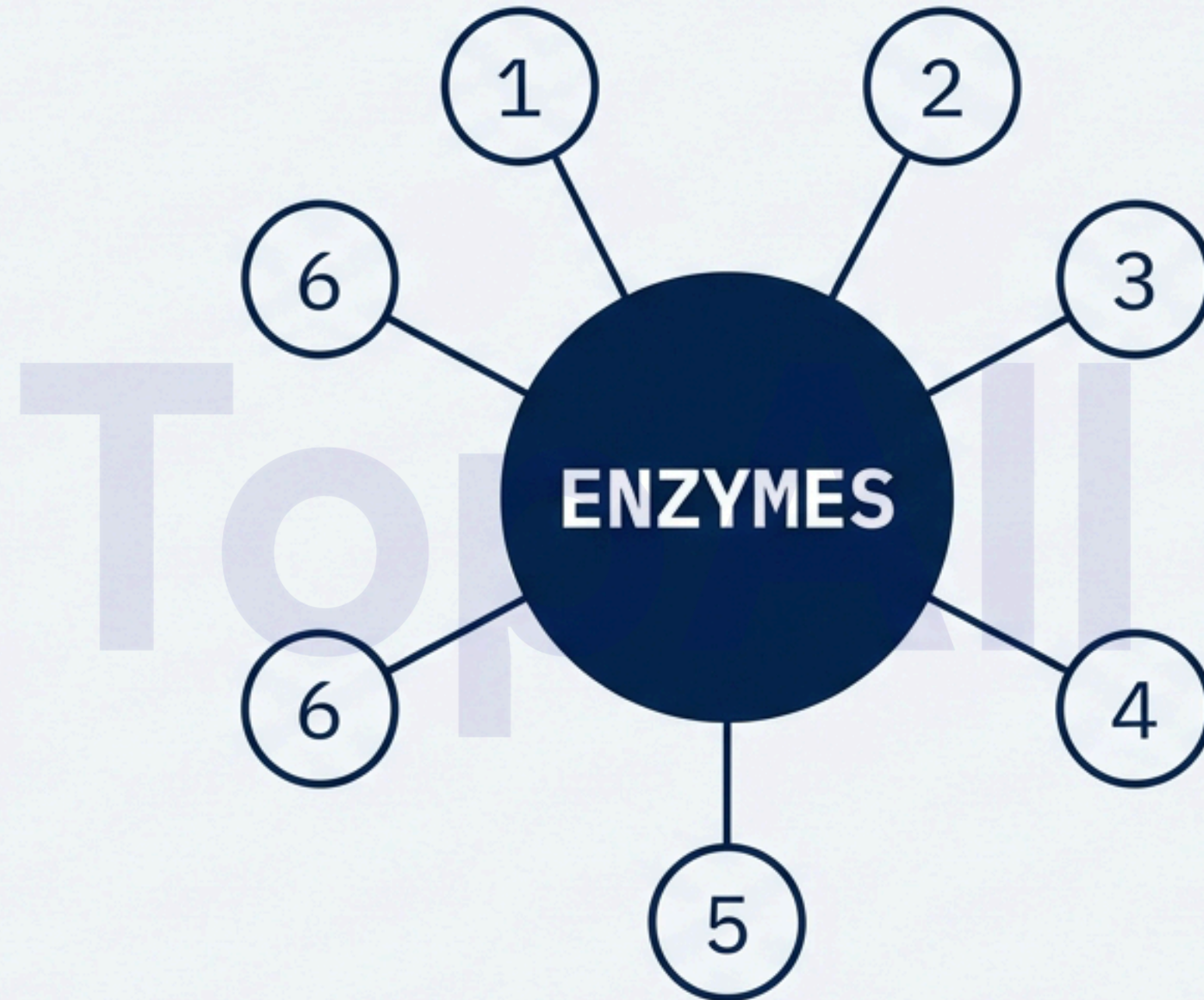


How Enzymes Are Named and Grouped

Thousands of discovered enzymes are organized by a universal system based strictly on the type of chemical reaction they catalyze.

The 4-Digit Rule

Every enzyme is assigned a unique 4-digit code. The first digit represents its primary class (1 through 6), followed by specific sub-classes ranging from 4 to 13 per category.



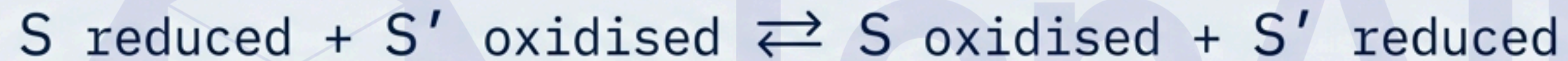
Classification ignores what the enzyme looks like and focuses entirely on what the enzyme does.

CLASS 1

Oxidoreductases / Dehydrogenases



These enzymes are the power-brokers of the cell. They catalyse oxidoreduction reactions, driving the transfer of electrons or hydrogen atoms between two substrates.

**Common Context**

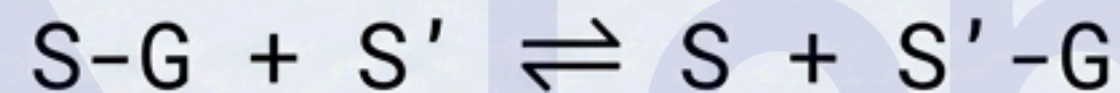
Essential for metabolic pathways like cellular respiration where energy is extracted by shuffling electrons.

CLASS 2

Transferases



The molecular movers. These enzymes catalyse the physical transfer of a specific **functional group (G)** from a donor molecule to an acceptor molecule.



DO NOT CONFUSE

The transferred group (G) must be something other than hydrogen. If hydrogen or electrons are transferred, the enzyme is classified as an Oxidoreductase (Class 1).



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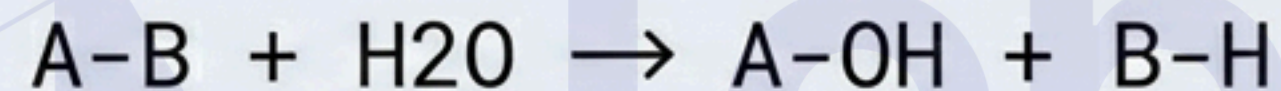


CLASS 3

Hydrolases



The molecular dismantlers. They utilize water to break complex molecules into simpler ones, a process known as hydrolysis.



Target Bonds

Catalyses hydrolysis of ester, ether, peptide, glycosidic, C-C, C-halide, or P-N bonds.

Key Takeaway Panel

Almost all digestive enzymes are hydrolases, breaking down massive biomacromolecules (proteins, starches) into absorbable pieces.

CLASS 4**Lyases**

These enzymes catalyse the removal of specific groups from substrates to break chemical bonds, resulting in the formation of a double bond.

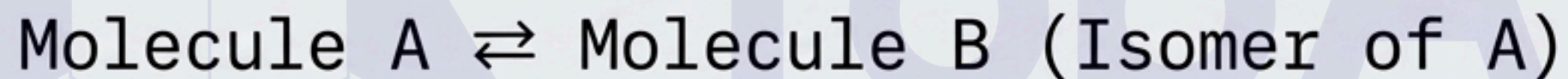
**DO NOT CONFUSE**

Lyases cleave bonds by mechanisms other than hydrolysis. No water is consumed in this reaction, and no oxidation occurs.

CLASS 5

Isomerases

The shape-shifters. Instead of adding or removing atoms, these enzymes catalyse the internal rearrangement of atoms within a single molecule to create an isomer.



(Same exact chemical formula, different 3D structure)

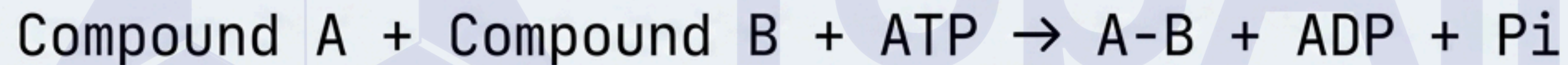
Inter-conversions

Includes all enzymes catalysing the shifting of optical, geometric, or positional isomers.

**CLASS 6**

Ligases

The molecular glue. Ligases catalyse the linking together of two separate chemical compounds into a single, larger molecule.



Target Bonds

Catalyses the joining of C-O, C-S, C-N, and P-O bonds.

Ligases are essential for constructing complex biopolymers, such as joining strands of DNA together during replication.

Final Six-Class Revision Board

1 **Oxidoreductases**
Transfer Electrons
 $S + S' \text{ (redox)}$

2 **Transferases**
Move Groups
 $S-G + S'$

3 **Hydrolases**
Break with Water
 $+ H_2O \text{ Cleavage}$

4 **Lyases**
Break & Double Bond
No H_2O , creates $C=C$

5 **Isomerases**
Rearrange Atoms
 $A \rightleftharpoons B \text{ (Isomers)}$

6 **Ligases**
Join Together
Link $C-O$, $C-S$, $C-N$

The Bottom Line Every enzyme in existence, regardless of complexity, can be classified into one of these six functional toolkits based entirely on the chemical reaction it performs.



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