# Enzymes

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**Definition:**

Enzymes are biological catalyst that increases the rate of chemical reaction without itself being changed in the overall process. The term "Enzyme" was coined by FW Kuhn. "Urease" was established as the first enzyme to be isolated and crystallized in 1926. Except a few Ribozymes, all the enzymes are proteins. All the catalytic activity of an enzyme is lost once the enzyme lost its integrity and dissociate into amino acids. Therefore, primary, secondary and tertiary structures of the enzymes are very much essential for their proper functioning. Some enzymes does not require any external chemical groups other than their respective amino acids while others require one or more inorganic or organic components-

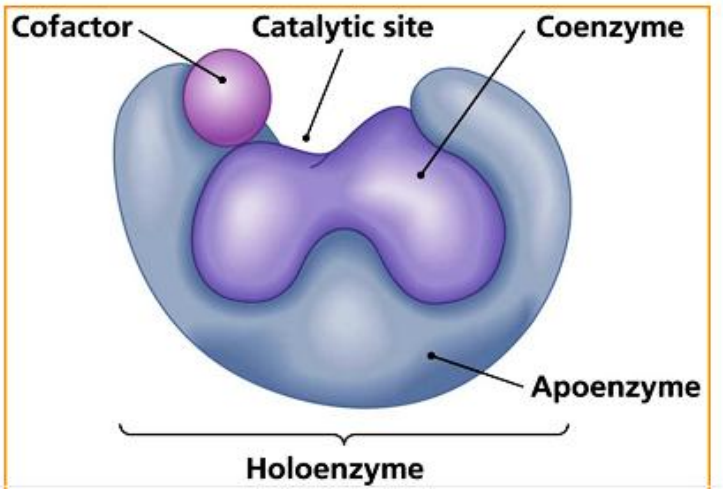
**Cofactor:** A cofactor is a non-protein chemical compound or metallic ion ($Cu^{2+}$, $Fe^{2+}$, $Mg^{2+}$, $Zn^{2+}$ etc) which can be considered as "helper molecules" that assist in biochemical transformations.

**Coenzyme:** Coenzymes are organic molecules and quite often bind loosely to the active site of an enzyme and aid in substrate recruitment. These are carriers of some specific functional groups. For example Coenzyme A transfers Acyl groups and Thiamine Pyrophosphate carries Aldehyde groups.

Some enzymes require both coenzymes and cofactors for activity.

**Prosthetic group:** The non-proteinaceous part of an enzyme is termed as prosthetic group. It is normally very tightly or covalently bound to enzymes.

**Holoenzyme:** A complete catalytically active enzyme which is bound with coenzymes and/or metal ions. The protein part of the holoenzyme is termed as **Apoenzyme.**




## Nomenclature and classification of enzymes:

*Enzymes* are named by adding the suffix *-ase* to the name of the substrate that they modify (Urease and Tyrosinase), or the type of reaction they catalyze (dehydrogenase, decarboxylase). *Enzymes* are classified into seven categories according to the type of reaction they catalyze-

1) **Oxidoreductases:** Oxidoreductases are the enzymes concerned with biological oxidation and reduction and therefore participate in respiration and fermentation processes.

2) **Transferases:** Transferases are enzymes that catalyze the transfer of a group of atoms, such as amine, carboxyl, carbonyl, methyl, acyl, glycosyl, and phosphoryl from a donor substrate to an acceptor compound.

3) **Hydrolases:** It is a class of enzyme that commonly perform as biochemical catalysts that use water to break a chemical bond, with biological roles ranging from energy production to cell signalling.

4) **Lyases:** Lyases are enzymes that promote breaking of various chemical bonds by means other than hydrolysis.

5) **Isomerase:** Any one of a class of enzymes that catalyze reactions involving a structural rearrangement of a molecule.

6) **Ligase:** It is an enzyme that can catalyze the joining of two large molecules by forming a new chemical bond.

7) **Translocases:** Catalyse the movement of ions or molecules across membranes or their separation within membranes.