**PHOTOSYSTEM/PIGMENT SYSTEM** 1. Jons and Mayers (1964), Mayers and French (1966), Robino witch and Govind ji (1965 – 1967) suggested that two pigment system are involved in photosynthesis. 2. There two kinds of photosystem are :- Photosystems – I and Photosystems – II . 3. Photosystems are functional and structural units made up of [protein complexes](https://en.wikipedia.org/wiki/Protein_complex). 4. These are involved in [photosynthesis](https://en.wikipedia.org/wiki/Photosynthesis) that together carry out the primary [photochemistry](https://en.wikipedia.org/wiki/Photochemistry) of [photosynthesis](https://en.wikipedia.org/wiki/Photosynthesis), the [absorption of light](https://en.wikipedia.org/wiki/Absorption_%28electromagnetic_radiation%29) and the transfer of [energy](https://en.wikipedia.org/wiki/F%C3%B6rster_resonance_energy_transfer) and [electrons](https://en.wikipedia.org/wiki/Electron_transfer). 5. These are found in the [thylakoid membranes](https://en.wikipedia.org/wiki/Thylakoid_membrane) of plants. 6. They are located in the [chloroplasts](https://en.wikipedia.org/wiki/Chloroplast) of plants. 7. Both the photosystem absorb different types of wavelength of light. 8. Each photosystem has a reaction centre. 9. The reaction centers are composed of Chl.a, Chl.b, Carotenoids and Phycobilins. 10. Electrons first travel through photosystem – II and then photosystem – I. **PHOTOSYSTEM – I / PIGMENT SYSTEM – I** 1.Photosystem – I is one of two [photosystems](https://en.wikipedia.org/wiki/Photosystem) in the [photosynthetic light reactions](https://en.wikipedia.org/wiki/Light-dependent_reactions) of [plants](https://en.wikipedia.org/wiki/Plant). 2. This photosystem is known as PS – I because it was discovered before [Photosystem](https://en.wikipedia.org/wiki/Photosystem_II) –II. . 3. Photosystem – I receives electrons from [plastocyanin](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/plastocyanin) or cytochrome to supply to ferrodoxin on the [thylakoid](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/thylakoid) membrane. 4. The reaction centre of PS – I is Chl.a. 5. The light energy for PS – I is absorbed by Chl.a, Chl.b and carotenoids. 6. Here the electron is excited by the wavelength of light at P700 [nanometers](https://en.wikipedia.org/wiki/Nanometer). 7. It uses the light energy to transfer them to [ferrodoxin](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/ferredoxin) on the stromal side. 8. It can also function in a cyclic [electron transport](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/electron-transport) pathway or the excited electron of pigment system are transferred to NADP. 9. This makes NADP to react with H+ ion and to form NADPH2 .  **PHOTOSYSTEM – II / PIGMENT SYSTEM – II** 1.Photosystem – II is one of two [photosystems](https://en.wikipedia.org/wiki/Photosystem) in the [photosynthetic light reactions](https://en.wikipedia.org/wiki/Light-dependent_reactions) of [plants](https://en.wikipedia.org/wiki/Plant). 2. The photosystem – II accepts the electron one by one, which are released by the photolysis of water, and supplies to PS – I by the help of several carriers on the [thylakoid](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/thylakoid) membrane. 3.The reaction centre of PS – II is Chl.a. 4. The light energy for PS – II is absorbed by Chl.a, Chl.b, Chl.c, Chl.d and phycobilins. 5. Here the electron is excited by the wavelength of light at P680 [nanometers](https://en.wikipedia.org/wiki/Nanometer). 6. It uses the light energy to transfer them to PS – I through several carriers on the stromal side. 7. The photosystem – I was discovered before [Photosystem – II](https://en.wikipedia.org/wiki/Photosystem_II), but the experiments showed that [Photosystem – II](https://en.wikipedia.org/wiki/Photosystem_II) is actually the first enzyme of the photosynthetic electron transport chain.

 **CARBON DIOXIDE (CO2) REDUCTION** 1. Most of the gaseous discharges comes from the use of fuels and released into the atmosphere, which increase temperatures of the atmosphere. 2. At present – day fuels release both CO2 and H2O, along with hot air, in their exhaust (waste). 3.Due to this, the CO2 continuously increases and participate in the heat transfer in the atmosphere.
4. The extraction of metals can reduce any oxide compound (compound in which oxygen is combined with other element) to its elemental form. Examples of this are the making of iron from iron oxides, aluminum from aluminum oxides, and hydrogen from hydrogen oxide (or water). 5. Thus Carbon dioxide is also just like any other oxide and can be reduced to its respective elements by applied energy, a process that could minimize the amount of CO2 released in the air.
6. In reductions (making less) process some form of energy are required to control the formation of the compound oxides. 7. In CO2 reduction, the CO2 is captured and pushed back into the ground. 8. The second option of CO2 reduction metallurgy (study of metal) is using energy from various alternate sources in making materials. 9. So the CO2 reduction is a chemical process in the atmosphere can be carried out by chemical reduction of CO2 and/or H2O into fuels by applying extractive metallurgy for reducing oxides. 10. Recently, global warming and climate change are receiving attention all over the world. 11. The anthropogenic CO2 discharge raises the global temperature through absorption of infrared light. 12. This phenomenon leads to the possibility of extreme seasonal weather. 13. So the CO2 reduction has become an urgent to be solve problem.

**Reduction of CO2 in Photosynthesis** 1. During oxygenic photosynthesis (Photosynthesis in which O2 is liberated), light energy transfers electrons from water (H2O) to carbon dioxide (CO2), to produce [carbohydrates](https://www.livescience.com/topics/carbohydrates). 2. In this transfer process, the CO2  is reduced, or receives electrons, and the water becomes oxidized or loses electrons. 3. Ultimately, oxygen is produced along with carbohydrates. 4. The oxygenic photosynthesis functions as a counter balance in which carbon dioxide is taken for respiration and the oxygen is released to the atmosphere. 5.The oxygenic photosynthesis is written as follows :-

6CO2 + 12H2O + Light Energy → C6H12O6 + 6O2 + 6H2O

6. Here, six molecules of carbon dioxide (CO2) combine with 12 molecules of water (H2O) using light energy. 7. The end result is the formation of a single carbohydrate molecule (C6H12O6, or glucose) along with six molecules of oxygen and six molecules of water.

  **RED DROP EMERSON EFFECT**  1. The different wavelength of light absorbed by chlorophyll are studied with the help of spectrum. 2. Emerson & Lewis (1943) measured quantum yield at different wavelengths of light. 3. Quantum yield can be defined as a number of O2 molecules released per quantum of light absorbed. 4. Robert Emerson measured the photosynthesis in spectrum by the help of a monochromatic light. So called Emerson effect. 5. The process was done by an apparatus called spectrometer. 6. He studied different wavelength of light and observed that the quantum number are more in the red region. 7. Here the electrons are excited at 680 nm. and takes part in photosynthesis. 8. When the 680 nm. of excited electrons decreases, a sudden drop was noticed in the rate of photosynthesis. 9. This was called Red drop or this photosynthetic enhancement is referred as Emerson enhancement effect or Emerson effect.



 **QUANTUM YEILD (QY) (Φ)** 1. The quantum yield is a [radiation](https://en.wikipedia.org/wiki/Radiation) – induced process (chemical process promoting aqueous system purification). 2. In this a number of times a specific event occurs per absorbed by the system. 3. The "event" is typically a kind of [chemical reaction](https://en.wikipedia.org/wiki/Chemical_reaction).4. Quantum yield is also defined as the ability of converting absorbed light into releasing light, which can be in the form of fluorescence (bright light). 5. Fluorophores (chemical compound which leave light with light excitation) with high QY often release strong fluorescence, even at low concentration. 6. There is a wide range of QY values for CDs (Cadmium sulfide). 7. Some studies have found that the QY value of CDs can be converted . 8. Most of the studies have observed enhancement in fluorescence intensity and QY value. 9. For instance, QY of N – doped (process of adding nitrogen impurities to semiconductors to convert their properties) CDs was improved by varying the content of [carboxyl groups](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/carboxyl-group), whereas the doping of N into CDs produced from [hydrothermal treatment](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/hydrothermal-synthesis) of m – aminobenzoic acid have high QY.10. The crude (before treated with chemical) CD sample often purified by the isolate batches of CDs with different QYs. 11. CDs of similar physiochemical properties will have similar QY value and can be separated during purification.