1. **Distinguish between autotrophic and heterotrophic nutrition.**
2. **Distinguish between photoautotrophs and chemoautotrophs.**
3. **Describe the structure of a chloroplast, listing all membranes and compartments.**
4. **Write a summary equation for photosynthesis.**
5. **Explain van Niel’s hypothesis and describe how it contributed to our current**

**understanding of photosynthesis. Explain the evidence that supported his hypothesis.**

1. **In general terms, explain the role of redox reactions in photosynthesis.**
2. **Describe the two main stages of photosynthesis in general terms.**
3. **Describe the relationship between an action spectrum and an absorption spectrum.**

**Explain why the action spectrum for photosynthesis differs from the absorption spectrum for chlorophyll a.**

1. **Explain how carotenoids protect the cell from damage by light.**
2. **List the wavelengths of light that are most effective for photosynthesis.**
3. **Explain what happens when a solution of chlorophyll a absorbs photons. Explain what happens when chlorophyll a in an intact chloroplast absorbs photons.**
4. **List the components of a photosystem and explain the function of each component.**
5. **Trace the movement of electrons in noncyclic electron flow. Trace the movement of electrons in cyclic electron flow.**
6. **Describe the similarities and differences in chemiosmosis between oxidative phosphorylation in mitochondria and photophosphorylation in chloroplasts.**

**17. Describe the role of ATP and NADPH in the Calvin cycle.**

**18. Describe what happens to rubisco when O2 concentration is much higher than CO2 concentration.**

**19. Describe the major consequences of photorespiration. Explain why it is thought to be an evolutionary relict.**

**20. Describe two important photosynthetic adaptations that minimize photorespiration.**

**21. List the possible fates of photosynthetic products.**