

## **B.Sc. Botany (Hons) – 2ND SEM**

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### **Nomenclature and Classification of Enzymes**

The International Union of Biochemistry and Molecular Biology is entrusted with designating names to enzymes in addition to assigning a number in order to identify them.

Apart from a few originally studied enzymes such as rennin, pepsin and trypsin, almost all the enzyme names end in “ase”. As per the standards, focal points of nomenclature of enzymes are both the type of reaction catalyzed and the substrate acted upon.

Most commonly, enzymes are named to provide data on the function as opposed to the structure of the enzyme. However, there are 3 significant features of the nomenclature process of enzymes, which are:

- Suffix *-ase* recognizes a substance as that of an enzyme
  - Suffix *-in* is observed in the name of first enzymes learnt as pepsin, chymotrypsin, trypsin
- Prefix is identified by the type of reaction the enzyme catalyzes
  - Enzyme hydrolase : catalyzes a hydrolysis reaction
  - Enzyme oxidase : catalyzes an oxidation reaction
- In addition to the type of reaction, the identity of the substrate is taken into consideration
  - Glucose oxidase – catalysis of glucose oxidation
  - Lactate dehydrogenase – catalysis of eliminating hydrogen from lactate ion
  - Lactase – hydrolysis of lactose is catalyzed
  - Urease – hydrolysis of urea is catalyzed

### **Example of Naming:**

As per the standard International Union of Biochemistry, the name of the enzyme comprises 2 parts –

1. Name of the substrate for the enzyme
2. Type of reaction catalyzed by the enzyme. The second part, therefore, ends with “ase” suffix

Example – Lactate dehydrogenase

## Conventions of Naming – EC Numbers

The nomenclature developed by the International Union of Biochemistry and Molecular Biology has something called EC numbers where each enzyme is preceded by EC. The first number in this series classifies this enzyme on the basis of its mechanism.

### EC Numbers

There are six groups of enzymes as per the reaction that is being catalyzed. Therefore, all enzymes are designated as “EC numbers”. This classification does not consider protein structure, amino acid sequence or even the chemical mechanism.

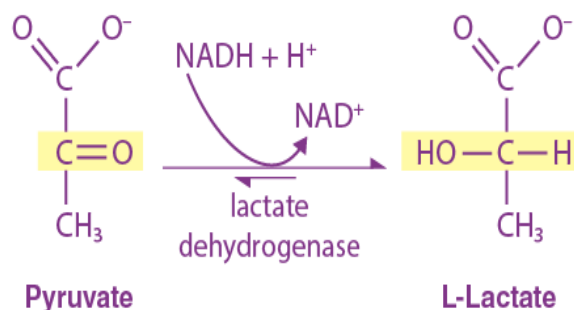
EC number is a 4 digit number for instance – a.b.c.d. Here “a” is class, “b” is subclass, “c” is sub-subclass and “d” is the sub-sub-subclass. The “b” and “c” part of the EC number describes the reaction, “d” differentiates between different enzymes with similar function on the basis of the actual substrate in the reaction.

Example – EC number of Alcohol: NAD<sup>+</sup> oxidoreductase is 1.1.1.1

### Six Classes of Enzymes – Enzyme Classification

- **EC 1. Oxidoreductases**
- **EC 2. Transferases**
- **EC 3. Hydrolases**
- **EC 4. Lyases**
- **EC 5. Isomerases**
- **EC 6. Ligases**

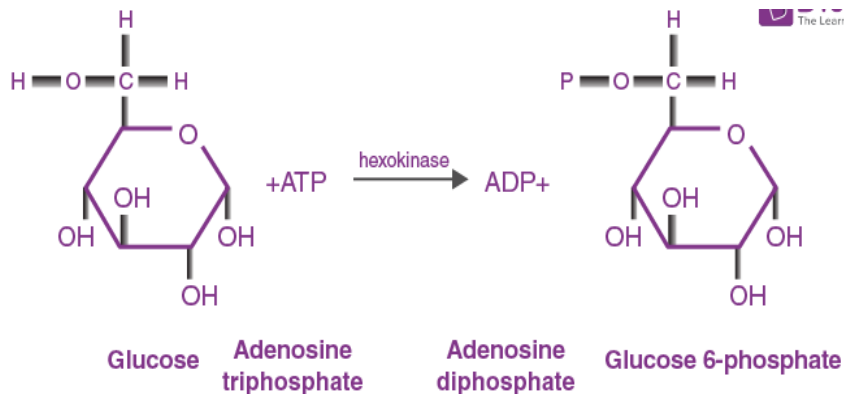
#### EC 1. Oxidoreductases



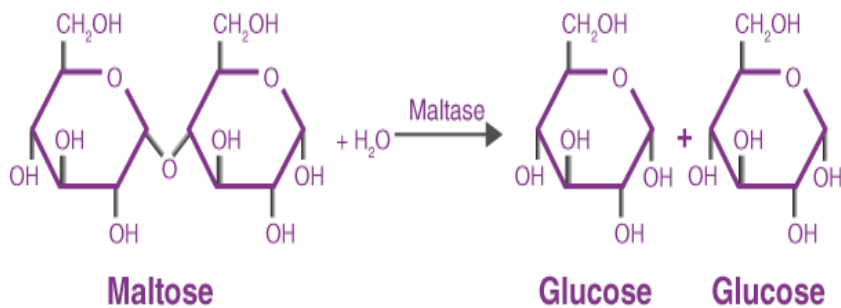
It catalyzes the transfer of oxygen atoms of hydrogen or electrons from one substrate to another substrate. It is also known as oxidases, reductases or dehydrogenases. An electron donor or an acceptor is also required to complete the reaction since these are redox reactions.

## EC 2. Transferases

It catalyzes the transfer of a group other than hydrogen from one substrate to another.



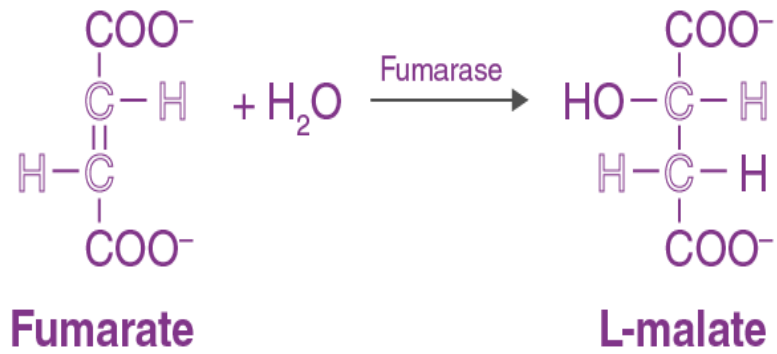
## EC 3. Hydrolases



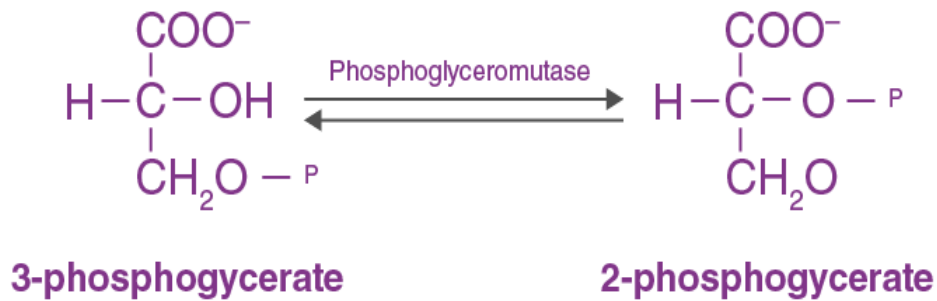
Hydrolases – it catalyzes hydrolytic reactions. This includes esterases, lipases, nitrilases, proteases.

## EC 4. Lyases

It catalyzes the non-hydrolytic removal of functional groups from substrates. This produces a double bond in the product or a reverse reaction. It includes aldolases and decarboxylases in the removal direction and synthases in the addition direction.



**EC 5. Isomerases**



Catalyzes isomerization reactions which include cis-trans isomerizations and racemizations.

**EC 6. Ligases**

