

RuBisCO – The Most Important Protein on Earth



What is RuBisCo?

Ribulose-1,5-bisphosphate carboxylase/oxygenase, more simply known as RuBisCO (or rubisco), is a key protein used in photosynthesis. It is the most abundant protein on the planet, and has been described as the most important. It catalyzes (facilitates) the initiation of carbon fixation, or the assimilation of carbon into organic molecules, to be used in the production of sugars, or energy.

What does rubisco do?



Ecobottle Sample

TWF

This section has been removed

Light reaction: Light energy is absorbed by chlorophyll molecules within chloroplasts, which are found inside leaf cells. This raises the energy level of their electrons. Some of this energy is used to

convert the molecule adenosine diphosphate (ADP) into the energy-carrying adenosine triphosphate (ATP) through the addition of a phosphate group. This ATP can carry energy to anywhere in the plant where it's needed and is used to convert CO_2 molecules into sugars. Some energy is used to split water (H_2O) into hydrogen (H) and hydroxide (OH) ions, releasing oxygen. Hydrogen attaches to the chemical compound NADP (nicotinamide adenine dinucleotide phosphate), resulting in NADPH, another energy carrier, which can then be used to convert CO_2 to sugars. Hydroxide ions give one electron to chlorophyll, becoming hydroxyls, which combine to form water.

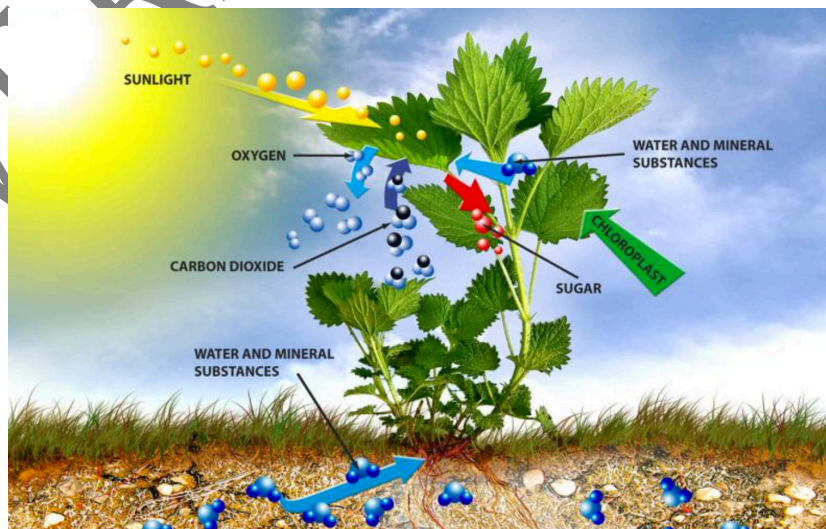


Dark reaction:

Ecobottle Sample

TWF

This section has been removed



Humans (and other animals) rely on the products of photosynthesis (oxygen and sugars) to survive. Without rubisco, such products would not be available.

Some concerns for the future

Ecobottle Sample



This section has been removed

TWF REAL

Reading Comprehension Questions:

1. What process is RuBisCo used in?
2. What
3. What energy source does the light reaction use?
4. What
5. What are the two sources of energy for the dark reaction?
6. What
7. Why is

Access the video via the URL or QR code below to answer questions 8-12.



<https://goo.gl/oX25qm>

8. What
9. Which
10. What happens to the 6-carbon chain?
11. What
12. Out of the twelve G3P's, how many are used to make one molecule of glucose?

Ecobottle Sample



This section has been removed

References

- Allaby, M. (2005). *Oxford Dictionary of Ecology*. New York: Oxford University Press.
- Earth Science Communications Team, NASA. (2017, Jan 28). *Global Temperature*. Retrieved from <http://climate.nasa.gov/vital-signs/global-temperature/>
- Farabe, M.J. (2007) Photosynthesis. In *An On-Line Biology Book* (Chapter 13). Retrieved from <https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookPS.html#Table of Contents>
- Parry, M.A.J., Andralojc, P.J., Khan, S., Lea, P.J., and Keys, A.J. (2002). Rubisco Activity: Effects of Drought Stress. *Annals of Botany* 89: 833-839.
- Salvucci, M.E. and Crafts-Brandner, S.J. (2004). Inhibition of photosynthesis by heat stress: the activation state of Rubisco as a limiting factor in photosynthesis. *Physiologia Plantarum* 120: 179-186.
- United States Geological Survey. (2017, Jan 26). *California Drought*. Retrieved from <https://ca.water.usgs.gov/data/drought/>