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U6y - Sem-VI

MJC - 11(T)

Unit - 2

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Characteristics of Enzymes

The characteristic features of enzymes are described below:

a. Catalytic efficiency: Enzymes are very efficient catalysts. They speed up reactions up to ten million times compared to the uncatalysed reactions. In general, very small quantity of any enzyme is needed for catalysing a chemical reaction.

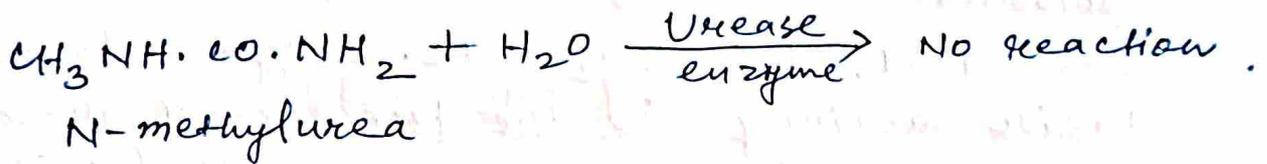
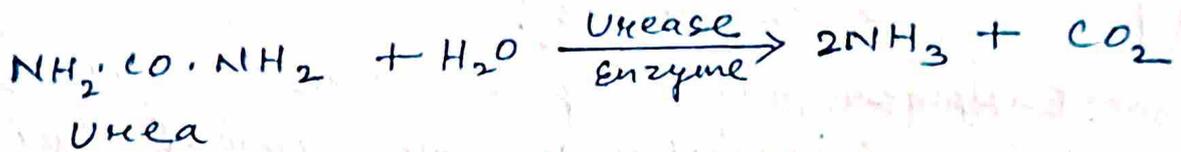
for eg - the enzyme renin coagulates over a million times its own weight of milk proteins during cheese making.

b. Specificity: Enzymes are highly specific in their action. Each enzyme catalyses a particular reaction.

for eg - An enzyme called Invertase can break up sucrose, a 12-carbon unit disaccharide into glucose and fructose (each 6-C units), but fails to break up a very similar disaccharide maltose.

- Maltose requires another enzyme called maltase for this purpose.
- The enzyme Urease hydrolyses urea to NH_3 and CO_2 , but it does not hydrolyse N-methylurea which has a similar structure.

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N.B. : specificity of enzymes is due to their shapes and the shape/size of the cavity on the surface of the substrate.

[c] Effect of temperature:

In general, the rates of all chemical reactions increases on increasing the temperature.

But, the rate of an enzyme-catalysed reaction first increases, shows a maximum at about $35-37^\circ\text{C}$, and then decreases at higher temperatures. i.e. work under mild conditions.

[d] Effect of pH:

The effect of pH on the rate of enzyme reaction is complex. The rate of an enzyme-catalysed reaction usually passes through a maximum at an optimum pH. At higher or lower pH than this optimum pH, the enzymes tend to get denatured, and therefore lose their activity.

So, pH is specific for each enzymes.

[e] Presence of electrolytes and ultraviolet rays.

Enzymes lose their activity in the presence of electrolytes or when exposed to the UV radiations. This is because enzymes get denatured in the presence of electrolytes or ultraviolet rays.

[7.] Enzyme Inhibitors;

Enzymes are very sensitive to catalytic poisons (inhibitors). Some typical poisons are HCN, H₂S, CS₂, etc. Enzymes lose their activity in the presence of these substances because these molecules tend to get absorbed on the surface of enzyme strongly.

[8.] Effect of metal ions and simple organic molecules;

Most enzymes are associated with some non-protein components required for their activity. These non-protein components are called prosthetic groups.

Prosthetic groups may be metal ions or smaller organic molecules called coenzymes.

Some of the metal ions involved are those of Zn, Mg, Mn, Fe, Cu, K and Na.

Many of the co-enzymes are derived from vitamins, such as thiamine, niacin, riboflavin etc.