

## Enzyme Commission Classification

**The Enzyme Commission (EC)** number is a numerical classification scheme for enzymes, established by the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (IUBMB). It categorizes enzymes based on the chemical reaction they catalyze.

**Hierarchical Structure:** The system is hierarchical, consisting of four numbers separated by periods (e.g., EC X.Y.Z.W).

**EC X (Class):** The first digit indicates one of the seven main classes of enzymatic reactions:

Class	Reaction catalyzed
EC 1	Oxidation/reduction reactions; transfer of H and O atoms or electrons from one substance to another
EC 2	Transfer of a functional group from one substance to another. The group may be methyl-, acyl-, amino- or phosphate group
EC 3	Formation of two products from a substrate by hydrolysis
EC 4	Non-hydrolytic addition or removal of groups from substrates. C-C, C-N, C-O or C-S bonds may be cleaved
EC 5	Intramolecule rearrangement, i.e. isomerization changes within a single molecule
EC 6	Join together two molecules by synthesis of new C-O, C-S, C-N or C-C bonds with simultaneous breakdown of ATP
EC 7	Catalyse the movement of ions or molecules across membranes or their separation within membranes

**EC X.Y (Subclass):** The second digit generally indicates the type of group or bond acted upon (e.g., the type of donor in oxidoreductases, the type of group transferred in transferases).

**EC X.Y.Z (Sub-subclass):** The third digit provides more specific information about the reaction, such as the type of acceptor group (for oxidoreductases and transferases) or the specific bond hydrolyzed (for hydrolases).

**EC X.Y.Z.W (Serial Number):** The fourth digit is a serial number specific to the enzyme within its sub-subclass, essentially identifying the specific substrate.

The EC classification system serves **several critical purposes** in biochemistry and related fields:

- **Standardization and Unambiguity:** Provides a unique, universally recognized identifier for each distinct enzyme function, eliminating confusion arising from multiple common names or names based on discovery rather than function.
- **Database Organization:** Essential for organizing and querying biochemical databases (e.g., BRENDA, KEGG, UniProt, PDB). Users can search for enzymes based on the reactions they catalyze.
- **Functional Annotation:** Aids in predicting and annotating the function of newly discovered genes and proteins identified through sequencing or structural genomics projects. If a protein shares significant sequence or structural similarity with an enzyme of known EC number, it suggests a similar function.
- **Metabolic Pathway Analysis:** Helps in understanding and reconstructing metabolic pathways by clearly defining the catalytic steps involved.
- **Drug Discovery:** Identifying enzymes by their function (EC number) is crucial for selecting targets for drug development.