I. Photosynthesis - The process which occurs in the chloroplasts of green plants in which simple sugars are formed from carbon dioxide and water in the presence of light and chlorophyll.

A. Two major parts of photosynthesis
   1. Light reactions
      a) Conversion of light energy into ATP and NADPH
   2. Dark reactions
      a) Use of energy (ATP & NADPH) to form carbohydrates

B. Purpose of photosynthesis
   1. Main biosynthetic pathway by which carbon and energy enter the web of life

II. Where it occurs

A. Chloroplast
   1. Light reactions - grnum (several thylakoids) and thylakoid membranes
   2. Dark reactions - stroma

III. Light reactions

A. Light-trapping molecule
   1. Chlorophyll (antenna chlorophyll pick up light)
      a) Transmits green and absorbs red and blue, etc.
      b) Right wavelength of energy excites an electron of chlorophyll
      c) Inductive resonance carries excitation energy from molecule to molecule
      d) Energy (P700 or P680) is transferred to an acceptor molecule

B. Two options for electron excitation energy
   1. Cyclic (short pathway)
   2. Non-cyclic (long pathway)

C. Cyclic photophosphorylation
   1. (Photosystem I) LIGHT - P700 - P700* (Chl a/b redox) - [ETS: Fe-S protein-Ferredoxin-Plastoquinone] - P700 + ATP

D. Non-cyclic photophosphorylation (Photosystem II and then I)
   1. (Photosystem II) LIGHT - (OEC) - P680 - P680* (Pheophytin a) - [ETS: Plastoquinone-Plastocyanin + ATP - (Photosystem I) W/LIGHT - P700 - P700* (Chl a/b redox) - [ETS: Fe-S protein-Ferredoxin] - NADPH (NADPH from 2 e⁻ and 1 H⁺)
   2. Electrons replaced by water (O₂ is released and H⁺ goes into thylakoid)
   3. Split of water referred to as photolysis
   4. ATP comes from proton gradient (H⁺ stored in thylakoid leaves to makes ATP)

E. Use of products from photosynthesis
   1. ATP - energy
   2. NADPH - reducing equivalents for organic synthesis