

# Module 7: Photosynthesis

## Keys to Success & Study Guide

### Learning Objectives

By the end of this module, you should be able to: 1. **Trace** the flow of energy from sunlight to chemical bonds in glucose. 2. **Locate** the specific reactions of photosynthesis within the chloroplast structure. 3. **Explain** the inputs and outputs of the Light Reactions and the Calvin Cycle. 4. **Differentiate** between C3, C4, and CAM photosynthetic strategies.

### Key Terminology Checklist

*Define these terms in your own words to ensure mastery.* - [ ] **Photon**: A particle of light. - [ ] **Stomata**: Pores in the leaf for gas exchange (CO<sub>2</sub> in, O<sub>2</sub> out). - [ ] **Carbon Fixation**: Converting inorganic CO<sub>2</sub> into organic molecules. - [ ] **NADP<sup>+</sup> / NADPH**: The electron carrier shuttle. - [ ] **G3P**: Glyceraldehyde-3-phosphate, the direct product of the Calvin Cycle (precursor to glucose).

### Concept Check

#### 1. The Split

- **Question**: What is the product of photosystem II and what is the mechanism for creating it?
- **Deep Dive**: This is arguably the most important reaction for animal life. Water (H<sub>2</sub>O) is split. The electrons feed the photosystem, the H<sup>+</sup> helps make ATP, and the O<sub>2</sub> is released for us to breathe.

#### 2. Fixing Gas

- **Question**: What does it mean to fix a gas?

- **Deep Dive:** It means taking a gas (CO<sub>2</sub>) which floats around and attaching it to a solid organic molecule so it becomes part of the plant's "body." Rubisco is the enzyme that does the fixing.

### 3. Different Strokes

- **Question:** What environmental pressures led to CAM/C4 evolution?
- **Deep Dive:** C3 plants (normal) struggle in heat because RuBisCO accidentally grabs Oxygen instead of CO<sub>2</sub> (Photorespiration).
  - **C4:** Separates capture and fixation by *Space* (different cells).
  - **CAM:** Separates capture and fixation by *Time* (open pores at night, fix largely during day).

### Study Tips

- **Follow the Carbon:**
  - In: CO<sub>2</sub> (Air)
  - Process: Calvin Cycle (Stroma)
  - Out: Sugar (Food)
- **Follow the Energy:**
  - In: Light (Sun)
  - Process: Light Reactions (Thylakoid)
  - Intermediate: ATP/NADPH
  - End: Chemical bonds in Sugar.
- **Compare:** Make a T-Chart comparing Photosynthesis and Cellular Respiration. Notice how they are almost exact opposites?