

Take a hint! Key word roots etc. that will help you figure out lots about biochemical reactions from names of molecules and enzymes alone!

Enzyme names often include information about what the enzymes do (both reaction type & substrate/product)

(though they might be named for the “opposite”/reverse reaction of how you typically think of them)

- Written above or next to reaction arrows
- Recognize them by looking for the ending “-ase” or “-zyme”
 - Often, but not always, if it just has a substrate name + “-ase”, it’s a hydrolase, that uses water to break the substrate (typically irreversibly)
 - e.g., nuclease (an enzyme that cuts nucleic acids)
- Reaction type name hints
 - **kinase:** adds a phosphate (technically usually a phosphoryl group) to a molecule, often by transferring from ATP
 - often these reactions are *irreversible*
 - **phosphatase:** removes a phosphate group via hydrolysis
 - **transferase:** transfers part of one molecule (typically in the name) onto another molecule
 - e.g., methyltransferase, acetyltransferase, aminotransferase
 - **dehydrogenase, oxidase, oxidoreductase:** catalyzes a redox reaction; keep an eye out for NAD(H), NADP(H), FAD(H₂)
 - **decarboxylase:** removes CO₂
 - often these reactions are *irreversible*
 - **isomerase, mutase:** shifts bonds around in a molecule
 - often these reactions are *easily reversible*
- Some enzymes have weird names for historic purposes, so they don’t help much
- Some enzymes have multiple names
- Some enzymes have the same abbreviation, so be sure to think critically and take context into account

Other hints for metabolic reactions:

- Oxidative reactions are often catabolic
 - look for use of NAD⁺, FAD
- Reductive reactions are often anabolic
 - look for use of NADPH
- If there are both mitochondrial and cytoplasmic versions of an enzyme, a little “m” or “c” might be added to the front of their name abbreviations to distinguish them
 - e.g., mMDH, cMDH

Word roots, prefixes, and suffixes can get you far! With pathways, processes, molecule names, and more!

- **gen/genesis:** birth, creation, making
 - e.g., glycogenesis (the making of glycogen, a storage form of sugar)
- **-lysis:** breaking, breakdown
 - e.g., glycogenolysis (the breakdown of glycogen)
- **neo-:** new
 - e.g. gluconeogenesis (the making of new glucose from non-sugar parts)
- There are several hints you're dealing with **sugars**
 - **glycol/glyc-:** involving sugars, sweet
 - e.g., glycolysis (the breakdown of glucose); glycoproteins (proteins with sugar chains attached)
 - **-ose:** sugar
 - e.g., glucose, fructose
 - **sacchar-:** involving sugars
 - e.g., monosaccharides (sugar monomers)
- **lipo/lipi:** involving lipids (fats/oils/waxes)
 - e.g. lipolysis: the breakdown of fats
- **prot:** involving proteins
 - e.g., proteolysis: the breakdown of proteins
- Element-ary my dear Watson . . .
 - **oxy/oxi-:** involving oxygen
 - **organic-:** involving carbon
 - **amin/amino-:** involving nitrogen
 - **sulfa/thio/mercapto-:** involving sulfur
 - **hydr-:** involving hydrogen
 - **ferro-:** involving iron
 - **cupr-:** involving copper
- **-ate:** anionic (negatively-charged) molecule
 - e.g. carboxylate (conjugate base of carboxylic acid)
 - often will have an associated conjugate acid with the same start of the name but ending in “-ic acid” – keep an eye out for it and know they're often used interchangeably (e.g. lactic acid and lactate)

Numbers and amounts:

- **Mono-, uni-** : one, single
- **Di-/Bi-**: “2”, where the 2 *may be* connected
 - o e.g., adenosine diphosphate
- **Bis-** : “2”, where the 2 are **not** connected
 - o e.g., glucose 1,6-bisphosphate, fructose 1,6-bisphosphate
- **Tri-** : 3
- **Tetr-** : 4
- **Pent-** : 5
- **Hex-** : 6
- **Hept/Sept-**: 7
- **Oct-**: 8
- **Non-**: 9
- **Dec-**: 10