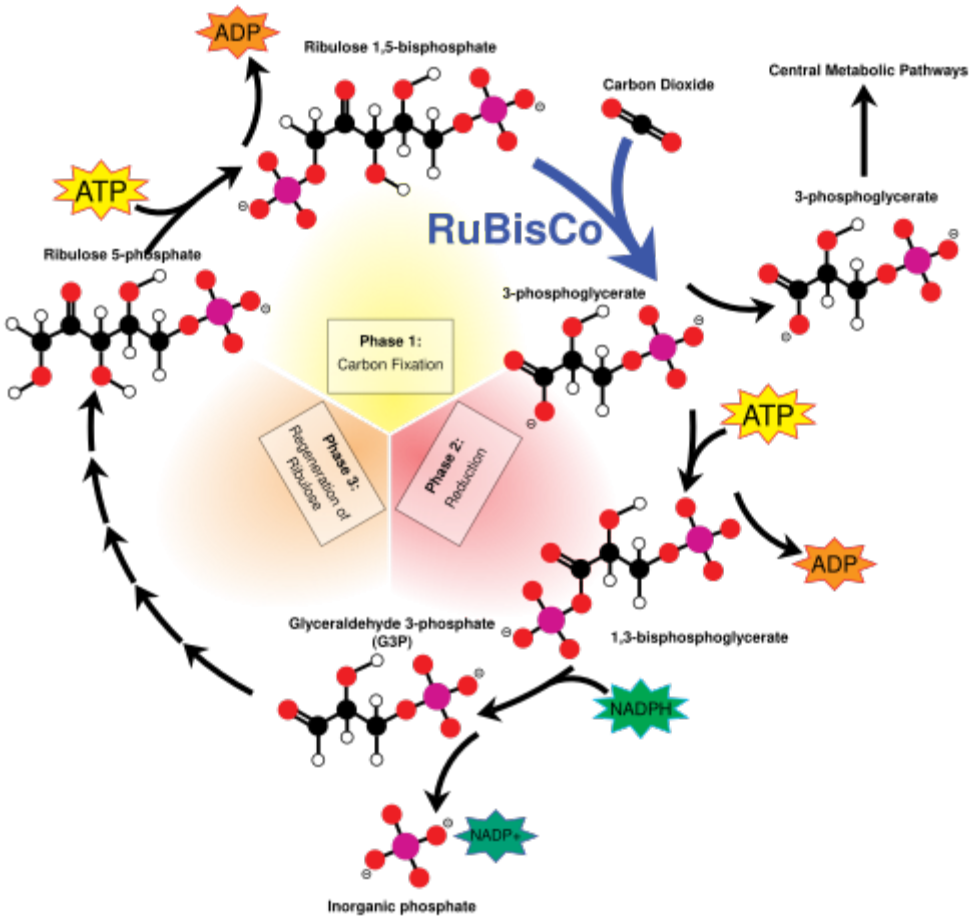
Contents
Reading
PDF (OpenStax)
8.3 Carbon Fixation (OpenStax CNX)
Learning Outcomes
Discuss the main events that occur in the Calvin-Bensen cycle, and tell the cycle must turn six times in order to generate a 6-carbon sugar.
Explain the process of photo respiration, and describe the environmental conditions that favor this process.
Discuss the C4 and CAM pathways; explain why C4 plants photosynthesize more efficiently than C3 plants.
Describe the global carbon cycle.

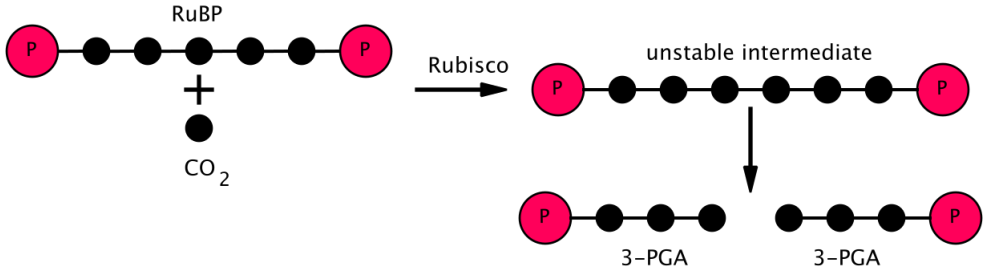
Light Independent Reactions



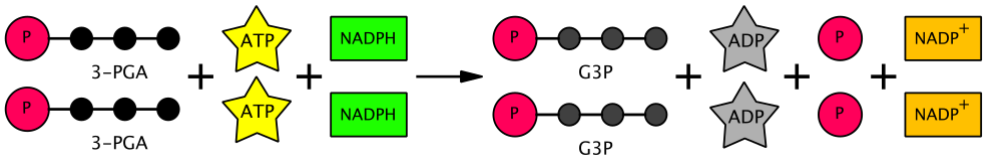
Credit:Mike Jones [CC-BY-SA 3.0]

The light independent reactions are also known as the dark reactions or **Calvin Cycle** and utilize the ATP and NADPH from the light-dependent reactions to fix gaseous CO_2 into carbohydrate backbones. Photosynthesis is often simplified into $6CO_2 + 6H_2O$ + light –>

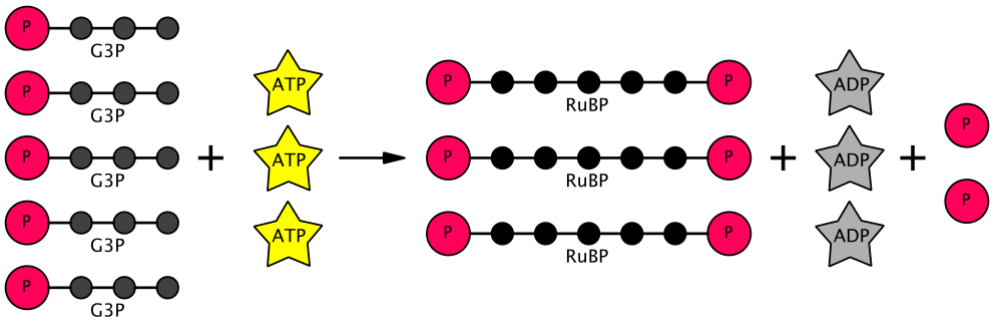
$C_6H_{12}O_6 + 6O_2$. However, the true product is 3-phosphoglycerate that can be used to generate longer carbohydrates like glucose. The starting point of **carbon fixation** is the carbohydrate Ribulose 1,5-bisphosphate. The enzyme Ribulose Bisphospate Carboxylase (**RuBisCO**) captures a CO_2 molecule onto Ribulose 1,5-bisphosphate to generate 2 molecules of 3-phosphoglycerate which can enter the process of **gluconeogenesis** to generate glucose. ATP from the light reactions can then facilitate the conversion of 3-phosphoglycerate to 1,3 bisphosphoglycerate which can be reduced by NADPH to glyceraldehyde-3-phosphate (G3P). G3P can then be used to regenerate Ribulose 1,5-bisphosphate.



1: Carbon fixation by RuBisCO



2: Reduction by NADPH



3: Ribulose ,5-bisphosphate regeneration