

Difference Between Synthesis and Biosynthesis

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Key Difference - Synthesis vs Biosynthesis

Macromolecules are formed by the polymerization of small subunits. Lipids, carbohydrates, proteins, nucleic acids, plastics, fiber, rubber, etc. are some known popular macromolecules. Some macromolecules are natural while some are synthetic. Some are organic compounds while others are not organic. The formation of macromolecules by combining simple or small molecules is referred to as synthesis. Biosynthesis is one way of synthesis. Biosynthesis refers to the formation of organic macromolecules from small molecules within a living organism by enzymatic reactions. These two words, synthesis and biosynthesis, are used more commonly to distinguish artificial and biological formations of macromolecules. Based on it, the key difference between synthesis and biosynthesis is that **synthesis is the artificial or the chemical formation of larger molecules by small molecules** while **biosynthesis is the formation of larger organic molecules from small molecules by the action of enzymes within a living organism**.

What is Synthesis?

In general, the term synthesis is used to refer to the combination of two or more small molecules together to form a new larger molecule. This term is also used to refer the artificial formation of larger molecules. There are different types of synthesis. Chemical synthesis, organic synthesis, total synthesis and convergent synthesis are some of them. All these synthetic processes are driven through a series of chemical reactions.

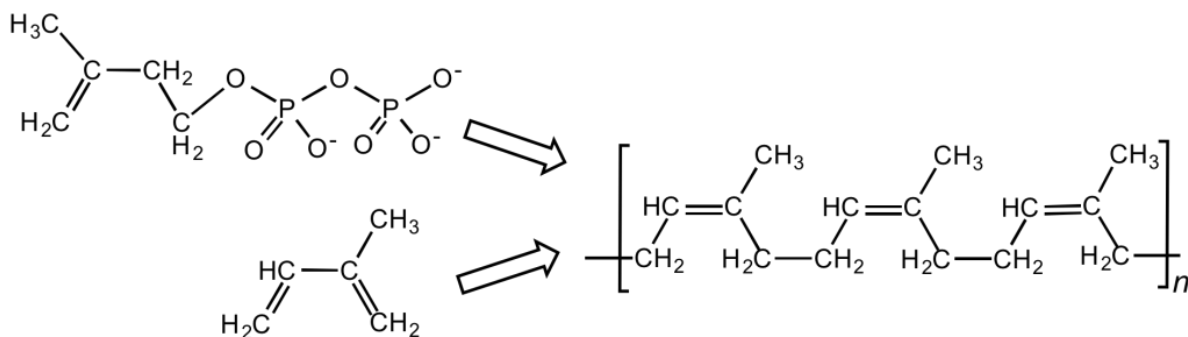


Figure 01: Synthesis of rubber

Plastic is a synthetic polymer composed of several elements such as carbon, hydrogen, oxygen, nitrogen, etc. Plastics can be synthesized by extractants from natural compounds or can be synthetically synthesized. Raw materials and other additives are converted stepwise into a stable [polymer](#) during the synthesis process.

What is Biosynthesis?

Biosynthesis is a process of forming larger organic compounds from small subunits within a living organism. Biosynthesis is mainly done by [enzymes](#). All these reactions are catalyzed by specific enzymes at the physiological state. Biosynthesis is also known as [anabolism](#) since simple compounds are joined together to form macromolecules by enzymes. Some biosynthetic processes have multi-steps while some have direct synthesis processes. Different types of macromolecules are produced within living organisms. Some metabolic pathways occur inside specific organelles. As an example, [photosynthesis](#) occurs inside the chloroplast. The light energy is converted into chemical energy during photosynthesis. The larger molecule glucose is biosynthesized from water and carbon dioxide by photosynthetic organisms.

The process of biosynthesis is feasible when the prerequisites such as precursor compounds, chemical energy in the form of ATP, enzymes, and [cofactors](#) are available. When they are present, monomers are joined by specific bonds with each other and make polymers inside the cells. Enzymes act as biological catalysts and lower the activation energy of the biological reactions. Cofactors assist enzymes in catalyzing the reaction. High energy molecules such as ATP provide energy for unfavorable reactions to proceed. Precursors serve as starting molecules for polymer formation.

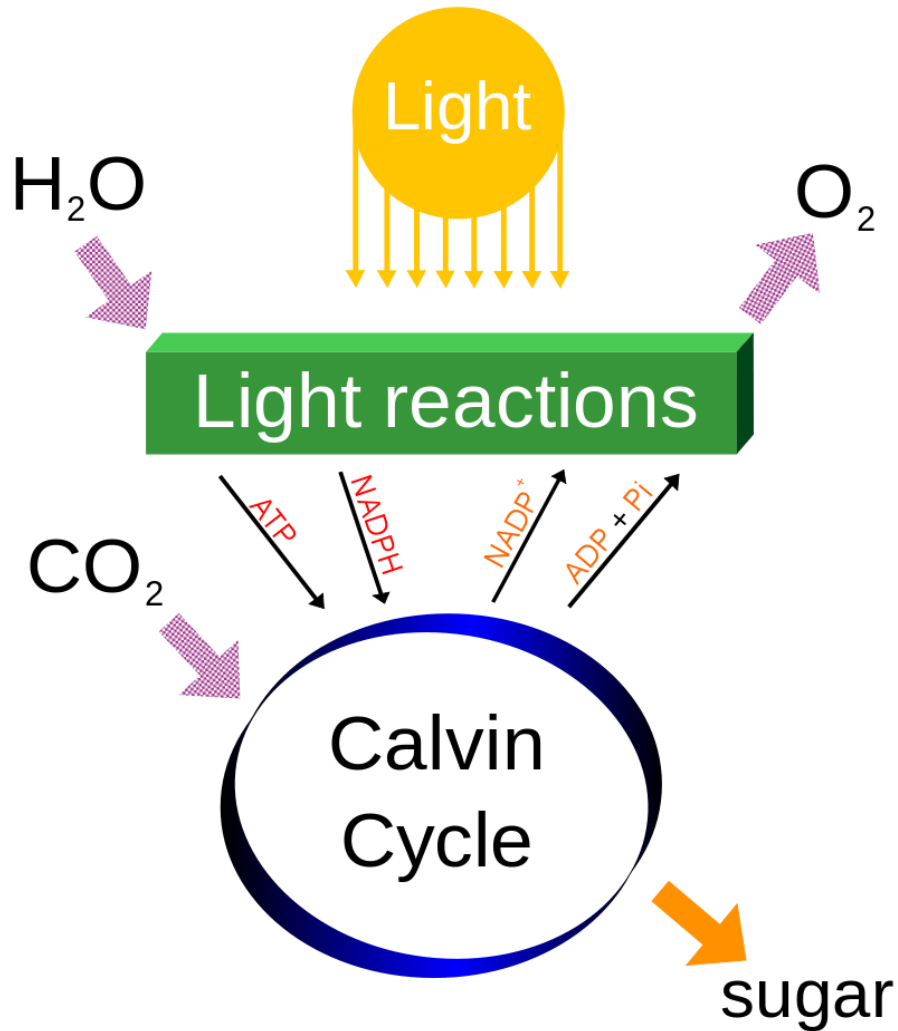


Figure 02: Photosynthesis

Photosynthesis, chemosynthesis, amino acid synthesis, protein biosynthesis, DNA synthesis, RNA synthesis, ATP synthesis are several biosynthetic processes occurring in living organisms

What are the similarities between Synthesis and Biosynthesis?

1. Synthesis and biosynthesis create macromolecules from simple subunits.
2. Both are completed by series of reactions.

What is the difference between Synthesis and Biosynthesis?

Synthesis vs Biosynthesis	
Synthesis refers to the formation of macromolecules from small molecules artificially.	Biosynthesis refers to the formation of larger organic compounds from small molecules within a living organism.
Process	
Synthesis is artificial and chemical.	Biosynthesis is biological and catalyzed by enzymes.
Resulting Polymers	
Synthesis can result in polymers which are organic or non-organic.	Biosynthesis is biological and catalyzed by enzymes.
Occurrence	
Synthesis occurs outside living organisms.	Biosynthesis occurs within a living organism.

Summary - Synthesis vs Biosynthesis

Synthesis is the formation of something complex or coherent by combining simpler things. This is done artificially, outside the living organism. Biosynthesis is the process which creates larger organic compounds from small subunits in a living organism. Biosynthesis is usually aided by enzymes. This is the main difference between synthesis and biosynthesis.

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