Honors Biology

*Step by step: How does the Light Independent stage of Photosynthesis happen?*

The Light Independent stage of photosynthesis happens in the stroma of the chloroplas

Molecules that you should be familiar with:

* RuBisCo (an enzyme)
* Ribulose Bi-phosphate (RUBP)
* Phosphoglyceralderhyde (PGAL)
* Carbon dioxide (CO2)
* Adenosine Triphosphate (ATP)
* NADPH
* Phosphate (P)
* Adenosine Diphosphate (ADP)
* Glucose
* Lipids
* Carbohydrates
* Proteins

Equation: Photons + 6CO2 + 6H20 yields **C6H12O6** + 6O2

Stagetwo goal: To convert the energy found in ATP and NADPH into Glucose

1. 12 ATP and 12 NADPH are made in the light dependent reaction in the Thylakoid membrane.
2. In the stroma of the chloroplast 6 CO2 moleucles combine with 6 RUBP molecules to make 12 PGAL molecules.
   * RUBP has 5 carbons and CO2 has one carbon. They combine to make a six carbon molecule with a phosphate attached at each end. (The oxygen connects to the carbons also).
   * The enzyme RuBisCo breaks the six carbon molecule into two 3 carbon molecules called PGAL which has a phosphate and an oxygen atom attached to the end.
   * The energy for combining RUBP and CO2 and for breaking those molecules into PGALs comes from 12 ATP and 12 NADPH molecules, that were created in the light dependent reaction of photosysnthesis.
3. 2 of the PGALs are combined to make glucose, the phosphates break free to float around in the stroma to be used later.

* This glucose molecule has 6 carbon 12 hydrogen and 6 oxygen atoms. Other types of atoms such as nitrogen, more oxygen, more hydrogens, phosphates, and sulfur can be added to the glucose to make different molecules needed by the cell. These molecules include carbohydrates, lipids (fats) and proteins. These molecules combine to build the parts of a cell. These parts of a cell make a cell, the combination of different types of cells make all the organisms we see: trees, grass, moss, and bushes.

1. The other 10 PGAL molecules are turned back into RUBP molecules to be used when the cycle repeats (it is a cycle after all).

* The 3 carbon PGAL molecules have to be broken apart and rearranged as the 5 carbon RUBP molecules.
* It takes 6 ATP molecules to provide the energy for PGAL to rearrange into RUBP.

1. The RUBP is now ready to combine with new CO2 and the process can start over.

**Diagram the cycle here:**

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