VIVEKANANDA COLLEGE
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NAAC ACCREDITED ‘A’ GRADE

Topic : Enzyme Classification
Course Title : Enzymes
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Unit : 1
Semester : 2
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Name of the Department : Biochemistry

IUBMB Classification of Enzymes

The International Union of Biochemistry (IUB, 1961) adopted a scheme for systematic functional classification and nomenclature of enzymes.

The recommendations of IUB are as follows:

(i) All known enzymes have been grouped into six major classes on the basis of reaction type they catalyze,

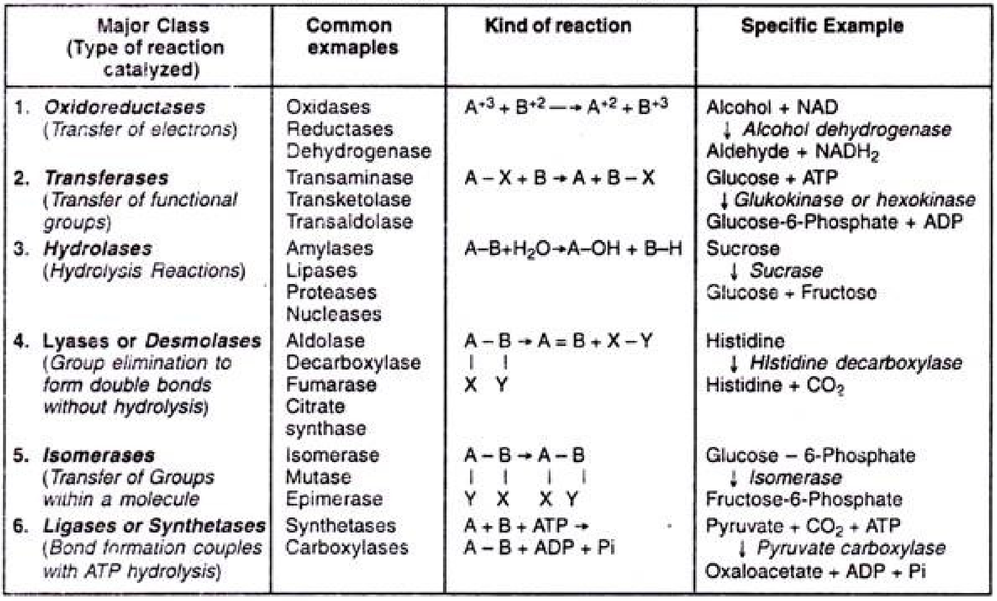
(ii) Each class further sub-divided into subclasses and sub-subclasses,

(iii) Each enzyme is assigned two names i.e., recommended (trivial) name and systematic name,

(iv) Each enzyme is identified by a unique four digit classification number.

For example, hexokinase is recommended name, its systematic name is glucose phosphotransferase and its classification number in EC 2.7.1.1. Here, “EC” stands for Enzyme commission, the first number (2) stands for the major class, the second number (7) stands for the sub class, the third number (1) indicates sub-class and the fourth number (1) denotes the serial number assigned in its sub-classes.

Table 5.2. IUB classification of enzymes



Major Class (Type of reaction catalyzed)	Common exmaples	Kind of reaction	Specific Example
1. ***Oxidoreductases*** (*Transfer of electrons*)	Oxidases Reductases Dehydrogenase	$A^{+3} + B^{+2} \longrightarrow A^{+2} + B^{+3}$	Alcohol + NAD ↓ *Alcohol dehydrogenase* Aldehyde + $NADH_2$
2. ***Transferases*** (*Transfer of functional groups*)	Transaminase Transketolase Transaldolase	$A - X + B \rightarrow A + B - X$	Glucose + ATP ↓ *Glukokinase or hexokinase* Glucose-6-Phosphate + ADP
3. ***Hydrolases*** (*Hydrolysis Reactions*)	Amylases Lipases Proteases Nucleases	$A{-}B + H_2O \rightarrow A{-}OH + B{-}H$	Sucrose ↓ *Sucrase* Glucose + Fructose
4. **Lyases or *Desmolases*** (*Group elimination to form double bonds without hydrolysis*)	Aldolase Decarboxylase Fumarase Citrate synthase	$\underset{X}{A} - \underset{Y}{B} \rightarrow A = B + X - Y$	Histidine ↓ *Histidine decarboxylase* Histidine + CO_2
5. ***Isomerases*** (*Transfer of Groups within a molecule*	Isomerase Mutase Epimerase	$\underset{Y}{A} - \underset{X}{B} \rightarrow \underset{X}{A} - \underset{Y}{B}$	Glucose – 6-Phosphate ↓ *Isomerase* Fructose-6-Phosphate
6. ***Ligases or Synthetases*** (*Bond formation couples with ATP hydrolysis*)	Synthetases Carboxylases	$A + B + ATP \rightarrow$ $A - B + ADP + Pi$	Pyruvate + CO_2 + ATP ↓ *Pyruvate carboxylase* Oxaloacetate + ADP + Pi

Naming of Enzymes

Common names

are formed by adding the suffix *–ase* to the name of substrate

Example:

- *tyrosinase* catalyzes oxidation of tyrosine;
- *cellulase* catalyzes the hydrolysis of cellulose

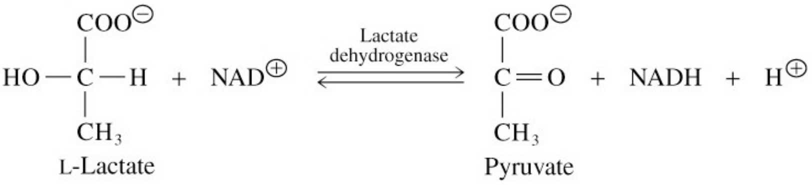
Common names don’t describe the chemistry of the

reaction **Trivial names**
Example: *pepsin, catalase, trypsin*.
Don't give information about the substrate,
product or chemistry of the reaction

The Six Classes of Enzymes

1. Oxidoreductases

- Catalyze oxidation-reduction reactions



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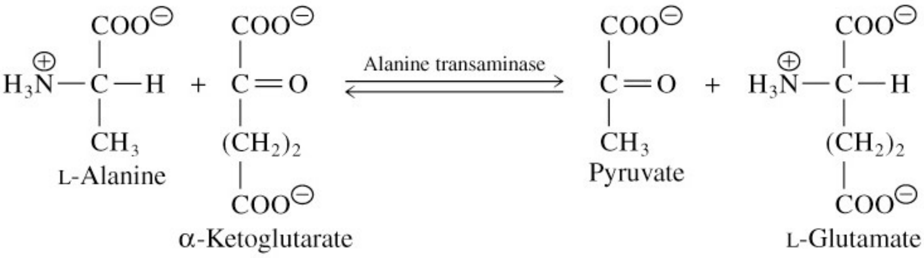
- oxidases
- peroxidases

2. Transferases

- Catalyze group transfer reactions



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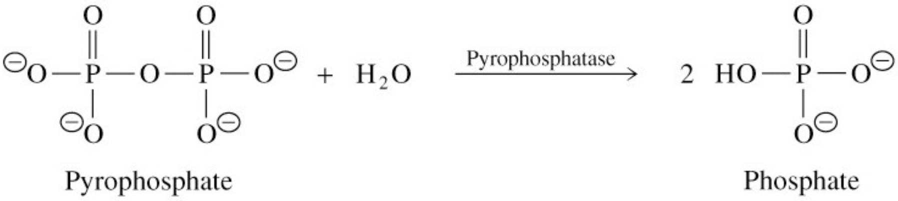
3. Hydrolases

- Catalyze hydrolysis reactions where water is the acceptor of the transferred group



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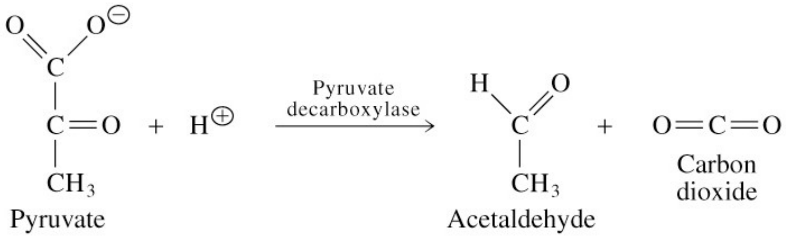
- esterases
- peptidases

4. Lyases

- Catalyze lysis of a substrate, generating a double bond in a nonhydrolytic, nonoxidative elimination



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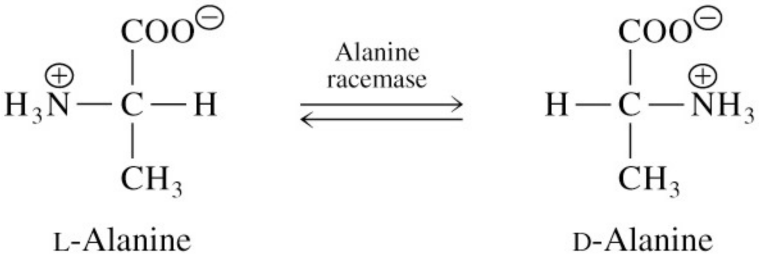
5. Isomerases

- Catalyze isomerization reactions



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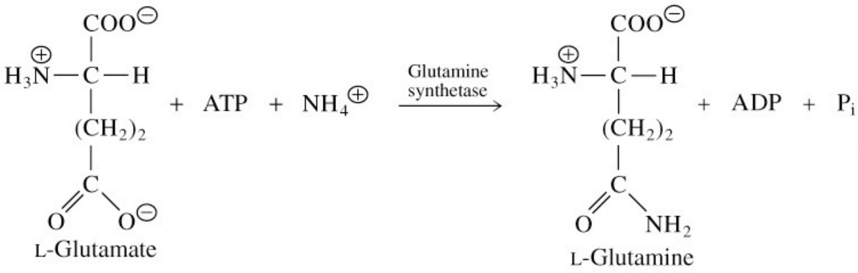
6. Ligases (synthetases)

- Catalyze ligation, or joining of two substrates
- Require chemical energy (e.g. ATP)



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Referrences :-

a) www.google.com