

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 (CO₂ in, O₂ out). - [] **Carbon Fixation:** Converting inorganic CO₂ into organic molecules. - [] **NADP⁺ / 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 (H₂O) is split. The electrons feed the photosystem, the H⁺ helps make ATP, and the O₂ 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 (CO₂) 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 CO₂ (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: CO₂ (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?