

Module 7: Photosynthesis

Comprehension & Critical Thinking Questions

Part 1: Core Concepts

1. The Big Picture

- Write the balanced equation for photosynthesis: $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$.
- Identify which molecule is reduced ($\text{CO}_2 \rightarrow \text{glucose}$) and which is oxidized ($\text{H}_2\text{O} \rightarrow \text{O}_2$).

2. Chloroplast Anatomy

- Define thylakoid, granum, and stroma.
- Where do the Light Reactions occur? Where does the Calvin Cycle occur?

3. Pigments

- Why are most plants green? Explain in terms of light absorption and reflection.
- What is the role of the antenna complex in photosystems?

Part 2: Application

1. The Light Reactions

- Trace the path of an electron from water to NADPH.
- Why is water split at Photosystem II? What byproduct is released?
- How is ATP generated? (Chemiosmosis driven by H^+ gradient)

2. The Calvin Cycle

- The Calvin Cycle produces G3P from CO_2 . What two products from the Light Reactions are required?

- What is RuBisCO, and why is it considered the most abundant and important enzyme on Earth?

Part 3: Analysis & Evaluation

1. Evolutionary Adaptations

- In hot, dry climates, stomatal closure leads to photorespiration. Analyze how C₄ and CAM plants solve this problem.
- Compare corn (C₄) and cactus (CAM) in terms of spatial vs. temporal separation of carbon fixation.

2. Global Impact

- Photosynthesis removed CO₂ and added O₂ to Earth's early atmosphere. Analyze how this enabled the evolution of aerobic respiration.