. Products of Photosynthesis

- **Glucose** for plant growth.
- **Oxygen** released into atmosphere.
- Some **water** regenerated.

Lecture 3: Factors, Applications & Summary

1. Factors Affecting Photosynthesis

- **Light intensity**: Higher light increases rate up to a limit.
- **CO_2 concentration**: More CO_2 increases photosynthesis.
- **Temperature**: Works best at moderate temperatures.
- **Water availability**: Less water slows reaction.
- **Chlorophyll** level: Healthy leaves = higher rate.

2. Role in Ecosystem

- Provides food and oxygen.
- Supports terrestrial and aquatic life.
- Reduces atmospheric CO_2.
- Drives energy transfer in food chains.

3. Summary

- Photosynthesis converts solar energy into chemical energy.
- Occurs in leaves within chloroplasts.
- Requires CO_2, water, and sunlight.
- Produces glucose and oxygen.
- Essential for survival of life on Earth.

End of 3-Lecture Lesson Content