Module 7: Photosynthesis

Comprehension & Critical Thinking Questions

Part 1: Understanding Core Concepts

1. **The Big Picture**
    - Write the balanced chemical equation for Photosynthesis. Identify which reactant is "reduced" to make sugar and which is "oxidized" to make oxygen.
    - Compare **Autotrophs** (producers) and **Heterotrophs** (consumers).
2. **Anatomy of a Chloroplast**
    - Define **Thylakoid**, **Granum**, and **Stroma**.
    - Where exactly do the Light Reactions take place? Where does the Calvin Cycle take place?
3. **Pigments**
    - Why are plants green? Explain in terms of absorption and reflection of light wavelengths.
    - What is the role of an **Antenna Complex** in a photosystem?

Part 2: Applying Biological Principles

1. **The Light Reactions**
    - Trace the path of an electron from Water to NADPH.
    - **Crucial Concept**: Why is water split (Photolysis) at Photosystem II? What waste product is produced?
    - How is ATP generated during the light reactions? (Hint: Proton gradient).

2. **The Calvin Cycle (Dark Reactions)**

    - The Calvin Cycle builds sugar (G3P) from CO_2. What two energy molecules from the Light Reactions are required to power this?
    - What is **Rubisco** and why is it possibly the most important protein on Earth?

Part 3: Analyzing & Evaluating

1. **Evolutionary Adaptations**

    - In hot, dry climates, plants must close their stomata to save water, which leads to photorespiration (wasteful). Analyze how **C4** and **CAM** plants solve this problem.
    - **Compare**: Corn (C4) vs. a Cactus (CAM). How do they differ in *when* or *where* they fix carbon?

2. **Global Impact**

    - Photosynthesis removed massive amounts of CO_2 from the ancient atmosphere and filled it with O_2. Analyze how this event shaped the evolution of life (i.e., aerobic respiration).