SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr M.G.R Medical University, Chennai

DEPARTMENT OF CARDIO PULMONARY PERFUSION CARE

TECHNOLOGY

COURSE NAME: BIOCHEMISTRY

UNIT : 3

TOPIC : ENZYMES – NOMENCLATURE & ITS CLASSIFICATION

FACULTY NAME: MITHRA V

ENZYMES - DEFINE

- Globular Proteins - speed up chemical reactions in living organisms, biocatalysts.

- i) absorption of nutrients, digestion

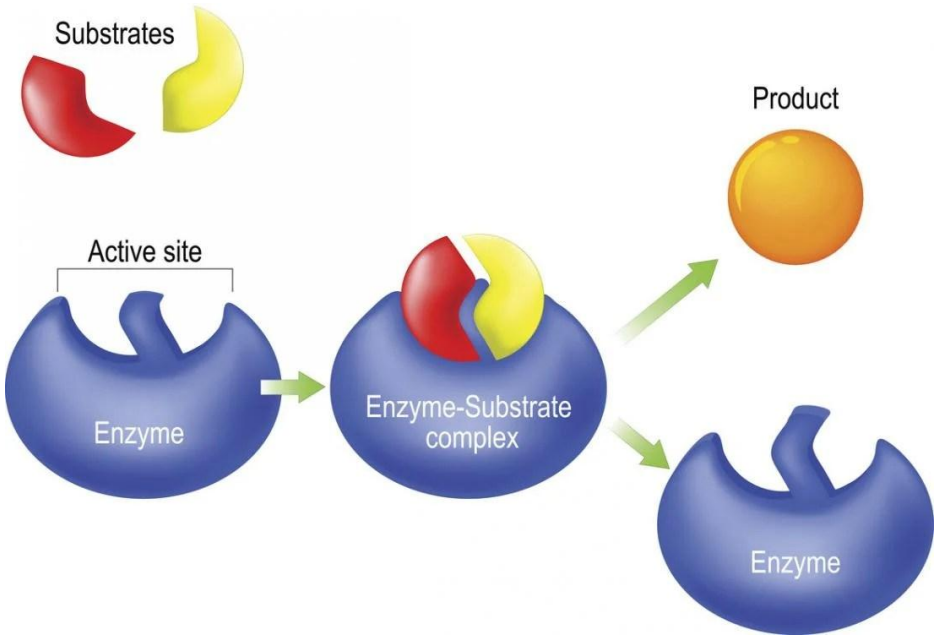
  ii) breathing, excretion, reproduction,

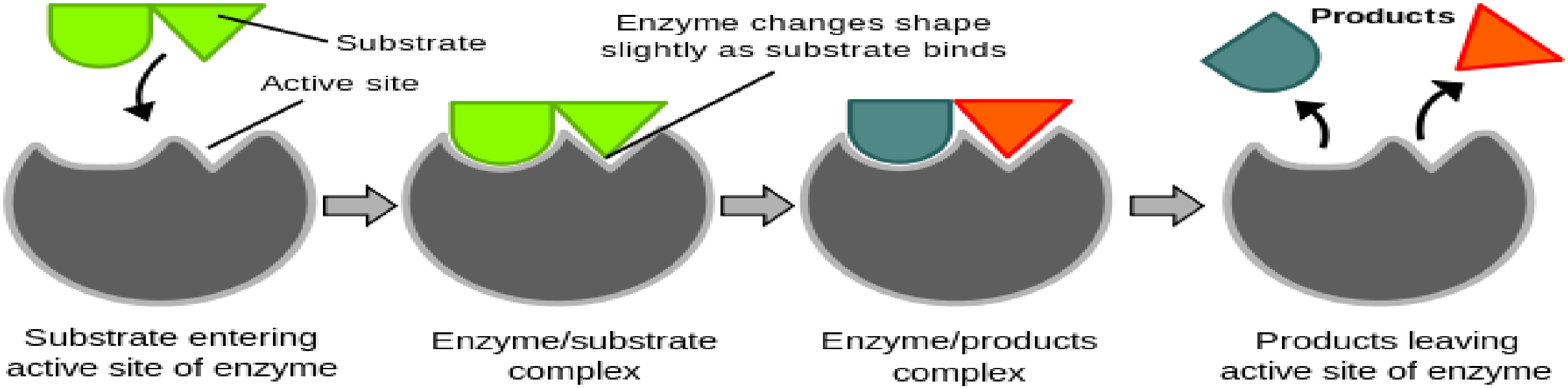
  iii) function of the liver and kidney.

- Enzymes are linear chains of amino acid sequence that fold into a specific 3D structure.
- Sequence determines the structure, which in turn determines catalytic activity, depends on intact primary, secondary, tertiary, and/or quaternary structure.

SUBSTRATES AND PRODUCTS

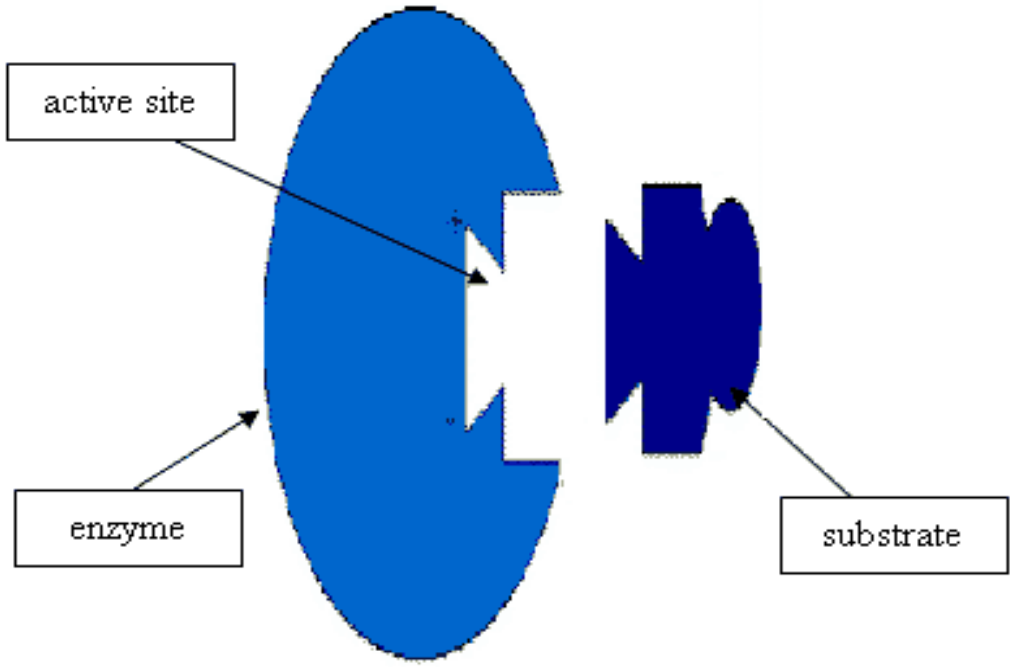
- Heating causes denaturation of the structure, leading to loss of enzyme activity (temperature-sensitive).
- Enzymes act on molecules called **substrates**, converting them into **products.**
- Substrates are the starting molecules that enzymes react with.
- Enzymes transform substrates into distinct molecules called products.

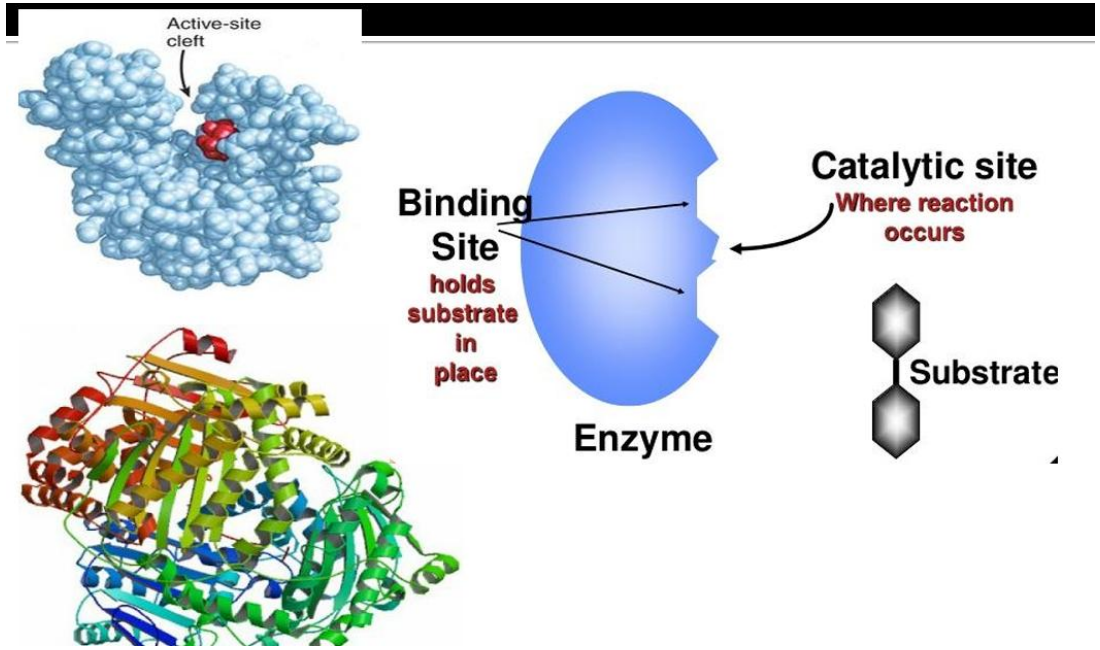



Substrate
Active site
Enzyme changes shape
slightly as substrate binds
Products
Substrate entering
active site of enzyme
Enzyme/substrate
complex
Enzyme/products
complex
Products leaving
active site of enzyme

ACTIVE SITE

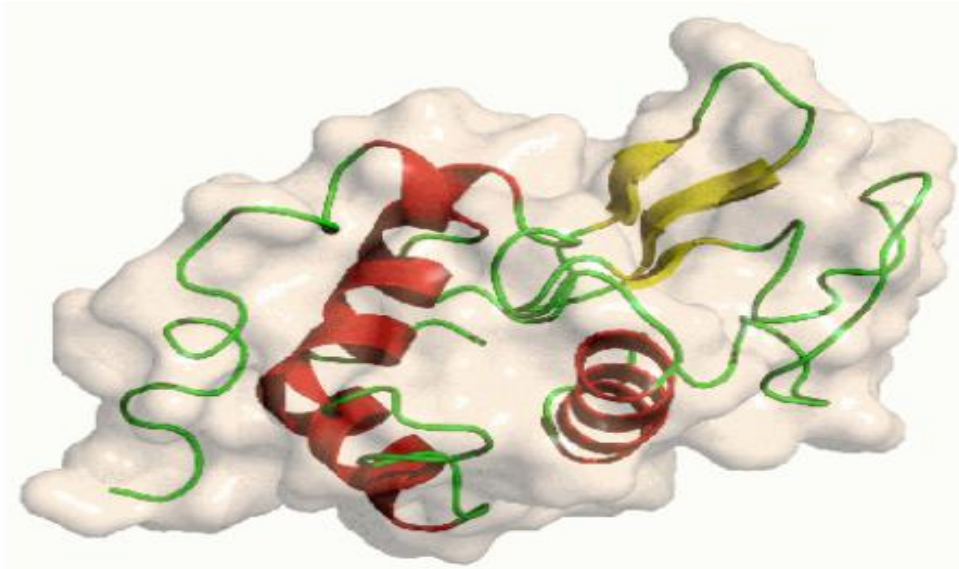
- The active site - small region where substrates bind & reactions occur.
- Has unique 3D structure formed by amino acid residues

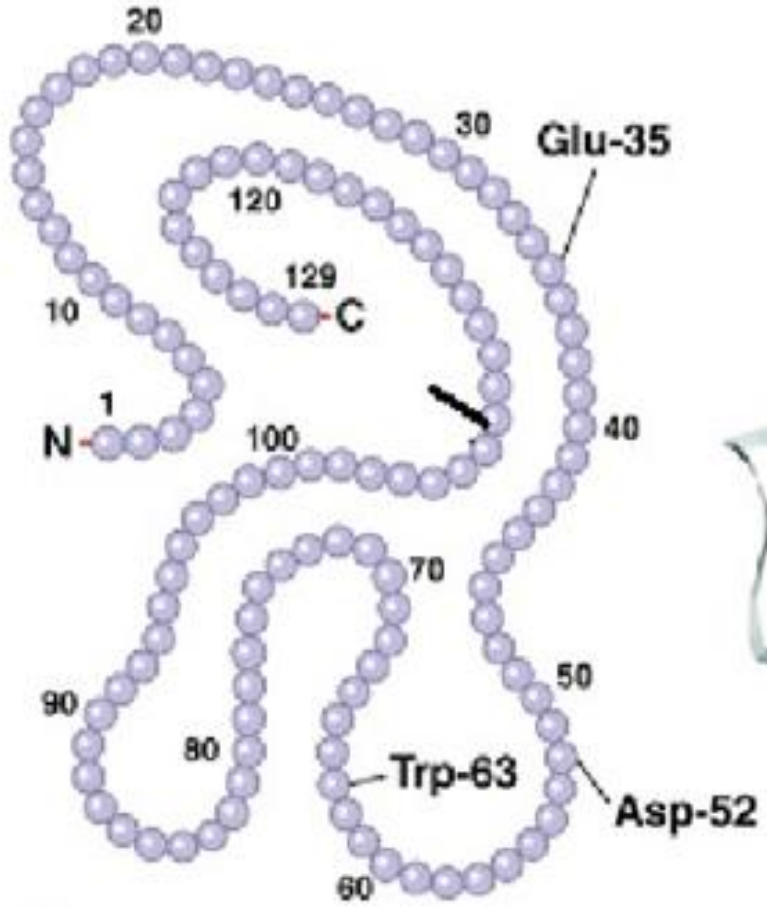


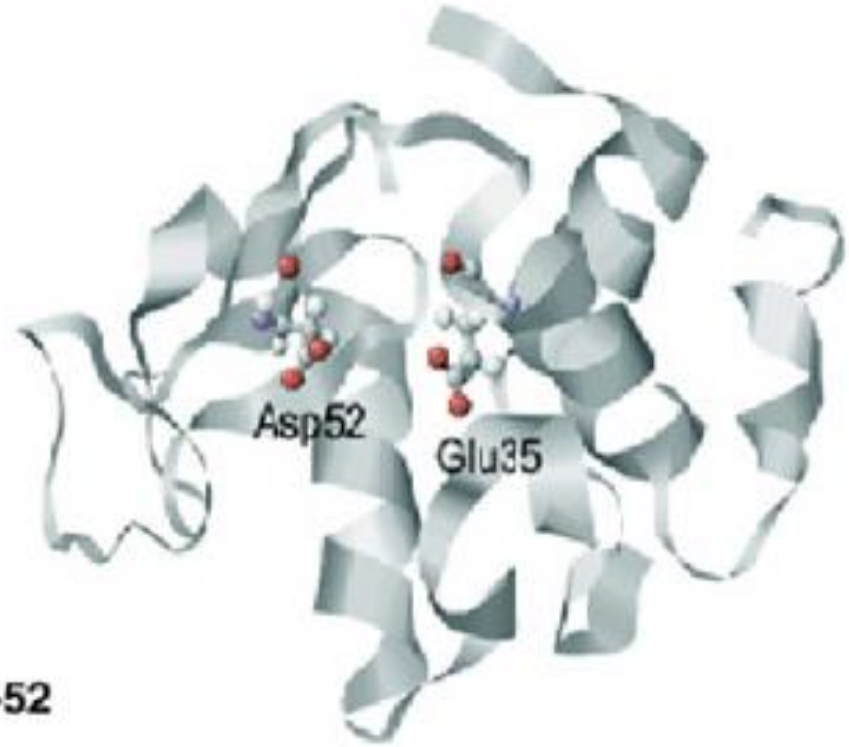


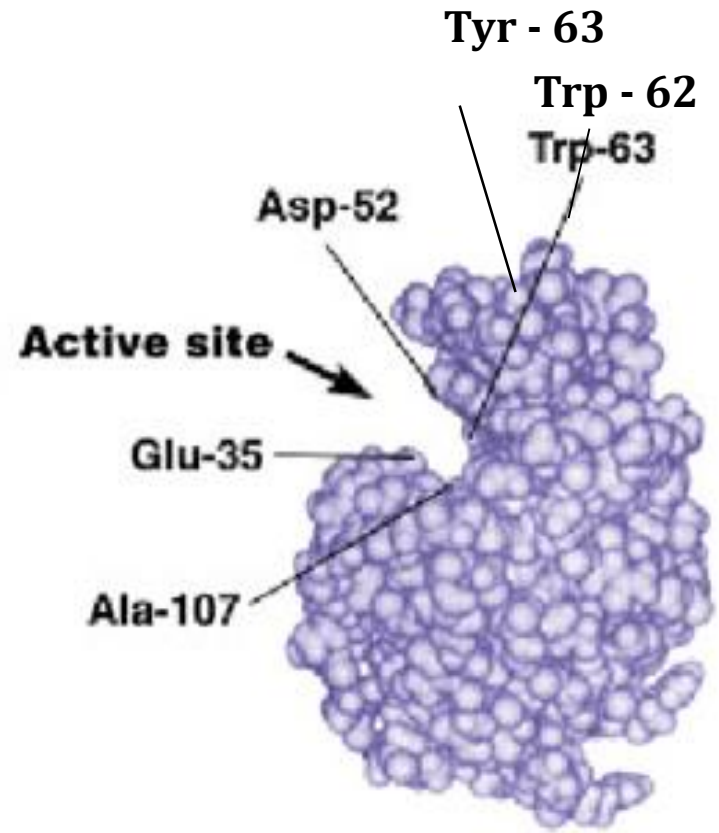
ACTIVE SITE - EXAMPLE

- Lysozyme (129 amino acids), the active site is formed by residues 35, 52, 62, 63 & 107.
- It is antimicrobial enzyme, small globular protein.
- Present in tears, nasal mucous, gastric secretion, milk and egg white.
- It lyse the bacterial cell wall.
- Turn over no. : 0.5/sec. and E.C. no is 3.2.1.17
- In 1922, Alexander Fleming coined the term lysozyme.



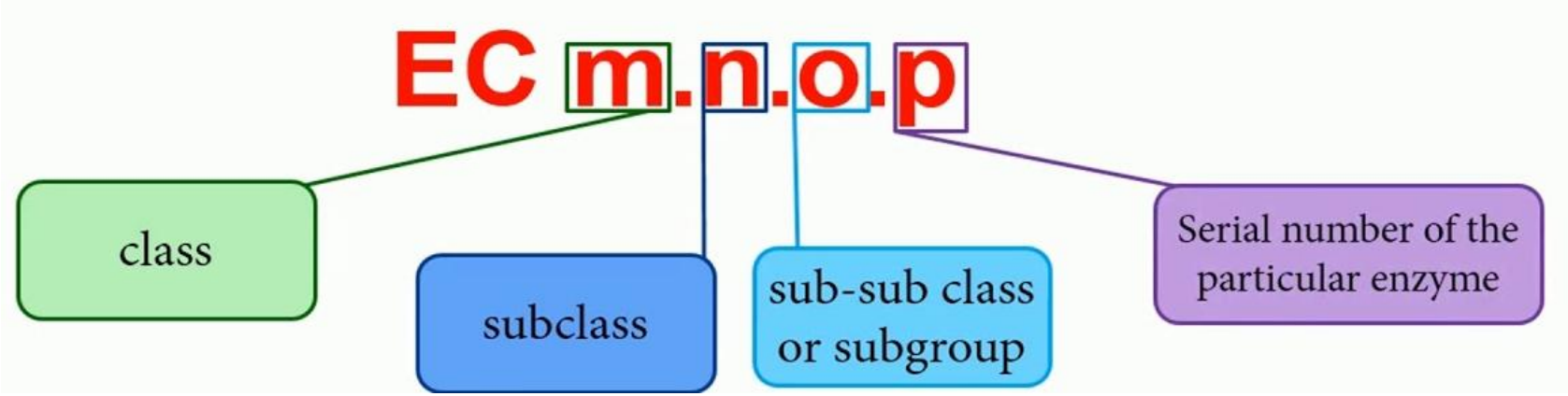

20
30
Glu-35
120
129
C
10
1
N
100
40
70
50
90
80
Trp-63
Asp-52
60


Asp52
Glu35


Tyr - 63
Trp - 62
Trp-63
Asp-52
Active site
Glu-35
Ala-107

NOMENCLATURE OF ENZYME

- IUBMB (International Union of Biochemistry and Molecular Biology) recommends:
- Trivial name (common/recommended name)
- Systematic name (official name)
- Assigned a unique Enzyme Code Number (EC number) - four digits separated by dots:



Example

EC 2.7.1.1 → Hexokinase

ENZYME CLASSIFICATION

According to the IUBMB system, enzymes are grouped into 6 major classes

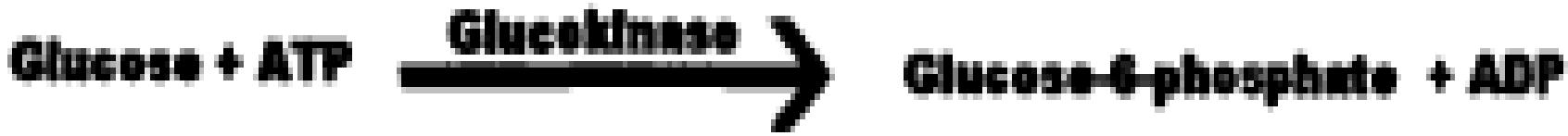
EC 1 OXIDOREDUCTASES	• Catalyze oxidation-reduction reactions (transfer of electrons)
EC 2 TRANSFERASES	• Catalyze transfer of functional groups from one molecule to another
EC 3 HYDROLASES	• Catalyze hydrolysis reactions (breaking bonds with water)
EC 4 LYASES	• Catalyze addition or removal of groups to/from double bonds
EC 5 ISOMERASES	• Catalyze isomerization (rearrangement within a molecule)
EC 6 LIGASES	• Catalyze joining of two molecules with energy input (usually ATP)

CLASSIFICATION OF ENZYMES

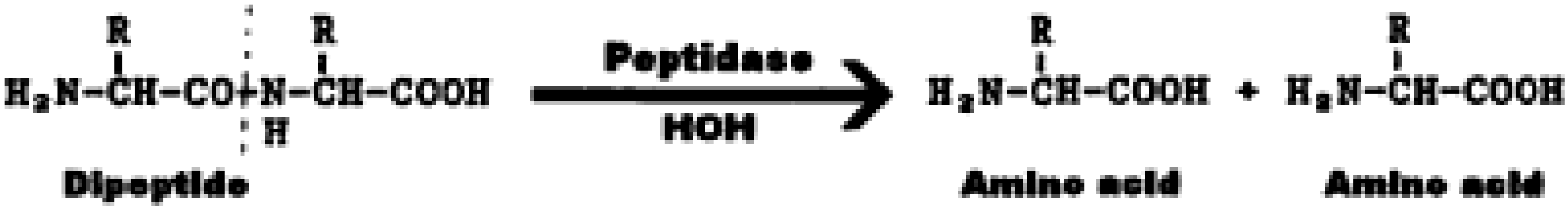
A. Oxidoreductases:

$$S\ (oxidized) + Y\ (reduced) \rightarrow S\ (reduced) + Y\ (oxidized).$$

B. Transferase:



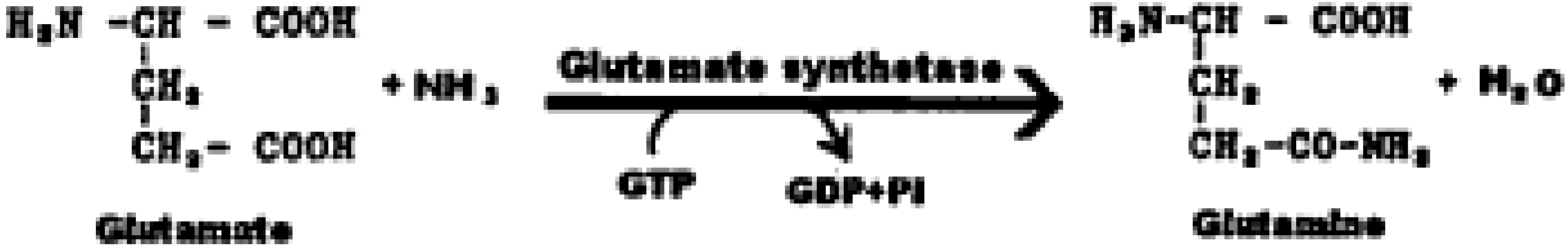
C. Hydrolases:



D. Lyases:

E. Isomerases:

F. Ligases:



REFERENCES

- Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis - Copeland, 3rd Edition
- https://www.ncbi.nlm.nih.gov/books/NBK9921/ (NCBI Bookshelf – Enzyme Classification)
- https://enzyme.expasy.org/ (ExPASy Enzyme Nomenclature Database)
- https://www.brenda-enzymes.org/

(BRENDA – The Comprehensive Enzyme Information System)

THANK YOU