

# [Biochemistry of photosynthesis](https://assignbuster.com/biochemistry-of-photosynthesis/)

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Biochemistry of Photosynthesis Overall Word Equation: Water+ Carbon Dioxide( Carbohydrates+ Oxygen ((: light + chlorophyll) 1. Light Dependent Stage/ photochemical reaction/ light reactions: Word Equation: Water ( Hydrogen ions + Oxygen ((: light + chlorophyll) Site: On the Thylakoid membrane of the chloroplast Major events: - Light absorption o Chlorophyll in the thylakoids absorbs light. The energy absorbed is used for photolysis (splitting of water molecules). - Photolysis of water (Photodissociation) o The light energy absorbed split H2O molecules into H+ ions and O2 â–ª 2H2O(4H+ +4e- + O2 â–ª O2 is released as a gas to the atmosphere (as a by-product) â–ª H+ ions is accepted by NADP to form NADPH2 - NADPH2 acts as a reducing agent by donating H+ ions in Calvin Cycle. - Generation of ATP (Adenosine triphosphate) o The light energy absorbed is used to form ATP (photophosphorylation) o In this way, light energy is converted to chemical energy stored in ATP â–ª Used to drive the reactions in Calvin Cycle Products formed in this stage: - Photolysis of water molecules to give H+ ions and O2 - ATP molecules: as energy source for subsequent synthesis of carbohydrates in light dependent reactions. The flow of electrons in Photosynthesis [pic] Photosystem: Consists of chlorophyll molecules & accessory pigments e. g. carotenoid accessory pigments trap light energy and pass to the chlorophyll. Results of chromatography: 2. Light independent stage/ carbon fixation/ dark reactions Word Equation: Carbon dioxide + Hydrogen ions ( Carbohydrates + Water ((enzymes) - Site: In the stroma of chloroplast with the presence of enzymes for dark reactions - Requires the products of light dependent stage (ATP, NADPH2), takes place whether or not light is present. - Details of this stage was analysed by Melvin Calvin and his co-workers and the process is called the Calvin Cycle. [pic] Major events occurring in Calvin Cycle: 1. Carbon dioxide fixation and formation of 3-C compound 2. Reduction of 3-C compound and formation of TP (Triose Phosphate) 3. Regeneration of carbon acceptor [pic] Pi: Inorganic phosphate (PO3) Role/ functions of the different substances in photosynthesis 1. Photolysis: - H2O molecules (2H2O(4H+ +4e- + O2(g) - H+ : Taken up by NADP to form NADPH2 - e- : Captured by the excited chlorophyll molecules to fill up their positively charged holes - O2: Released as a by-product 2. 5C-compound (ribulose bisphosphate) at the beginning of the Calvin cycle - Acts as a carbon dioxide acceptor 3. Triose phosphate (TP) in carbon fixation - Some of the triose phosphate are used to regenerate the 5-C compound (RuBP) - Some act as the raw material for the production of glucose and other carbohydrates. 4. ATP ( Supplies energy for o Reduction of a 3-C compound into 6-C sugar (glucose) o Conversion of triose phosphate into ADP 5. NADP - Act as the hydrogen acceptor. It takes up H+ ions from photolysis of water and e- from electron transport system to form NADPH2 which is an importance reducing agent used in carbon fixation 6. CO2 - Essential raw material for the synthesis of carbohydrates in carbon fixation 7. 1st stable product of photosynthesis: PGA (a 3-C compound) 8. 1st carbohydrates formed: Triose phosphate