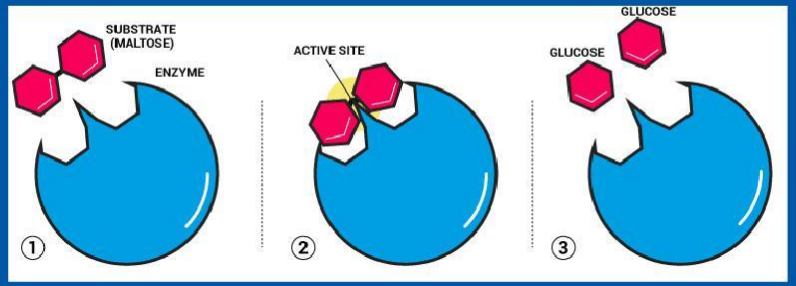
ENEZYMES-I

MISSION MBBS | NEET 2024

BIOMOLECULES - L6



PUSHPENDU SIR

CLASS 11 | ZOOLOGY

MISSION MBBS

MONDAY TO FRIDAY
4 PM - 8 PM

PUSHPENDU SIR	SACHIN SIR	VIVEK SIR	PANKHURI MA'AM	ANUSHRI MA'AM
ZOOLOGY	ZOOLOGY	CHEMISTRY	BOTANY	PHYSICS

Take the Aakash BYJU'S All India NEET Mock Test 2022

- India's largest NEET mock test
- Self-Assessment from additional sample papers and detailed solutions
- Based on NEET 2022 Pattern
- All India Rank (AIR) Projection
- Designed by Aakash BYJU'S experts

Registration Date
8th June onwards
Exam Date and Time
10th July
2:00 to 5:20pm
Test analysis on
11th July

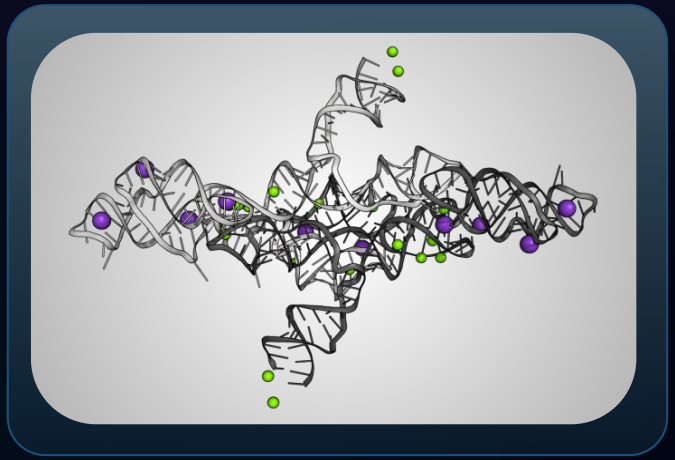
Register Now

(Link in Description)

Enzymes

Enzymes

- All enzymes are **proteins**
  - **Exception**: Ribozymes (RNA Enzymes)



Enzymes

- Biological or Organic catalysts
  - Catalyze reaction
  - Not consumed in reaction

Enzymes

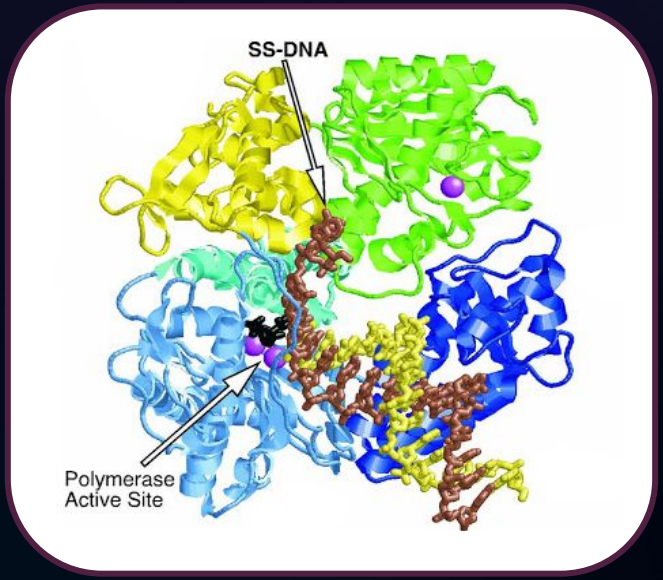
Biological or **Organic catalysts**

- **Catalyze reaction**
- **Not consumed in reaction**
- **Highly specific in action**
  - Due to the presence of active site

Key For the Lock!

Active Site

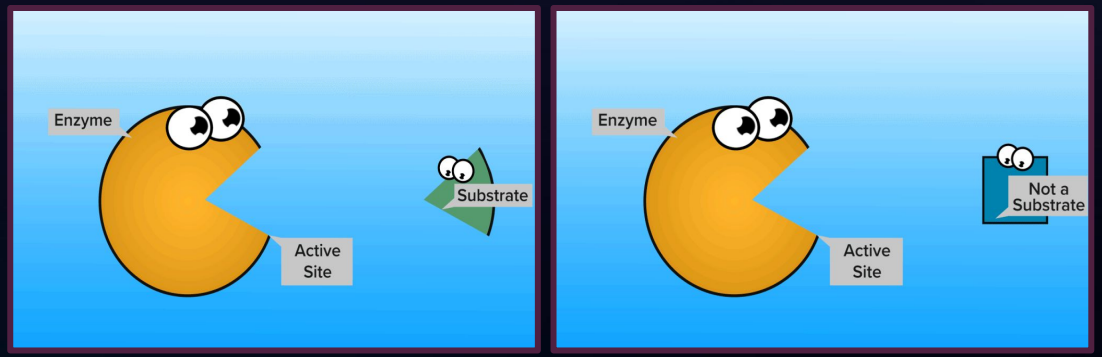
- **Crevice** or **pocket** in their structure for binding the substrate



DNA Polymerase

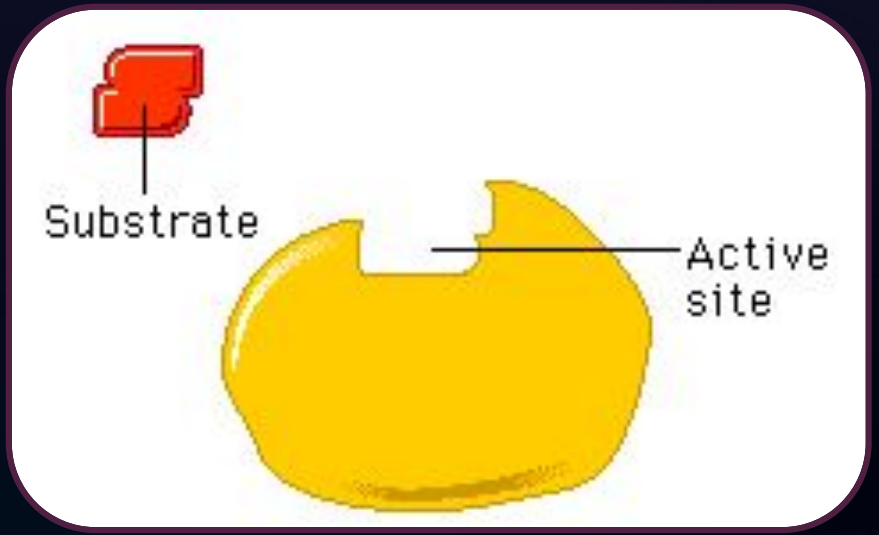
Active Site

- **Specific** for substrate



Active Site

- **Catalyse reactions** at a high rate



Enzymes are Our Friends!

Adds taste to Your Food!

Enzyme: Amylase
Location: Saliva in the mouth
Function: Starch digestion

Gives you Cheese!

Enzyme: Chymosin
Function: Coagulation of milk

Wine Production

Enzyme: Alcohol dehydrogenase
Location: Yeast
Function: Fermentation

Eases Your Work!

Enzyme: Lipases
Location: Laundry Detergent
Function: Oil-stain removal

Cleans up the waste!

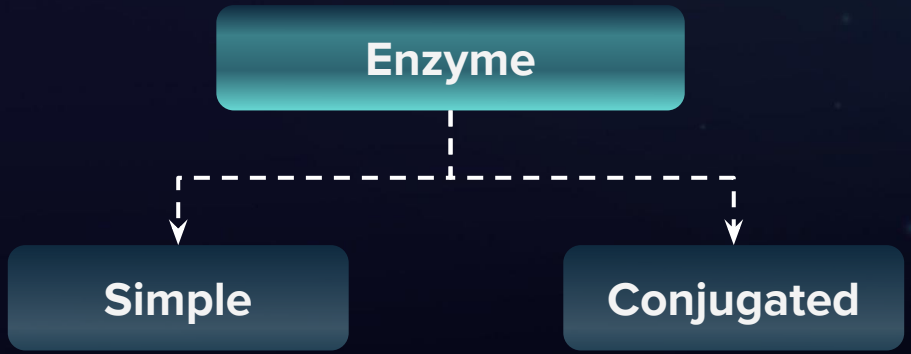
Enzyme: Microbial peroxidases
Location: Microbes
Function: Toxic compound removal

Enzymes Vs Inorganic Catalysts

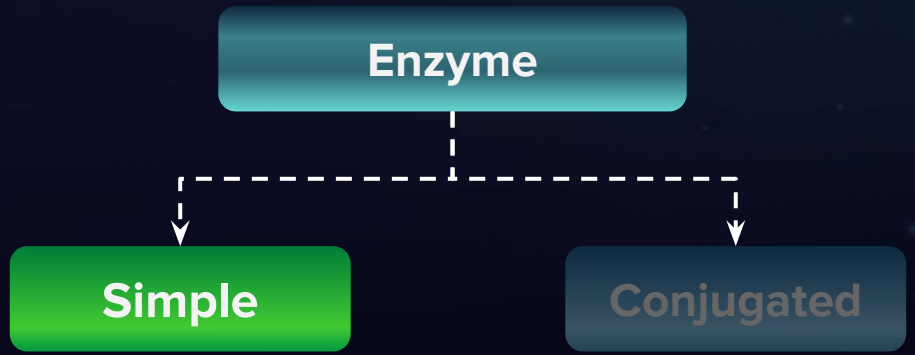
	Enzymes	Inorganic Catalysts
1.	Proteins	Metal ions or complex molecules
2.	Most of them are damaged at high temperatures (>40 degree celsius)	Work efficiently at high temperatures and pressures
3.	Example: Lipases, Chymosin, etc.	Example: Platinum, Palladium,etc.

Types of Enzymes

Types of Enzymes

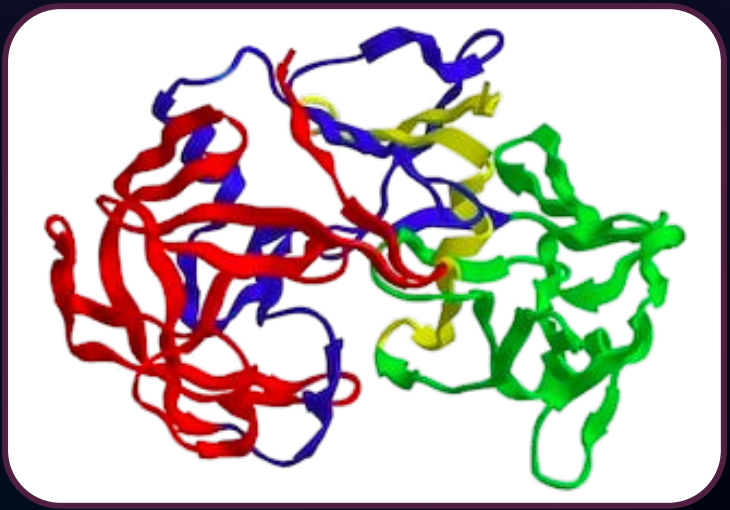


Types of Enzymes



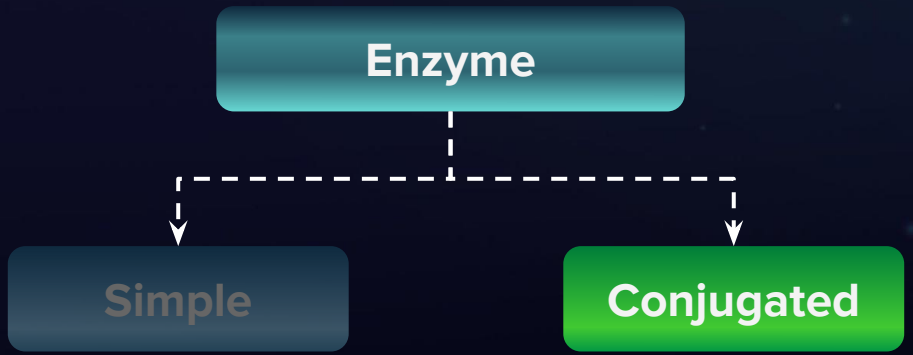
Simple Enzymes

Simple enzymes consists of **only amino acids (protein)**

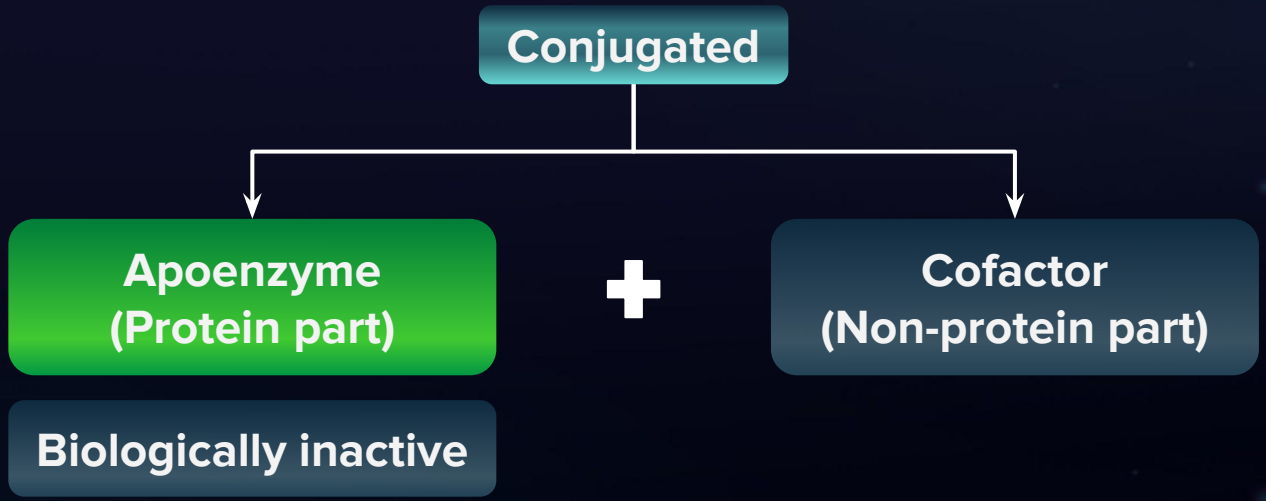


Pepsin

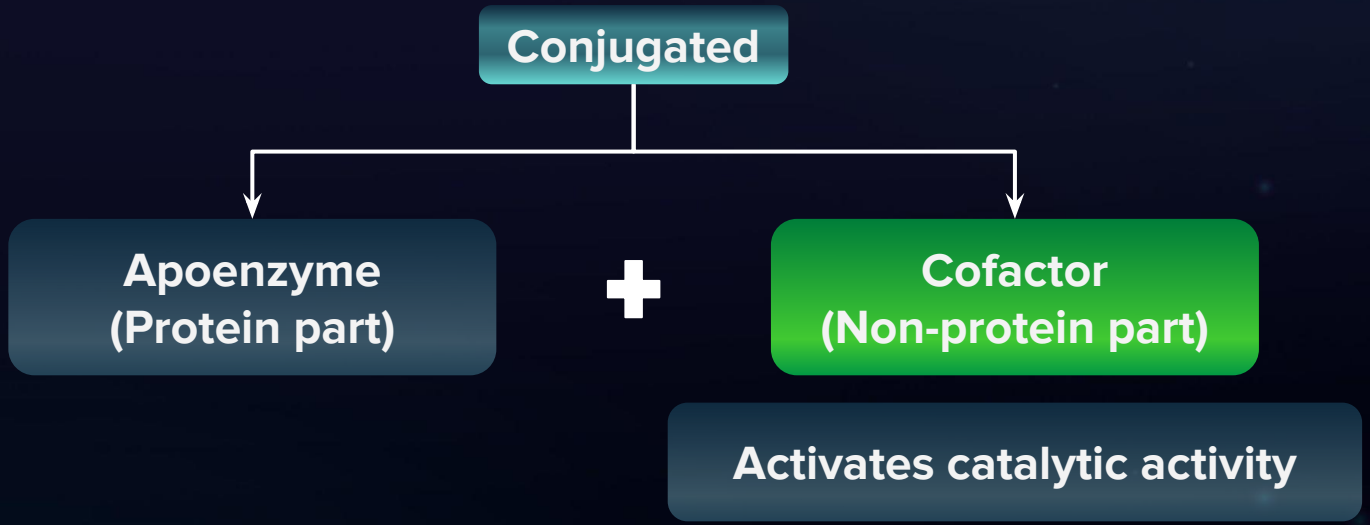
Types of Enzymes



Conjugated Enzymes



Conjugated Enzymes



Conjugated Enzymes

Conjugated

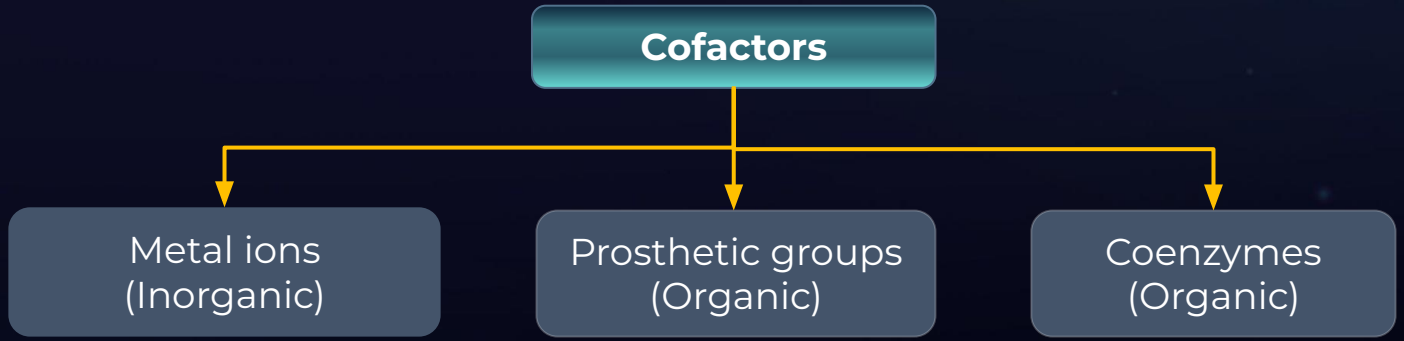
Holoenzyme: Apoenzyme + Cofactor
Where apoenzyme is the protein part and cofactor is the non-protein part

Apoenzyme (Protein part) + Cofactor (Non-protein part)

Holoenzyme: Apoenzyme + Cofactor

Complete & Biologically active

Types of Cofactors



Types of Cofactors

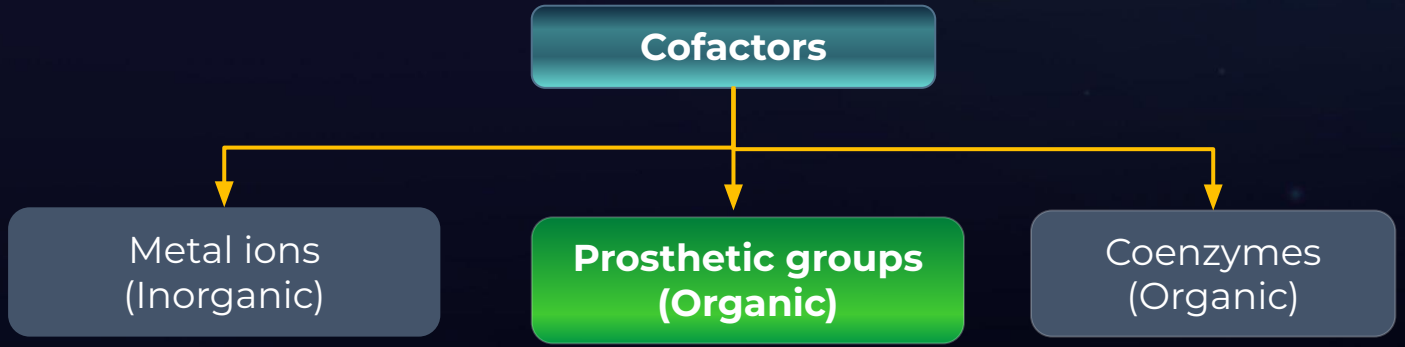
Cofactors

- **Metal ions (Inorganic)**
- Prosthetic groups (Organic)
- Coenzymes (Organic)

- Zn tightly bound to carbonic anhydrase

- **Zn tightly bound to carbonic anhydrase**
- **Coordination Bond**

Types of Cofactors

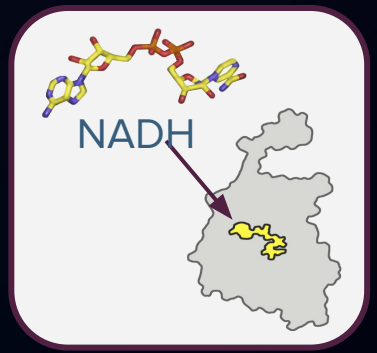


- Ex- Haem in the enzymes catalase and peroxidases

Types of Cofactors

Cofactors

- Metal ions (Inorganic)
- Prosthetic groups (Organic)
- **Coenzymes (Organic)**
  - Ex. Vitamins, in dinucleotides NAD and NADP have vitamin niacin



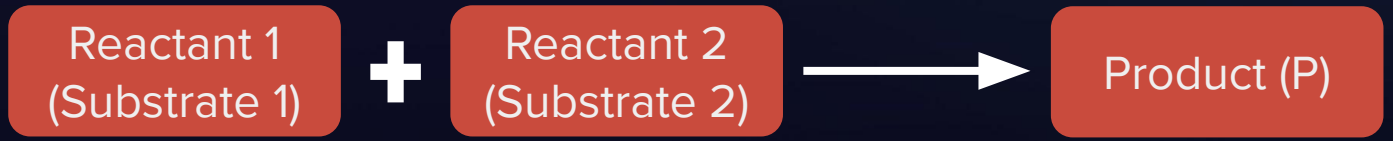
NADH bound to lactate dehydrogenase

Mechanism of Action

Mechanism of Action

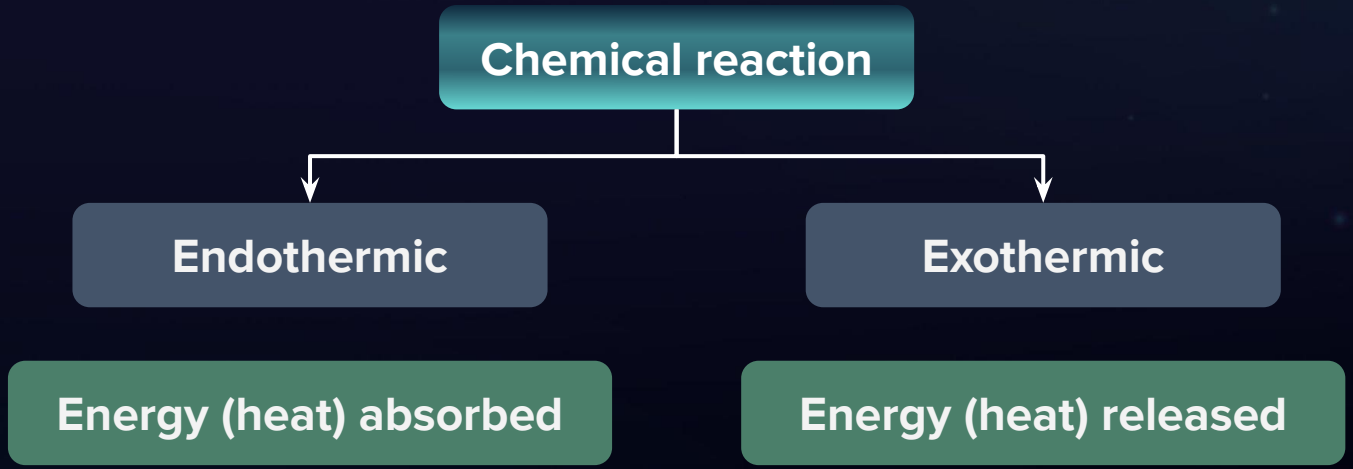
Every molecule has some energy stored in it in the form of bonds which is known as their potential energy.

How Enzymes do it!



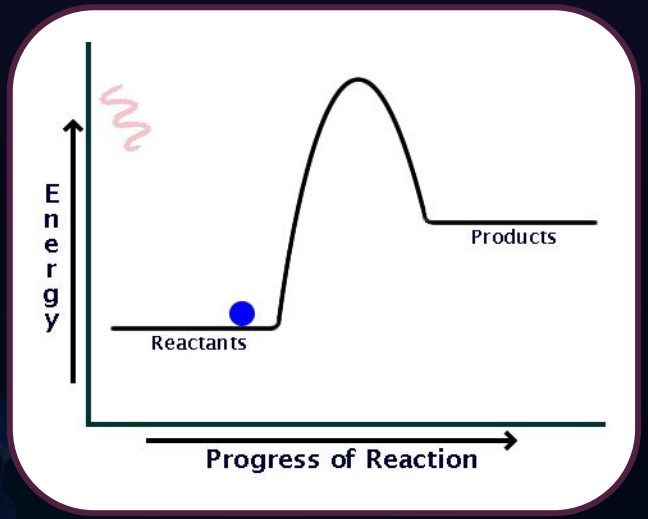
Chemical reaction: Process of formation or breaking of bonds

Recall! Types of Reaction

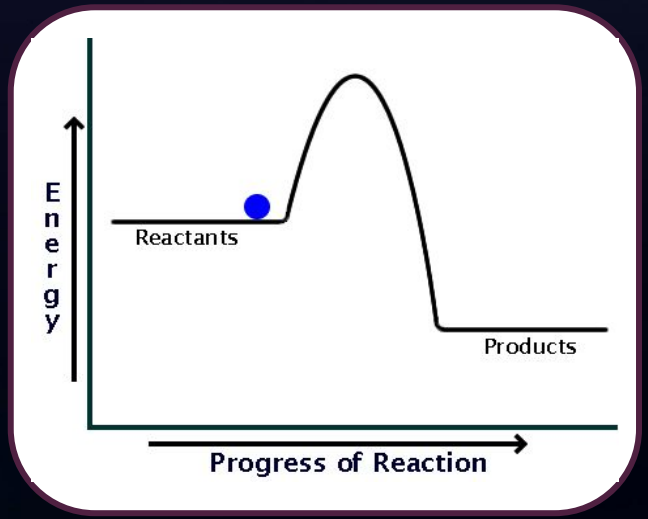


Reactions Without Enzymes

Reactant 1 + Reactant 2 → Product (P)



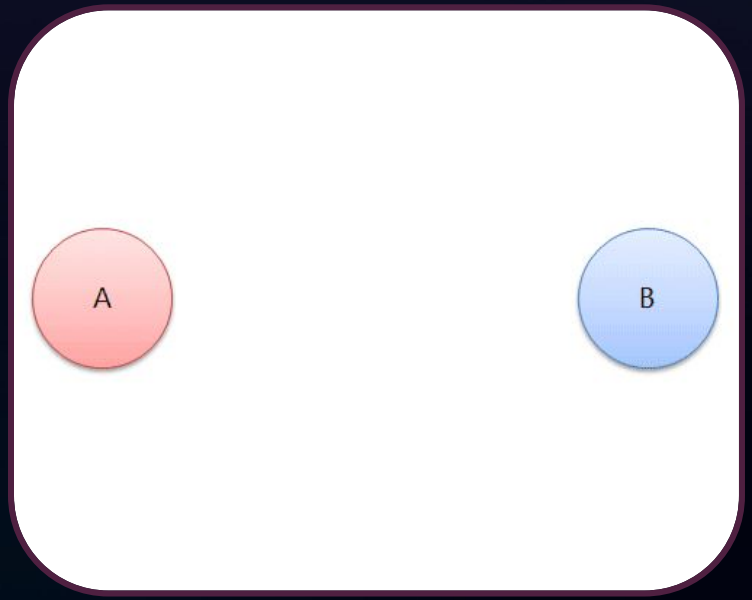
Endothermic reaction



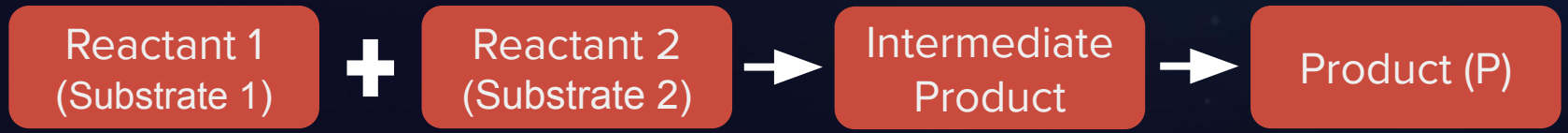
Exothermic reaction

A Chemical Reaction

Reactant 1 (Substrate 1) + Reactant 2 (Substrate 2) → Intermediate Product → Product (P)



A Chemical Reaction



Transition state: Intermediate product before the product is formed

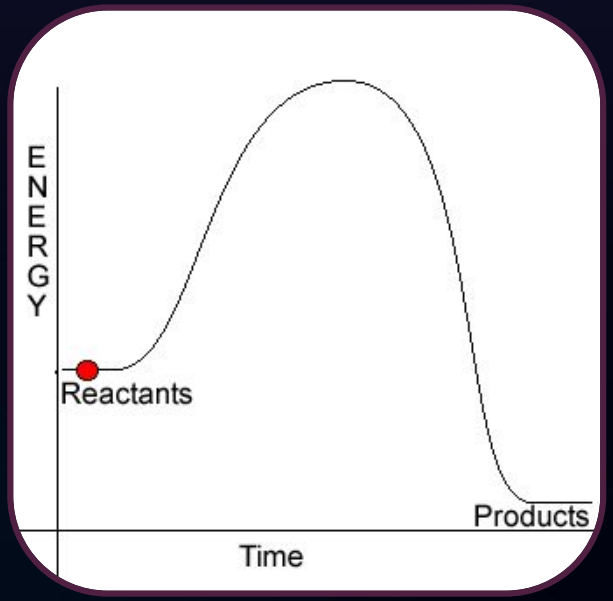
Activation Energy

The difference in average energy content of substrate from that of the transition state is called the activation energy.

When Enzymes Are Present!

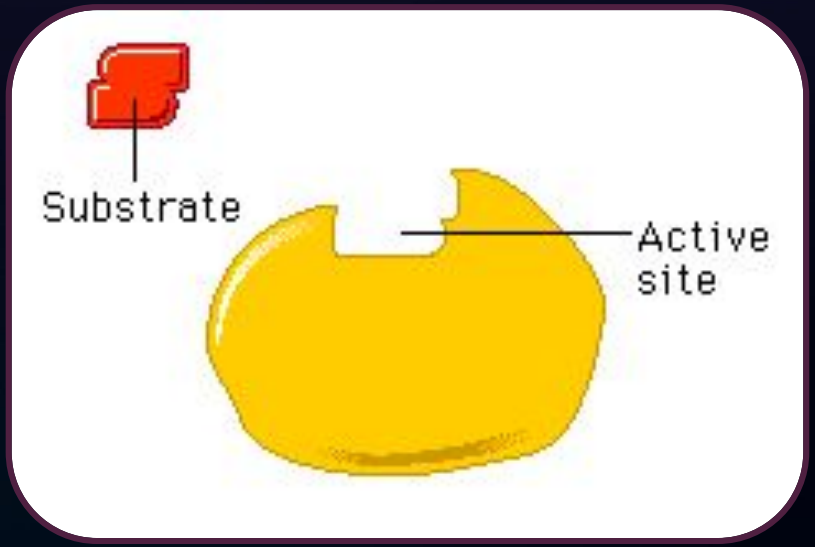
Enzyme (E)

Reactant 1 + Reactant 2 → Product (P)



Recall! Active Site

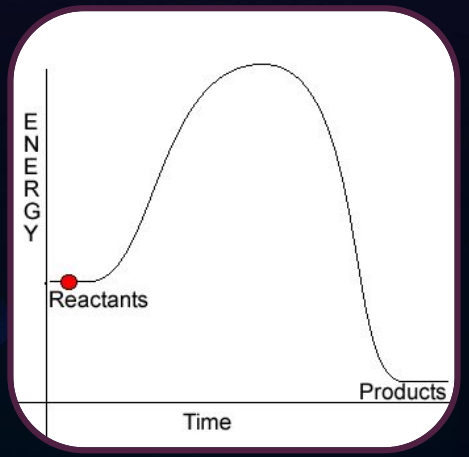
- **Crevice** or **pocket** into which the substrate fits
- **Catalyse** reactions at a high rate



Mechanism of Action

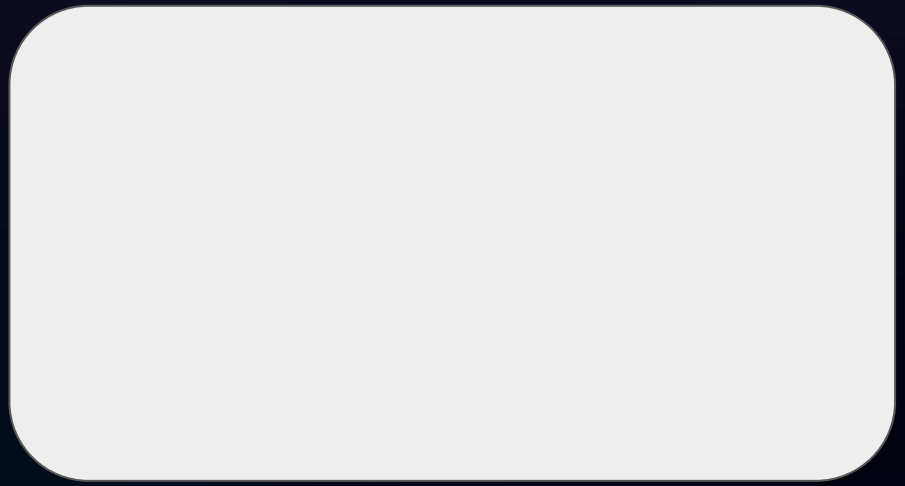
Substrate + Enzyme (E) → E-S Complex

Transition state structure



Mechanism of Action

Substrate + Enzyme (E) → E-S Complex → E-P Complex

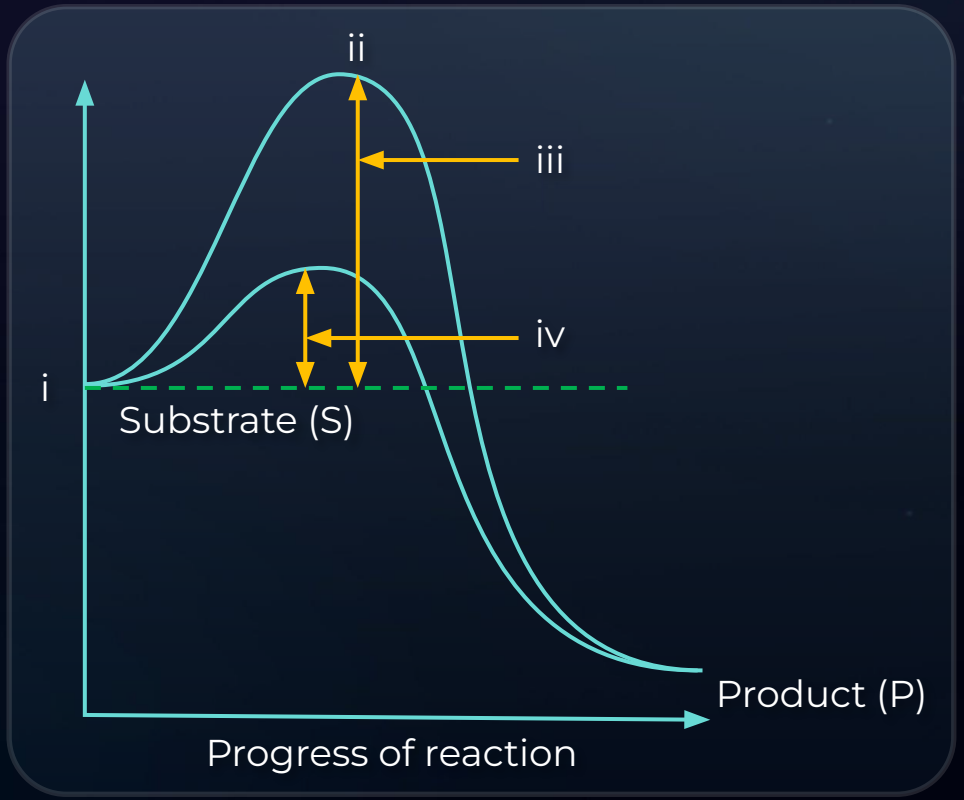


Mechanism of Action

E-S Complex → E-P Complex → Product (P) + Enzyme (E)

Let us solve a Question

Study the following graph on the concept of activation energy given below, select the options correctly labelled as i, ii, iii, iv.



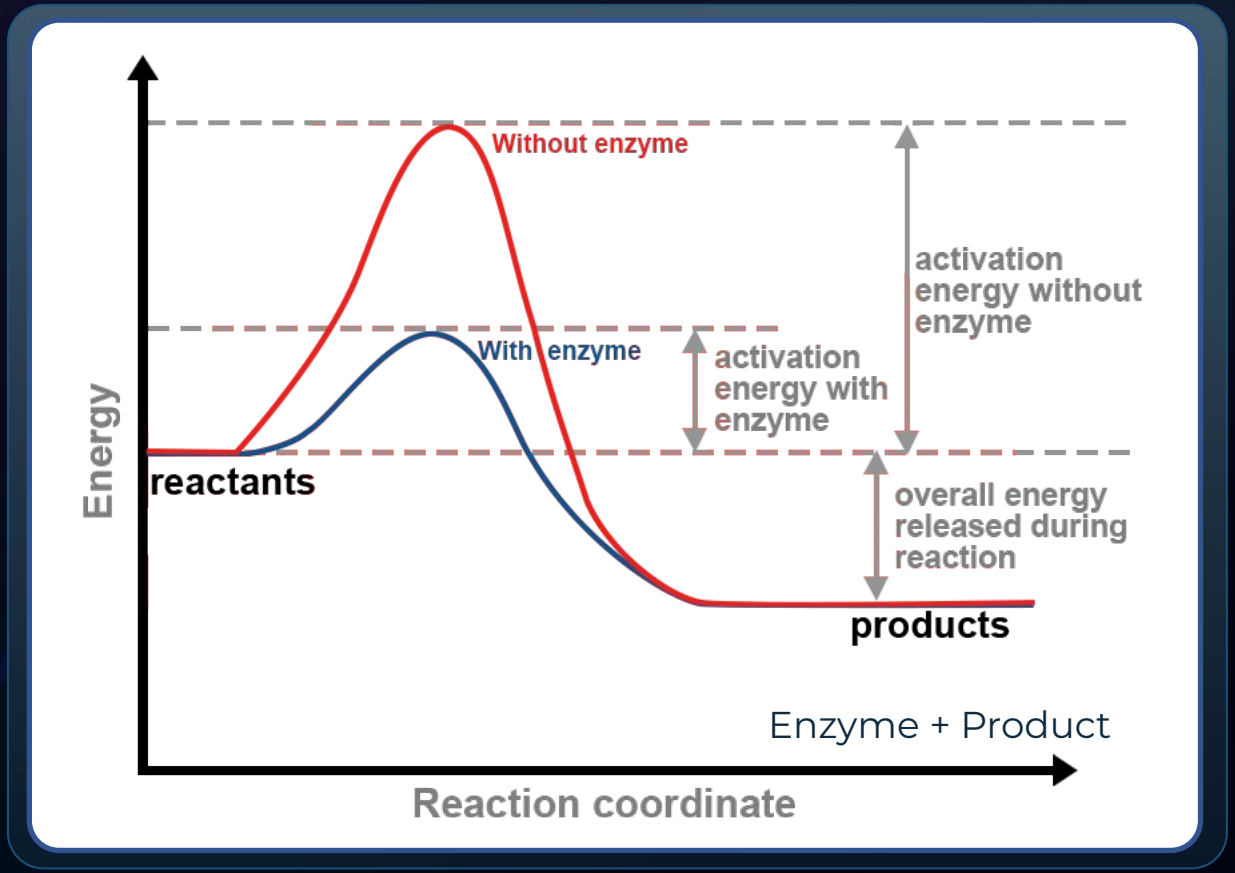
Study the following graph on the concept of activation energy given below, select the options correctly labelled as i, ii, iii, iv.

	i	ii	iii	iv
A	Transition state	Potential energy	Activation energy without enzyme	Activation energy with enzyme
B	Kinetic Energy	Potential energy	Activation energy without enzyme	Activation energy with enzyme
C	Potential energy	Transition state	Activation energy without enzyme	Activation energy with enzyme
D	Potential energy	Transition state	Activation energy with enzyme	Activation energy without enzyme

Study the following graph on the concept of activation energy given below, select the options correctly labelled as i, ii, iii, iv.

	i	ii	iii	iv
A	Transition state	Potential energy	Activation energy without enzyme	Activation energy with enzyme
B	Kinetic Energy	Potential energy	Activation energy without enzyme	Activation energy with enzyme
C	**Potential energy**	**Transition state**	**Activation energy without enzyme**	**Activation energy with enzyme**
D	Potential energy	Transition state	Activation energy with enzyme	Activation energy without enzyme

Key Takeaway



Summary

What we have learned so far!

Enzymes and its properties

Cofactors of enzymes
- Prosthetic groups
- Coenzymes

Mechanism of enzyme action

Next Class!

Topics for Next Class

Factors affecting the rate of enzyme

- Temperature
- pH
- Substrate concentration
- Reactant concentration

Inhibition of enzymatic action

- Competitive inhibition
- Non-competitive inhibition

Past Year Questions

A non-proteinaceous enzyme is

(NEET-2016-II)

A deoxyribonuclease

B lysozyme

C ribozyme

D ligase

A non-proteinaceous enzyme is

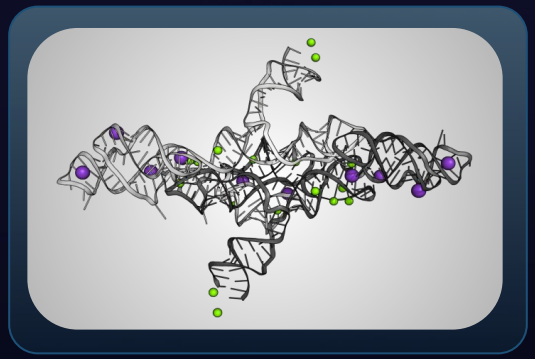
(NEET-2016-II)

A deoxyribonuclease

B lysozyme

C **ribozyme**

D ligase



- Majority of enzymes are proteins; however, certain RNA molecules are known to have the catalytic ability, these are called **ribozymes**.
- Ribozymes are enzymes that have the ability to catalyse specific biochemical reactions during **protein synthesis.**

The essential chemical components of many coenzymes are :

(NEET-2013)

A Proteins

B Nucleic acids

C Carbohydrates

D Vitamins

The essential chemical components of many coenzymes are :

(NEET-2013)

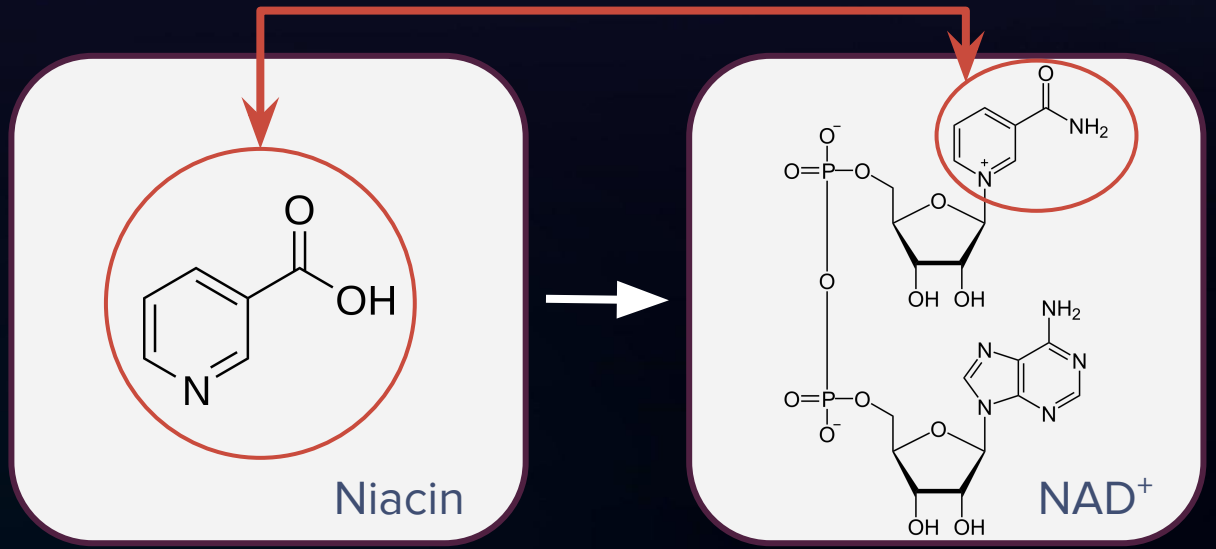
A Proteins

B Nucleic acids

C Carbohydrates

D **Vitamins**

- **Coenzymes**: Loosely attached organic parts of conjugated enzymes which are generally **derivatives of vitamins**
- Example: Coenzyme Nicotinamide Adenine Dinucleotide(NAD) and NADP contain the vitamin niacin



Which one of the following statements is correct with reference to enzymes?

(NEET-2017)

A. Apoenzyme = Holoenzyme + Coenzyme

B. Holoenzyme = Apoenzyme + Coenzyme

C. Coenzyme = Apoenzyme + Holoenzyme

D. Holoenzyme = Coenzyme + Co-factor

Which one of the following statements is correct with reference to enzymes?

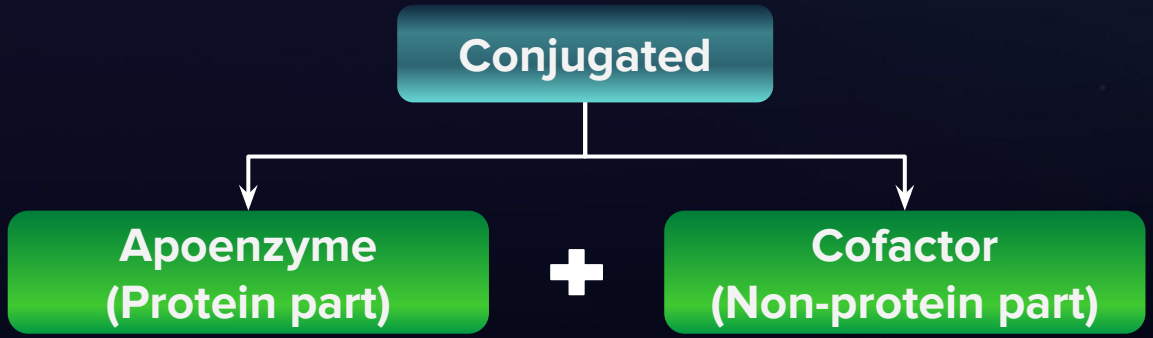
(NEET-2017)

A. Apoenzyme = Holoenzyme + Coenzyme

B. **Holoenzyme = Apoenzyme + Coenzyme**

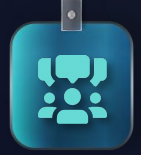
C. Coenzyme = Apoenzyme + Holoenzyme

D. Holoenzyme = Coenzyme + Co-factor



Holoenzyme: Apoenzyme + Cofactor

Complete & Biologically active



Cofactors

Metal ions (Inorganic)

- Zn tightly bound to carboxypeptidases

Prosthetic groups (Organic)

- Ex- Haem in the enzymes catalase and peroxidases

Coenzymes (Organic)

- Ex. Vitamins, in dinucleotides NAD and NADP have vitamin niacin


Keep
Learning!