



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai



DEPARTMENT OF CARDIO PULMONARY PERFUSION  
CARE TECHNOLOGY

**COURSE NAME : BIOCHEMISTRY**

**TOPIC : ENZYME INHIBITION**



# Enzyme Inhibitor



- Any substance that can diminish the velocity of an enzyme catalyzed
- These include drugs, antibiotics, poisons, and anti-metabolites.
- Useful in understanding the sequence of enzyme catalyzed reactions, metabolic regulation, studying the mechanism of cell toxicity produced by toxicants.
- Forms the basis of drug designing.



# Enzyme Inhibitors



Blocking an enzyme's activity can kill a pathogen or correct a metabolic imbalance.



Many **medications** are enzyme inhibitors.



Enzyme inhibitors are also used as **herbicides** and **pesticides**.

## EXAMPLE:

- Another example of competitive inhibition is **protease inhibitors**.

- They are a class of **anti-retroviral drugs** used to treat HIV.

- The structure of the drug **ritonavir** (say *ri-TAHN-a-veer*) **resembles the substrate of HIV protease**, an enzyme required for HIV to be made.



# Types of Enzyme Inhibitor

- Reversible inhibitors
- Irreversible inhibitors



# Reversible inhibitors can be classified into :

- **Competitive**
- **Non-competitive**
- **Un-competitive**



# Two Types of Enzyme Inhibitors



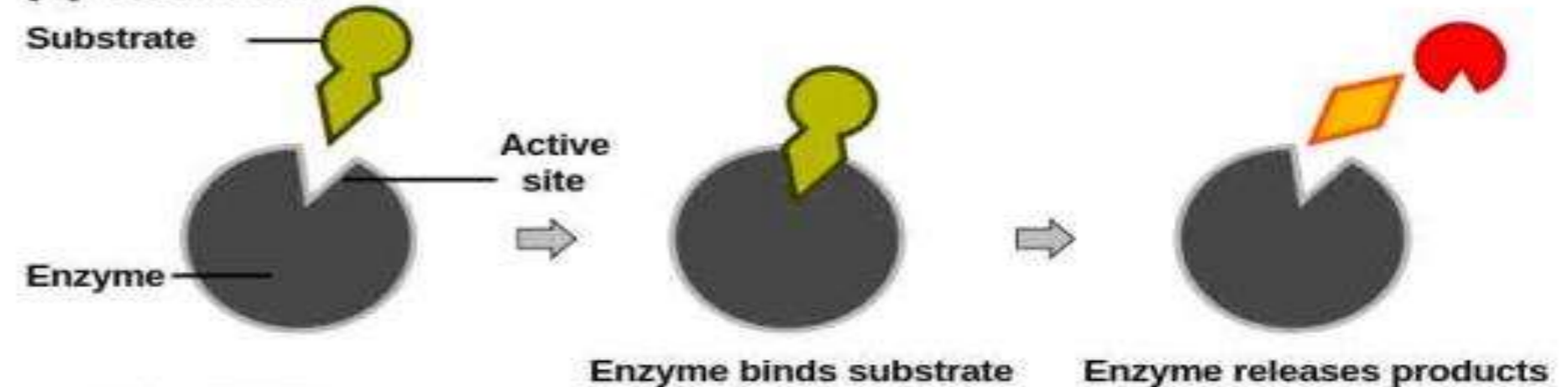
## 1. Competitive inhibitor

Chemicals that resemble an enzyme's normal substrate and compete with it for the active site.

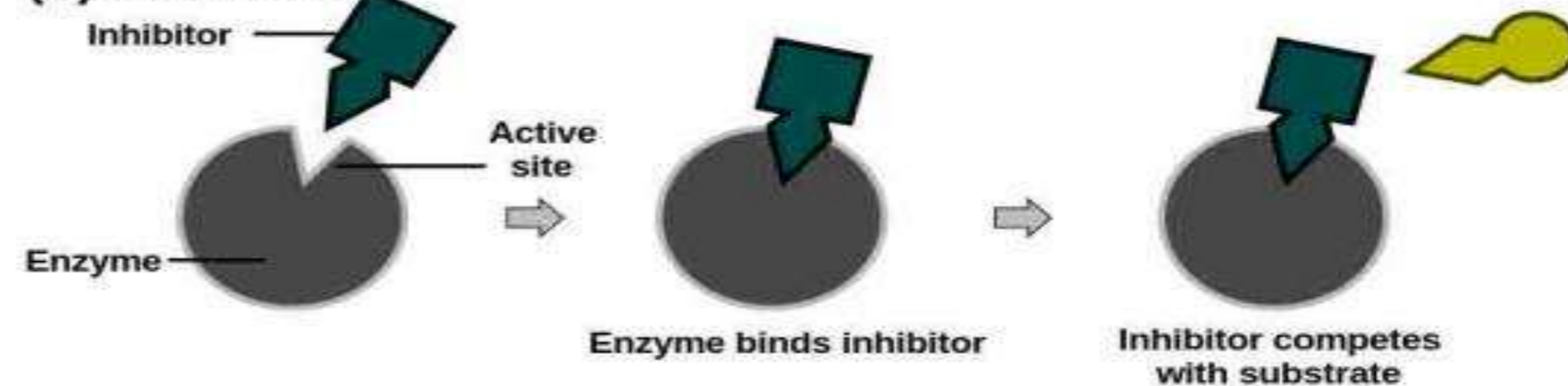
Reversible depending on concentration of inhibitor and substrate.



(a) Reaction

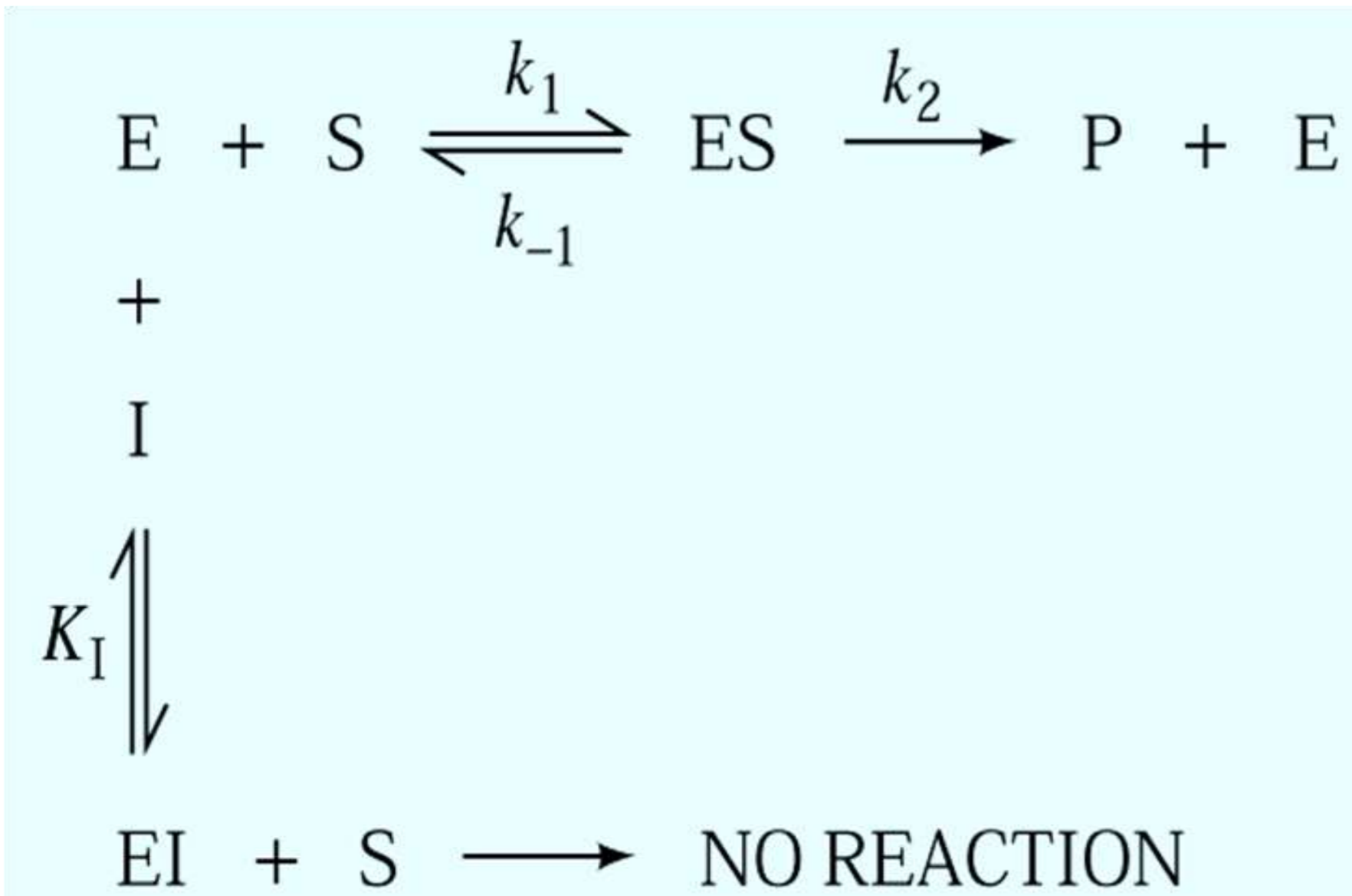


(b) Inhibition

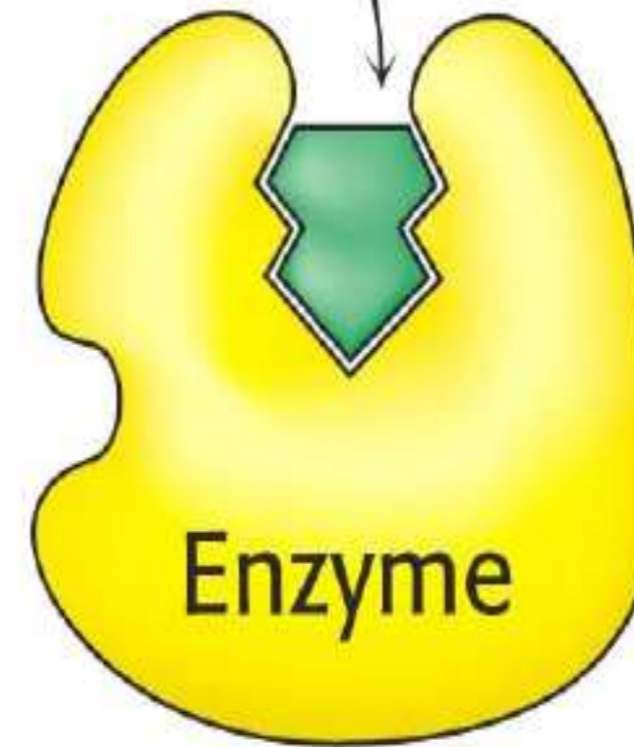


**EXAMPLE:** The drug **Antabuse** is used to help alcoholics quit drinking. Antabuse *inhibits aldehyde oxidase*, resulting in the accumulation of acetaldehyde during the metabolism of alcohol. Elevated acetaldehyde levels cause symptoms of nausea and vomiting.

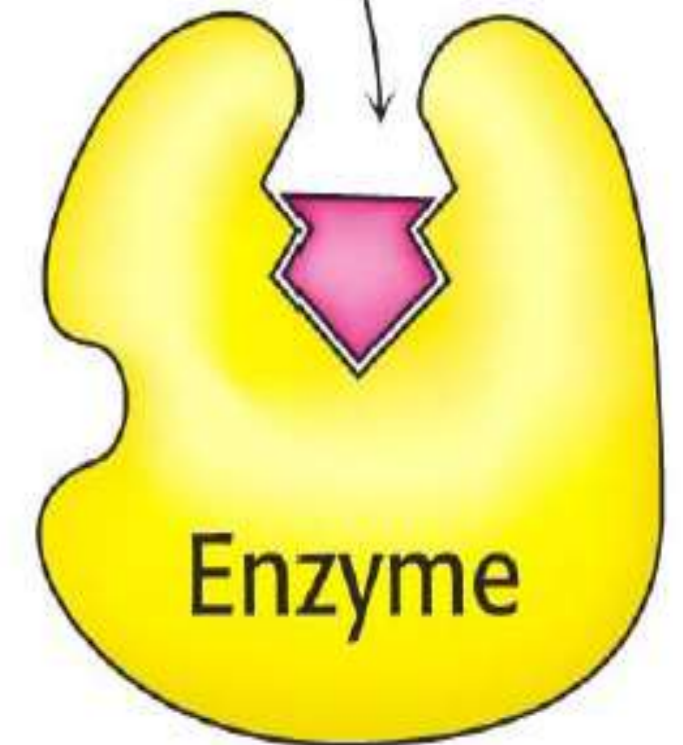
# Competitive Inhibition



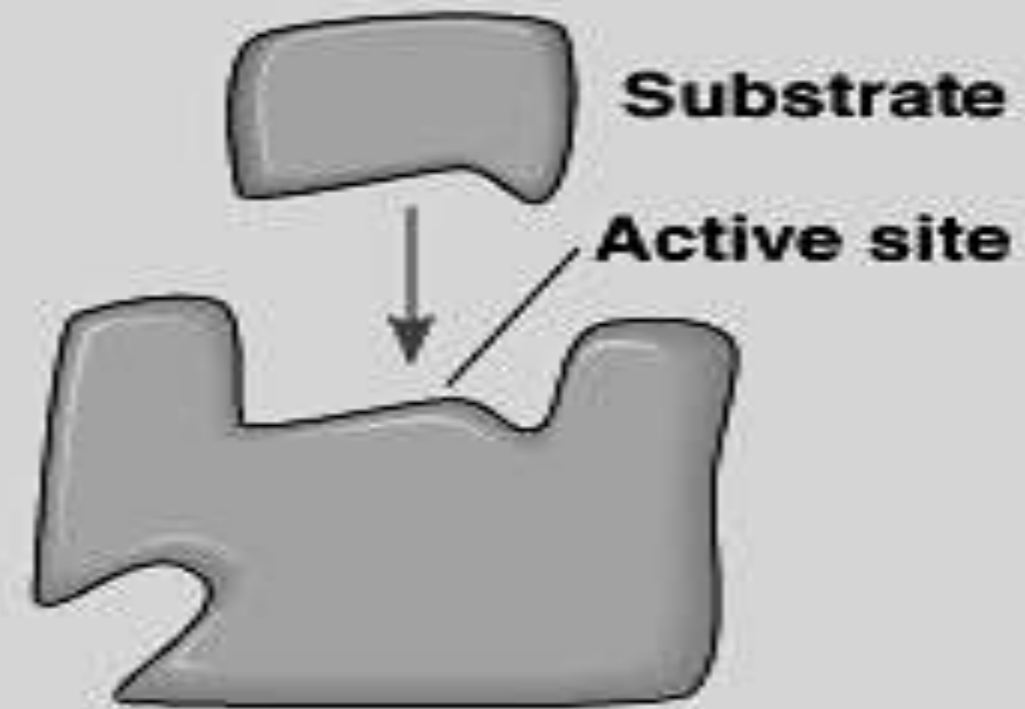
Substrate



Competitive inhibitor



**(a) A substrate can normally bind to the active site of an enzyme.**



**(b) A competitive inhibitor**







# Two Types of Enzyme Inhibitors

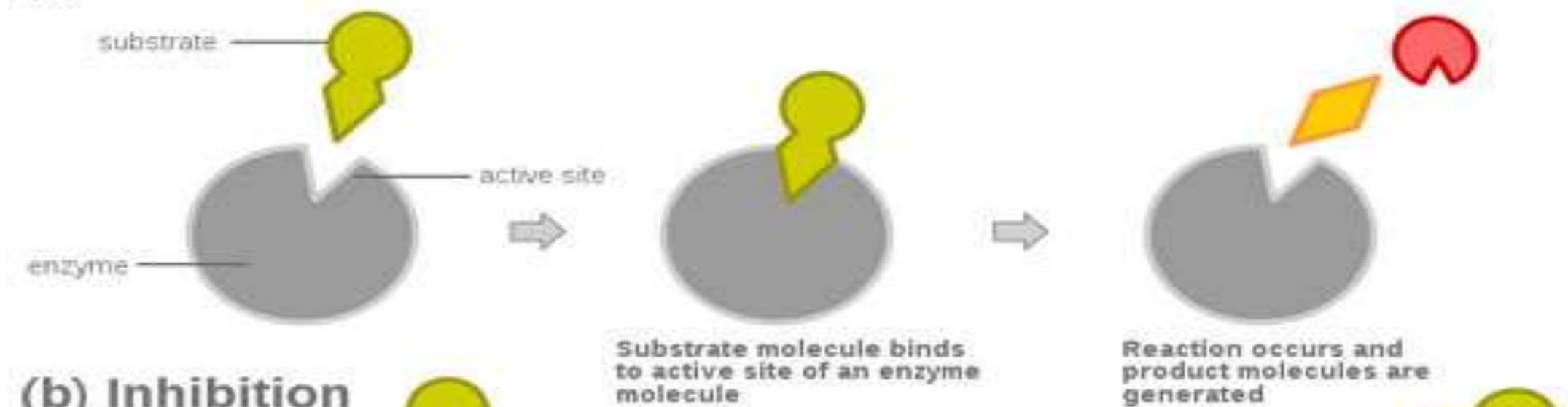


## 2. Non-competitive inhibitor

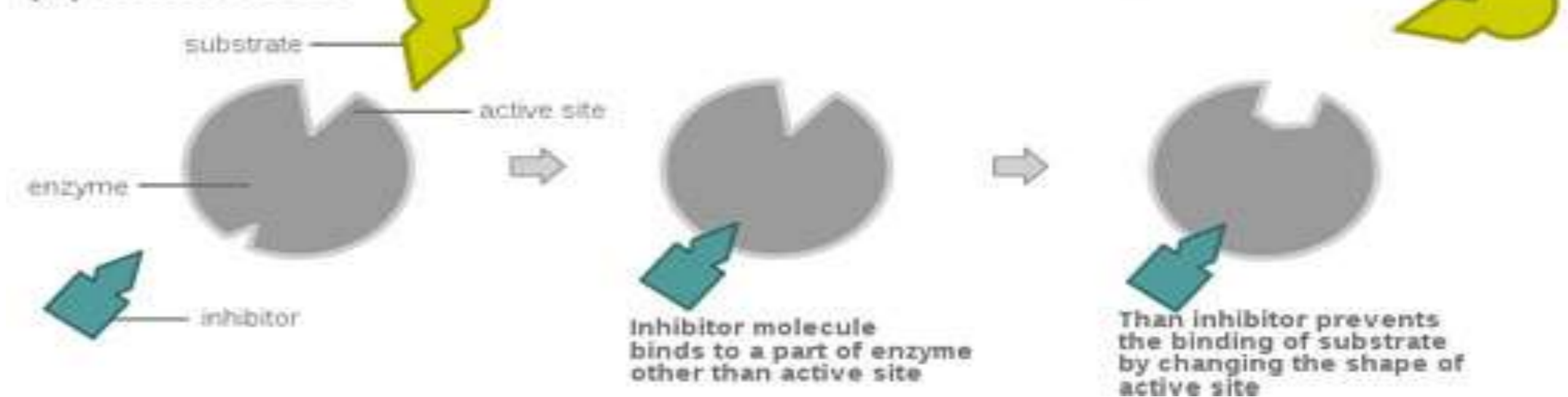
Do not enter active site, but bind to another part of the enzyme, causing the enzyme & active site to change shape.

Usually reversible, depending on concentration of inhibitor & substrate.

(a) Reaction

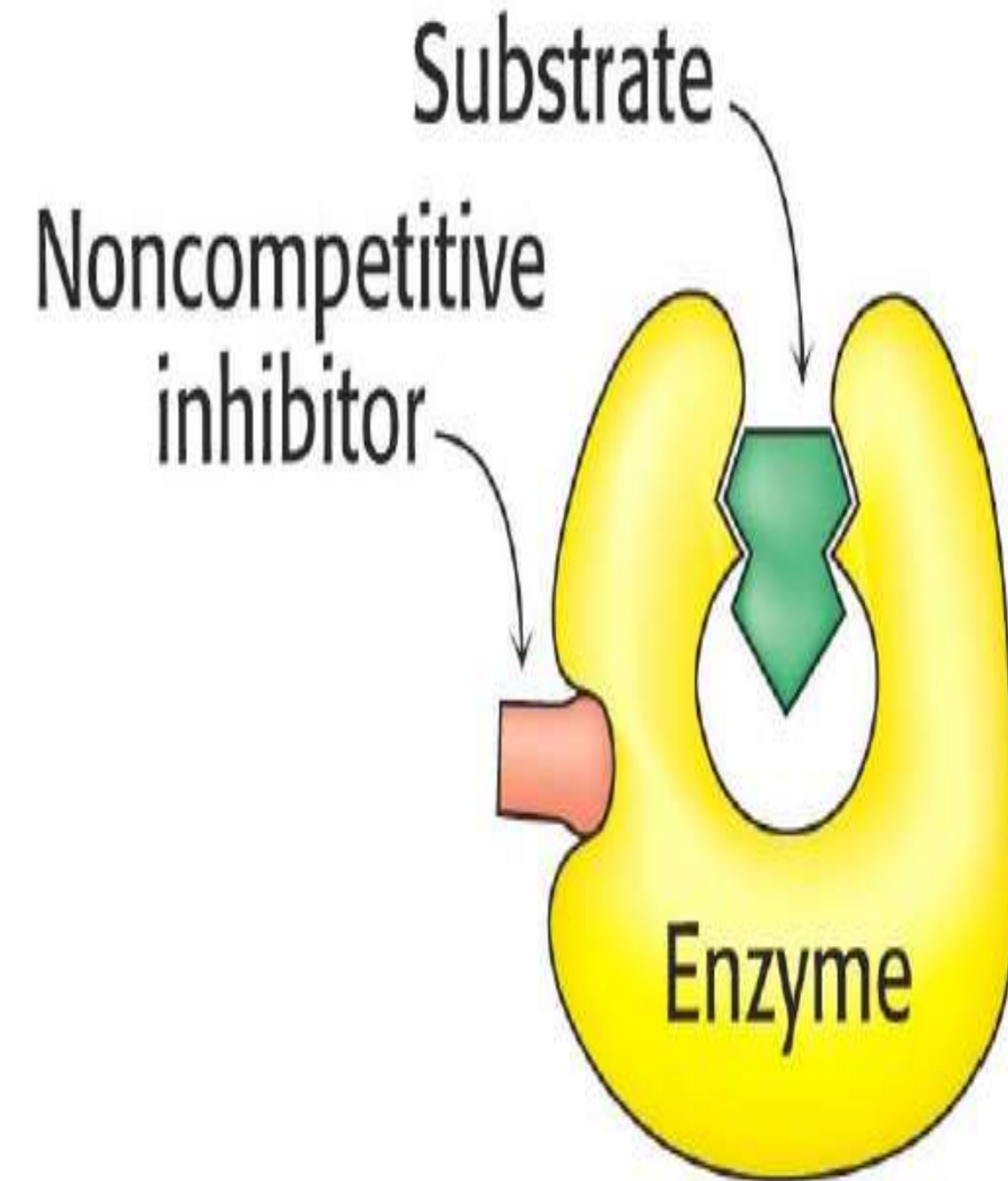
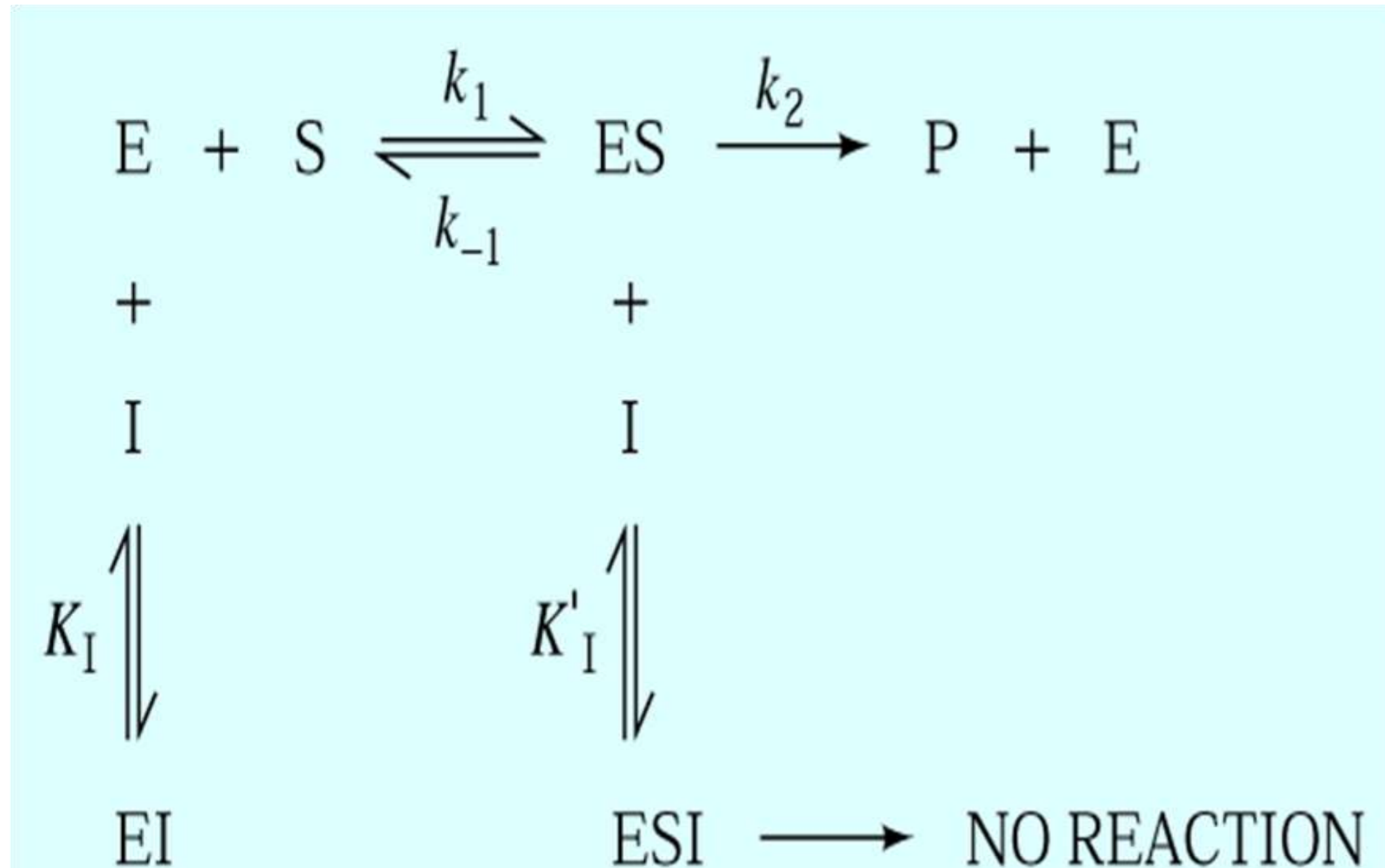


(b) Inhibition

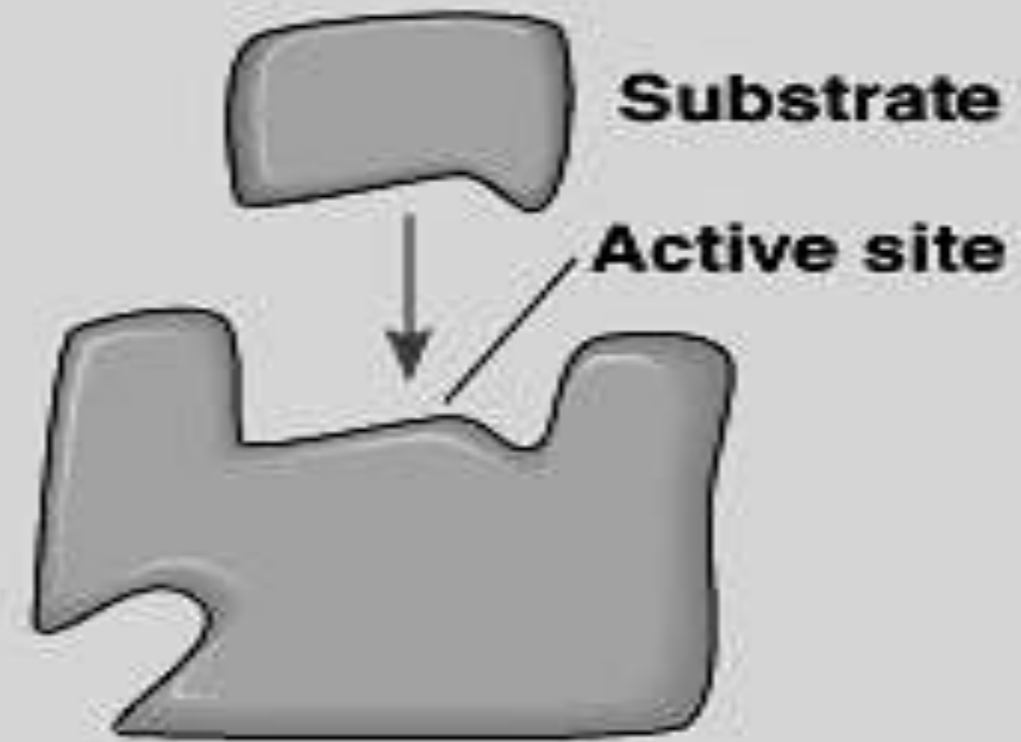


**EXAMPLE:** Compounds containing **heavy metals** such as lead, mercury, copper or silver are **poisonous**. This is because ions of these metals are non-competitive inhibitors for several enzymes.

# Non-Competitive Inhibition

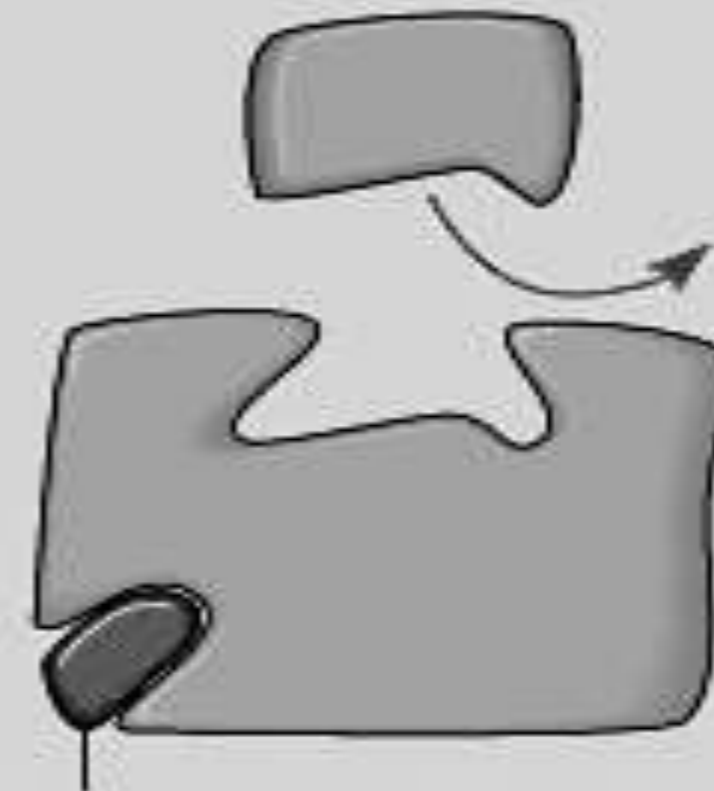


**(a) A substrate can normally bind to the active site of an enzyme.**



**(c) A noncompetitive inhibitor**

**Noncompetitive inhibitor**



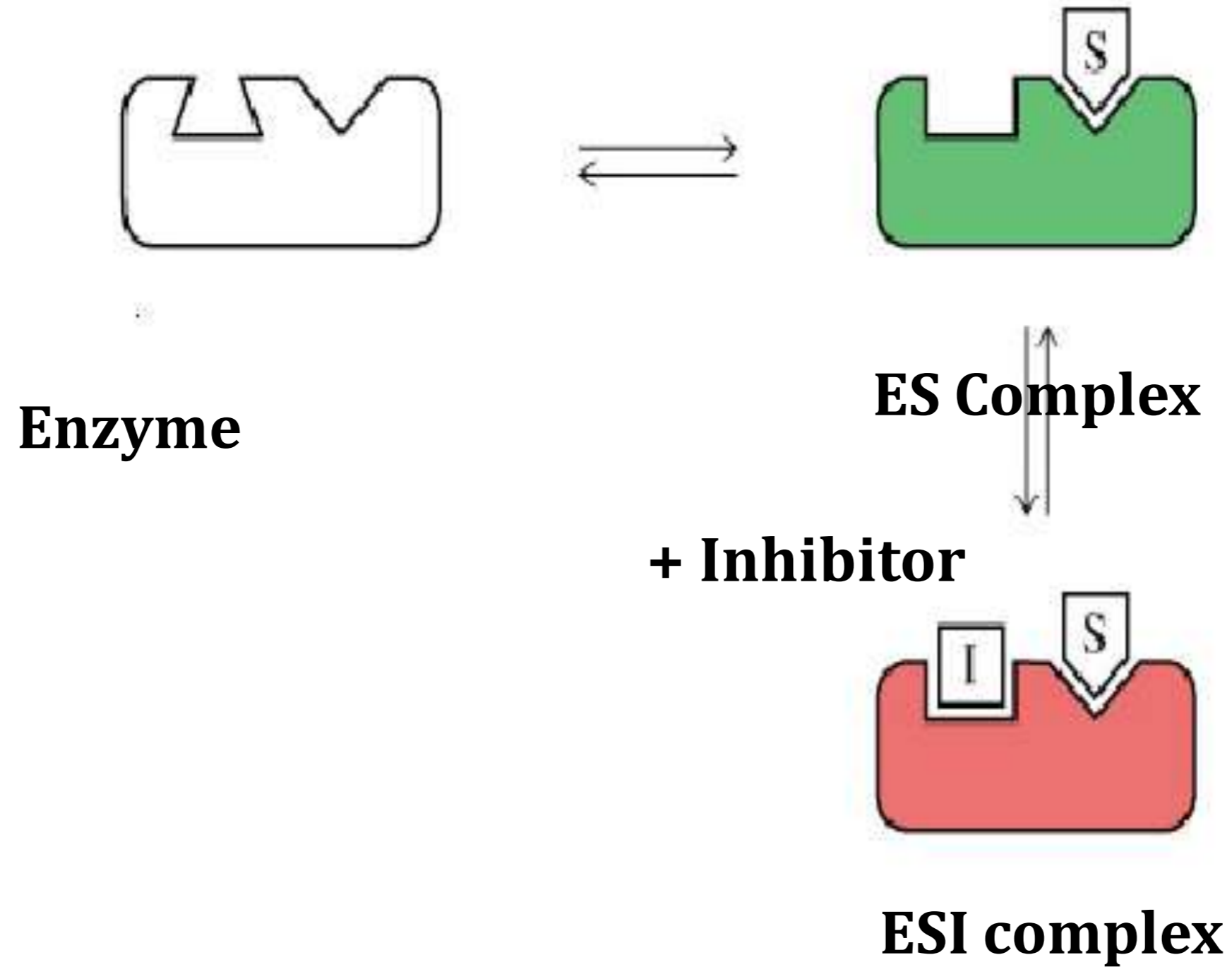


# Un-competitive Inhibition

- Binds only to the enzyme-substrate complex.
- Does not have the capacity to bind to the free enzyme.
- Not overcome by increasing substrate concentration.
- Both the  $K_m$  and  $V_{max}$  are reduced.



# Un-competitive Inhibitor





# Assessment



1. What is Enzyme Inhibition?
2. What are the types of enzyme inhibition?
3. Define Competitive Inhibition?
4. Define Non - Competitive Inhibition?
5. Define Un - Competitive Inhibition?



**THANK YOU**