

ENZYMES

What are Enzymes?

The term “enzyme” is derived from a Greek word “enzymos” which means “in the cell or ferments”. It is a misconception with many that enzymes are living organisms. In fact enzymes are present in living organisms but are themselves not living organisms.

The enzymes are large protein molecules made up of a long chain of amino acids which are produced by living cells in plants, animals and micro-organisms such as bacteria and fungi. Enzymes therefore possess the properties characteristic of proteins: they are denatured by heat, are precipitated by ethanol or high concentrations of inorganic salts like ammonium sulfate, and do not dialyze (pass through semi permeable membranes). Many enzymes consist of a protein combined with a low molecular weight organic molecule called a coenzyme. The protein portion in this instance is referred to as the apoenzyme. When united, the two form the complete enzyme, identified as the holoenzyme, as shown below:

Apoenzyme	+	coenzyme	→	holoenzyme
Inactive Protein		Inactive Organic molecule		Active
High- molecular weight		Low- molecular weight		
Nondialyzable		Dialyzable		

In some instances the non protein portion of an enzyme may be a metal, e.g. iron in the enzyme catalase. The metal may be tightly bound to the protein or loosely bound and easily dissociable, depending on the specific enzyme. Many enzymes require the addition of metal ions (Mg^{2+} , Mn^{2+} , Fe^{2+} , Zn^{2+} , etc.) in order to be “activated”. It is assumed that these metal ions function in combination with the enzyme protein, and they are regarded as inorganic coenzymes, or cofactors. Sometimes, both a cofactor and a coenzyme (organic) are required before an enzyme becomes active.

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Classification of Enzymes

The type of chemical reaction catalyzed is the basis for the classification and naming of enzymes, because it is this specific property that distinguishes one enzyme from another. Two names are recommended for each enzyme, a working or trivial name and a systematic name.

Major classes of enzymes:

Class No.	Class	Catalytic Reaction
1	Oxidoreductases	Electron-transfer reactions (transfer of electrons or hydrogen atoms)
2	Transferases	Transfer of functional groups (functional groups include phosphate, amino, methyl, etc.)
3	Hydrolases	Hydrolysis reactions (addition of a water molecule to break a chemical bond)
4	Lyases	Addition to double bonds in a molecule as well as non hydrolytic removal of chemical groups
5	Isomerases	Isomerization reactions (reactions in which one compound is changed into an isomer)
6	Ligases	Formation of bonds with cleavage or breakage of ATP(adenosine triphosphate)

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