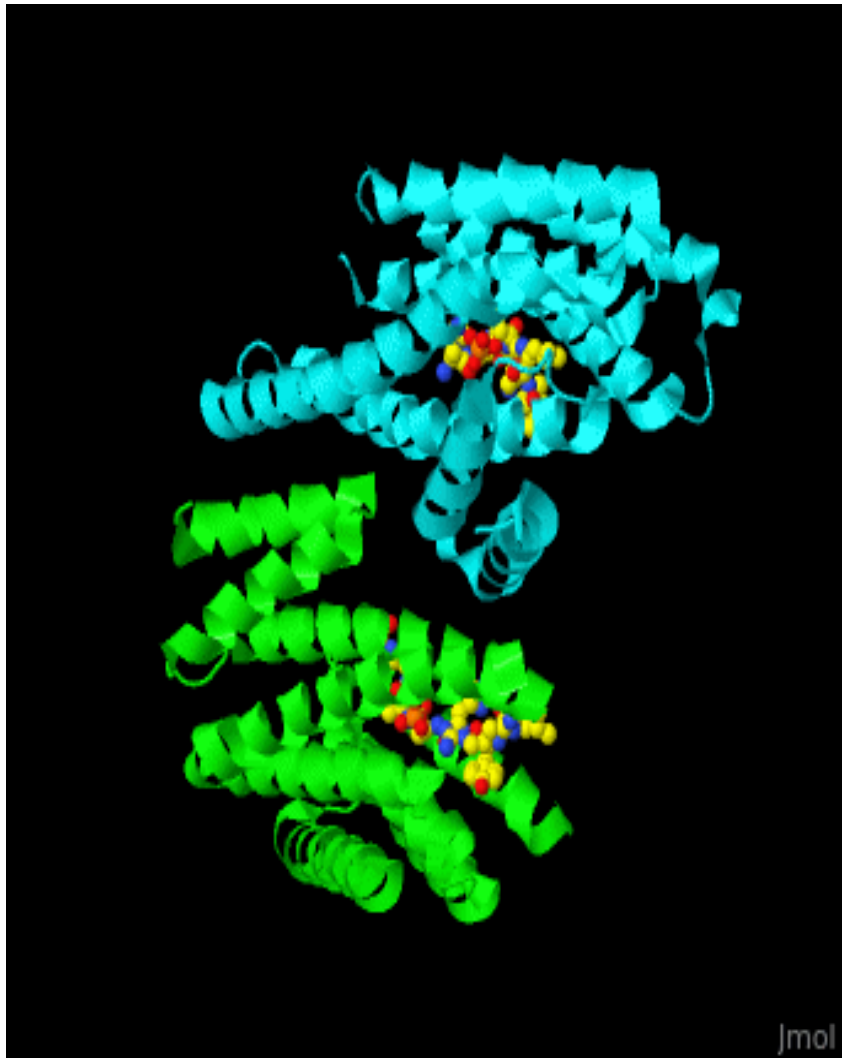
IIT Guwahati Lecture 20

Course BT 631

Protein Structure, Function and Crystallography



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Enzyme Nomenclature

Each enzyme is assigned two names.

- **The first is its short, recommended name, convenient for everyday use.**
- **The second is the more complete systematic name, which is used when the enzyme must be identified without ambiguity.**

Enzyme Nomenclature

A. Recommended name

Most commonly used enzyme names have the suffix "-ase" attached to the substrate of the reaction,

for example, *glucosidase, urease, sucrase*

or to a description of the action performed,

for example, *lactate dehydrogenase* and *adenylate cyclase.*

[Note: Some enzymes retain their original trivial names, which give no hint of the associated enzymic reaction, for example, *trypsin* and *pepsin*.]

Enzyme Nomenclature

B. Systematic name

The International Union of Biochemistry and Molecular Biology (IUBMB) developed a system of nomenclature in which enzymes are divided into six major classes, each with numerous subgroups or subclasses.

The suffix "-ase" is attached to a fairly complete description of the chemical reaction catalyzed,

for example *D-glyceraldehyde 3-phosphate: NAD oxido-reductase.*

The IUBMB names are unambiguous and informative, but are sometimes too cumbersome to be of general use.

Enzyme Nomenclature

An outline of IUBMB system is presented below.

1. **Reactions and the enzymes that catalyze them form six classes, each having 4-13 subclasses.**

2. **The enzyme name has two parts. The first part is the name of the substrate(s). The second part ends in suffix *-ase*, indicates the type of reaction catalyzed.**

3. **Additional information, on nature of reaction is given in parentheses.**
   e.g. the enzyme malate dehydrogenase catalyzing

$$\text{L-malate} + NAD^+ \rightarrow \text{Pyruvate} + CO_2 + NADH + H^+$$

is designated as 1.1.1.37 L-malate: NAD^+ oxidoreductase (decarboxylating).

Enzyme Nomenclature

4. **Each enzyme has been allotted a systemic code number called Enzyme Commission (E.C.) number.** ***The EC number of each enzyme consists of series of numbers at 4 places. The first place number represents the major class to which the enzyme belongs. The second and third place numbers denote subclass and sub-subclass of the enzyme within the major class. The last place number or the 4th digit numbers represent the serial number of the enzyme within the sub-subclass and signifies the order in which the enzyme was recognized.*** **e.g.**

EC 2.7.1.1 denotes **class 2** (a transferase), **subclass 7** (transfer of phosphate), **sub-subclass 1** (an alcohol is the phosphate acceptor). The fourth digit 1, denotes **hexokinase**, or **ATP: D-hexose 6-phosphotransferase**, an enzyme catalyzing phosphate group transfer from ATP to the hydroxyl group on carbon 6 of glucose.

ATP + D-Hexose → ADP + Hexose-6-phosphate

E.C. 5.3.1.1, 5 indicates the isomerase, 3 indicates an intra-molecular isomerase, the third digit indicates the substrate are aldose or ketose carbohydrates. And fourth digit 1 is the serial number allotted to isomerase within sub-subclass.

Enzyme Nomenclature

5. **Where no specific category has been created for an enzyme it is listed with a final figure of 99 in order to leave space for new subdivisions.**

   e.g. 4.2.99 refers to other carbon-oxygen lyases. The numbers 99, 98, 97 etc. are used for miscellaneous or "other" entries.

- **Sub class 1.97 is for other oxidoreductases;**
- **sub-subclass 1.1.99 is for oxido-reductases acting on CH-OH groups with "other accepters".**
- **These classifications should be regarded as provisional and are likely to be changed in future editions of Enzyme Nomenclature (e.g. subclass 1.99 has been replaced in current edition by subclasses 1.13 and 1.14).**