

## Biochemistry (and related) word parts – A non-exhaustive list of some key prefixes, suffixes, roots, etc. you may see (some lots!)

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<https://thebumblingbiochemist.com/365-days-of-science/wordparts/>

### Numbers/Quantities

| Word Part                                                                                                       | Definition                         | Example(s)                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>mono-</b>                                                                                                    | single, one                        | monomer (a single unit, a molecule acting by itself)                                                                |
| <b>bi-/di- (2), tri- (3), tetr-/quartr- (4), pent- (5), hex- (6), sept- (7), oct- (8), non- (9), deci- (10)</b> | numeric prefixes for quantities    | bimolecular (involving 2 molecules)                                                                                 |
| <b>bis-</b>                                                                                                     | "2", where the 2 are not connected | glucose 1,6-bisphosphate                                                                                            |
| <b>oligo-</b>                                                                                                   | few, little                        | oligonucleotide (a short nucleic acid chain, such as a PCR primer); oligopeptide (a short chain of amino acids)     |
| <b>poly-</b>                                                                                                    | many                               | polymer (a long chain of linked-together monomers), such as a polypeptide (a long chain of amino acids - a protein) |
| <b>multi-</b>                                                                                                   | multiple                           | multimer (typically used to refer to a protein with multiple subunits/chains)                                       |
| <b>pleio-</b>                                                                                                   | more                               | pleiotropic (doing or affecting multiple things, such as a drug potentially doing more than you want)               |
| <b>amphi-, amphi-, ambi-</b>                                                                                    | both                               | amphoteric (able to act as both an acid and a base); amphiphilic (having both hydrophilic and hydrophobic parts)    |

### Size

| Word Part     | Definition                                                                        | Example(s)                                                                                                                                   |
|---------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>macro-</b> | big                                                                               | macromolecules (large molecules including nucleic acids, proteins, lipids); macroscopic (something you can see with the naked eye)           |
| <b>micro-</b> | small or one-millionth ( $\mu$ )                                                  | microliter ( $\mu$ L, a millionth of a liter); microscopic (something you need a microscope to see) (PS - option + m will give you a $\mu$ ) |
| <b>nano-</b>  | super-duper small or one-billionth (n), or what people put in names to sound cool | nanometer (nm, a billionth of a meter); nanodiscs (tiny lipid disks used to surround membrane proteins to visualize them, e.g. with cryo-EM) |

### Relative Amounts/Locations

| Word Part     | Definition                         | Example(s)                                                                                                   |
|---------------|------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>hypo-</b>  | under/below (remember hypo, below) | hypoactive (less active than normal); hypotonic (having lower tonicity)                                      |
| <b>hyper-</b> | over/above (remember hyper, over)  | hyperactive (more active than normal); hypertonic (having higher tonicity)                                   |
| <b>iso-</b>   | equal, similar                     | isotonic (having equal tonicity); isomers (molecules that are similar but differ in some way, such as shape) |
| <b>meso-</b>  | middle, moderate                   | mesothermic (living at moderate temperature)                                                                 |

| Word Part           | Definition                       | Example(s)                                                                                                                                                |
|---------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>infra-</b>       | below                            | infrared (wavelengths of light with frequencies below those of red light)                                                                                 |
| <b>ultra-</b>       | above                            | ultraviolet (wavelengths of light with frequencies above those of violet light); ultracentrifuge (a centrifuge that spins faster than a conventional one) |
| <b>epi-</b>         | over/above                       | epigenetics (field dealing with genetic information "above" the level of the DNA sequence, such as DNA modifications like histone methylation)            |
| <b>supra-</b>       | beyond, over, above              | supramolecular (made up of multiple molecules, beyond a single molecule)                                                                                  |
| <b>sub-</b>         | under                            | subcutaneous (under the skin)                                                                                                                             |
| <b>meta-</b>        | beyond                           | metastasis (the spread of cancer beyond its original location)                                                                                            |
| <b>endo-, ento-</b> | inside (remember enside)         | endogenous (something made by an organism rather than taken in from outside, such as hormones the body produces)                                          |
| <b>exo-, ecto-</b>  | outside (remember exo, external) | exogenous (something added "artificially" or from the outside, such as pharmaceutical drugs)                                                              |
| <b>peri-</b>        | around                           | periplasm (the space around the bacterial cytoplasm, between the inner and outer membranes)                                                               |
| <b>per-</b>         | through                          | permeable (allowing things through)                                                                                                                       |
| <b>cis-</b>         | same                             | cis-regulatory elements (regulatory, noncoding DNA regions, such as promoters, on the same piece of DNA as the gene they regulate)                        |
| <b>trans-</b>       | across                           | transmembrane proteins (proteins that go across/span membranes)                                                                                           |
| <b>inter-</b>       | between                          | intermolecular interactions (interactions between different molecules)                                                                                    |
| <b>intra-</b>       | within                           | intramolecular interactions (interactions between different parts of the same molecule)                                                                   |
| <b>telo-</b>        | end                              | telomeres (the end parts of chromosomes)                                                                                                                  |
| <b>ortho-</b>       | normal, straight, correct        | orthosteric (binding in the same site as the "normal" binding partner)                                                                                    |
| <b>allo-</b>        | other                            | allosteric (binding at another site, not the "normal" one, and/or something at one site affecting another)                                                |

## Completeness

| Word Part    | Definition       | Example(s)                                                                                                                                      |
|--------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>semi-</b> | partly           | semipermeable (allowing some things through but not others)                                                                                     |
| <b>pan-</b>  | all              | pan-genome analysis (an experiment looking across the entire genome, not just select parts)                                                     |
| <b>holo-</b> | whole            | holoenzyme (an enzyme with any necessary cofactors)                                                                                             |
| <b>apo-</b>  | without, lacking | apoenzyme (an enzyme without its cofactors); apo structure (a protein structure, e.g. from x-ray crystallography, without some binding partner) |

## Identity/Relationships

| Word Part      | Definition           | Example(s)                                                                                                                                                            |
|----------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>auto-</b>   | self                 | autotroph (an organism able to make its own food); autologous (a sample or transplant from the recipient themselves, e.g. autologous bone marrow or CAR-T transplant) |
| <b>allo-</b>   | other                | allogeneic (a sample or transplant from a different organism than the recipient, e.g. allogeneic bone marrow or CAR-T transplant)                                     |
| <b>xeno-</b>   | foreign              | xenotransplant (a transplant of an organ, tissue, or cells from one species into another)                                                                             |
| <b>contra-</b> | against, contrasting | contraindication (a condition that makes it so someone shouldn't be given a particular treatment)                                                                     |
| <b>homo-</b>   | same                 | homogenous (made up of a single thing and/or consistently distributed); homomer (a complex with multiple copies of a single component)                                |
| <b>hetero-</b> | different, other     | heterogenous (made up of multiple things and/or not consistently distributed); heteromer (a complex with different components)                                        |
| <b>pseudo-</b> | fake, false          | pseudogene (remnants of a gene that remain in a genome but aren't functional)                                                                                         |
| <b>eu-</b>     | true, normal, good   | eukaryotes (organisms whose cells have a true nucleus)                                                                                                                |
| <b>dys-</b>    | abnormal             | dysfunction (when something isn't functioning normally)                                                                                                               |
| <b>syn-</b>    | together             | synthesis (combining pieces to make something)                                                                                                                        |

## Age/Time/etc.

| Word Part     | Definition          | Example(s)                                                                                                                                                                                        |
|---------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>neo-</b>   | new                 | gluconeogenesis (the making of new glucose from non-sugar parts)                                                                                                                                  |
| <b>paleo-</b> | old                 | paleogenomics (the study of ancient DNA)                                                                                                                                                          |
| <b>pre-</b>   | before              | pre-messengerRNA (pre-mRNA), RNA transcripts that haven't yet been spliced and otherwise processed                                                                                                |
| <b>post-</b>  | after               | post-translational modifications (PTMs) (modifications such as phosphorylation that are added onto proteins after the proteins are translated)                                                    |
| <b>pro-</b>   | before, in front of | prodrug (an inactive version of a pharmaceutical compound that's metabolized in the body to form an active compound)                                                                              |
| <b>retro-</b> | backward, behind    | retrosynthesis (an organic chemistry strategy where chemists start by analyzing their desired product and then work backwards to figure out a series of experimental steps that could produce it) |
| <b>co-</b>    | with, together      | coprecipitant (something like glycerol or GlycoBlue that helps nucleic acids precipitate out of solution along with it)                                                                           |

## Characteristics

| Word Part   | Definition     | Example(s)                                                                                                |
|-------------|----------------|-----------------------------------------------------------------------------------------------------------|
| <b>bio-</b> | involving life | biology (the study of living organisms)                                                                   |
| <b>viv-</b> | living         | in vivo (in a living organism); ex vivo (in tissues from an organism, worked on outside of that organism) |

| Word Part             | Definition                    | Example(s)                                                                                                                                                                                    |
|-----------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>vitr-</b>          | glass                         | in vitro (outside of a living organism, in a controlled laboratory environment such as a test tube); vitrification ("flash freezing" to "freeze" molecules in a layer of glassy water/buffer) |
| <b>sit-</b>           | site                          | in situ (at the site, such as labeling molecules in tissues by binding them to fluorescent antibodies, e.g. FISH - fluorescence in situ hybridization)                                        |
| <b>therm-</b>         | involving heat                | mesothermic (living at moderate temperatures)                                                                                                                                                 |
| <b>calor-</b>         | heat                          | calorimetry (measuring changes in heat to study the energetics of molecular interactions and reactions)                                                                                       |
| <b>photo-</b>         | involving light               | photosynthesis (the making of food using energy from light)                                                                                                                                   |
| <b>ster-, stereo-</b> | involving spatial orientation | stereoisomers (chemicals with the same atomic makeup but that differ in which way their groups stick out in space)                                                                            |
| <b>morph-</b>         | shape                         | morphology (shape, or the study of shape)                                                                                                                                                     |
| <b>dent-</b>          | bite, teeth                   | tridentate (a chelating agent that "bites" down 3 times on a metal, having 3 lone pairs that form coordinate bonds with it)                                                                   |
| <b>color-, chrom-</b> | color                         | colorimetric (an experiment with a color-based readout, such as binding to a visible dye)                                                                                                     |

## Colors

| Word Part                | Definition | Example(s)                                                                                         |
|--------------------------|------------|----------------------------------------------------------------------------------------------------|
| <b>leuk-, leuko-</b>     | white      | leukocyte (white blood cells, aka immune cells or immunocytes)                                     |
| <b>erythr-, erythro-</b> | red        | erythrocyte (red blood cell)                                                                       |
| <b>cyano-</b>            | blue       | cyanosis (when someone's body (or a part of it) isn't getting adequate oxygen and thus turns blue) |
| <b>melan-, melano-</b>   | black      | melanin (a dark pigment that protects skin from UV damage)                                         |
| <b>chlor-, chloro-</b>   | green      | chloroplast (a plant cell organelle where photosynthesis occurs)                                   |
| <b>xant-, xantho-</b>    | yellow     | xanthophyll (a yellow plant pigment that's a major type of carotenoid)                             |

## Molecular Composition

| Word Part            | Definition                         | Example(s)                                                                                         |
|----------------------|------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>hydro-</b>        | involving water or hydrogen        | hydrolysis (the breakdown of water, or breakdown of something else by water)                       |
| <b>lipo-, lipi-</b>  | involving lipids (fats/oils/waxes) | lipophilic (lipid-loving; a molecule that associates with lipids, such as membrane-bound proteins) |
| <b>glycol-, gly-</b> | involving sugars, sweet            | glycolysis (the breakdown of glucose); glycoproteins (proteins with sugar chains attached)         |
| <b>sacchar-</b>      | involving sugars                   | monosaccharides (sugar monomers)                                                                   |
| <b>halo-</b>         | involving salt                     | halophile (an organism that lives in high salt conditions)                                         |
| <b>oxy-, oxi-</b>    | involving oxygen                   | oxidative stress (a type of cell stress caused by high levels of reactive oxygen species)          |

| Word Part                       | Definition       | Example(s)                                                                                                     |
|---------------------------------|------------------|----------------------------------------------------------------------------------------------------------------|
| <b>sulfa-, thio-, mercapto-</b> | involving sulfur | dithiothreitol (DTT) and beta-mercaptoethanol (BME), a couple of commonly used reducing agents                 |
| <b>ferro-</b>                   | involving iron   | ferritin (a protein that binds, stores, and transports iron); ferroptosis (a form of iron-mediated cell death) |
| <b>cupr-</b>                    | involving copper | various chemical names                                                                                         |

## Actions

| Word Part             | Definition              | Example(s)                                                                                                                                                        |
|-----------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>gen-, -genesis</b> | birth, creation, making | glycogenesis (the making of glycogen, a storage form of sugar)                                                                                                    |
| <b>kin-</b>           | move                    | kinetics (the study of the rate at which things, such as enzymatic reactions, happen); kinase (an enzyme that moves phosphate groups from ATP to other molecules) |
| <b>phag-, phago-</b>  | eat                     | phagocytosis (a way cells pinch in their membrane to take things in from outside); macrophage (an immune cell that eats foreign material)                         |
| <b>pino-</b>          | drink                   | pinocytosis (a way cells pinch in a smaller portion of membrane to take things in from outside)                                                                   |
| <b>phor-, -phore</b>  | bear, carry             | ionophore (a molecule that helps transport ions across membranes)                                                                                                 |

## Suffixes

| Word Part              | Definition                                                                             | Example(s)                                                                                                                                |
|------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>-philic, -phile</b> | loving/lover                                                                           | hydrophilic (water-loving/water-loved); lipophilic (lipid-loving/lipid-loved); halophile (an organism that grows in high salt conditions) |
| <b>-phobic, -phobe</b> | fearing/fearer                                                                         | hydrophobic (water-fearing/water-feared - though it's really more like water-avoiding than fearing)                                       |
| <b>-ogy</b>            | study of                                                                               | biology (study of life)                                                                                                                   |
| <b>-omics</b>          | an experimental method/field dealing with gathering and analyzing huge amounts of data | proteomics (study of all the proteins made and how this changes across circumstances/tissues); genomics (study and comparison of genomes) |
| <b>-metry, -meter</b>  | measurement                                                                            | mass spectrometry (a technique that measures the mass/charge ratios of molecules)                                                         |
| <b>-graph</b>          | device for recording                                                                   | chromatograph (a device that separates components based on their properties for detection/characterization)                               |
| <b>-graphy</b>         | method of recording                                                                    | chromatography (technique that separates components based on their properties for detection/characterization)                             |
| <b>-gram</b>           | chart or graph                                                                         | chromatogram (graph showing light absorbance corresponding to sample coming off a chromatography column)                                  |
| <b>-ase</b>            | ending denoting an enzyme                                                              | nuclease (an enzyme that cuts nucleic acids)                                                                                              |
| <b>-zyme</b>           | ending denoting an enzyme                                                              | lysozyme (an enzyme that breaks down bacterial cell walls)                                                                                |
| <b>-lysis</b>          | breaking, breakdown                                                                    | catalysis (the breaking down of biochemicals for energy and/or building blocks); hemolysis (the breakdown of blood cells)                 |

| Word Part                         | Definition                                         | Example(s)                                                                               |
|-----------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>-stasis</b>                    | standing, placed, staying                          | homeostasis (a state of equilibrium/balance where things stay the same)                  |
| <b>-some</b>                      | body, structure                                    | endosome, ribosome, chromosome                                                           |
| <b>-ose</b>                       | sugar                                              | glucose, fructose                                                                        |
| <b>-troph, -trophy, -trophism</b> | having to do with eating, nutrition, and/or growth | autotroph (an organism that makes its own food)                                          |
| <b>-ate</b>                       | anionic (negatively-charged) molecule              | carboxylate (conjugate base of carboxylic acid)                                          |
| <b>-poiesis</b>                   | to make                                            | erythropoiesis (the process of making new red blood cells from hematopoietic stem cells) |

## Body Parts/Body Systems

| Word Part                                  | Definition                                       | Example(s)                                                                                                                                                                                              |
|--------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>cyt-, -cyte</b>                         | cell                                             | cytoskeleton (the network of tubules etc. giving cells their structure and helping move things around); erythrocyte (red blood cell)                                                                    |
| <b>hist-, histo-</b>                       | involving tissues                                | histology (the study of tissues); histopathology (the study of tissues for information about diseases and/or to look for signs of diseases)                                                             |
| <b>-blast</b>                              | bud, often used to refer to immature cells       | erythroblast (an immature red blood cell)                                                                                                                                                               |
| <b>-clast</b>                              | something that breaks down, destroys, or resorbs | osteoclast (a type of cell that dissolves and resorbs old and/or damaged bone cells)                                                                                                                    |
| <b>erythro-</b>                            | relating to red blood cells                      | erythropoiesis (the process of making new red blood cells from hematopoietic stem cells)                                                                                                                |
| <b>hem-, hema-, hemat-, hemato-, hemo-</b> | blood                                            | hematology (medical discipline specializing in disorders of the blood)                                                                                                                                  |
| <b>vasc-, vasculo-</b>                     | blood vessels                                    | vasculitis (an autoimmune disorder characterized by inflammation of blood vessels)                                                                                                                      |
| <b>immuno-</b>                             | immune system                                    | immunotherapy (a type of treatment that aims to increase or decrease immune system activity to treat a disease or condition)                                                                            |
| <b>myelo-</b>                              | spinal cord or bone marrow                       | myelitis (inflammation of the spinal cord); myeloid cells (a broad class of blood cells including granulocytes, monocytes, erythrocytes, and platelets – basically most blood cells except lymphocytes) |
| <b>myo-, muscul-, musculo-</b>             | muscle                                           | myocardiocyte (heart muscle cell)                                                                                                                                                                       |
| <b>adip-, adipo-</b>                       | fat                                              | adipocyte (fat cell)                                                                                                                                                                                    |
| <b>cardi-, cardio-</b>                     | heart                                            | cardiology (medical discipline focused on the heart)                                                                                                                                                    |
| <b>hepato-</b>                             | liver                                            | hepatocyte (a type of liver cell)                                                                                                                                                                       |
| <b>ost-, oste-, osteo-</b>                 | bone                                             | osteoclast (a type of cell that dissolves and resorbs old and/or damaged bone cells)                                                                                                                    |
| <b>oto-</b>                                | ear                                              | otology (medical discipline specializing in the ear)                                                                                                                                                    |
| <b>ocul(o)-, ophthalgo-, opt-</b>          | eye and/or vision                                | ocular muscles (muscles that control eye movement)                                                                                                                                                      |
| <b>ren-, nephro-, nephro-</b>              | kidney                                           | end-stage renal disease (ESRD)(final stage of chronic kidney disease)                                                                                                                                   |

| Word Part              | Definition | Example(s)                                      |
|------------------------|------------|-------------------------------------------------|
| <b>derm-, dermato-</b> | skin       | dermatologist (doctor specializing in the skin) |

## Medicine/Diseases

| Word Part                      | Definition                                                                                                | Example(s)                                                                                                                                                  |
|--------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>path-, -pathy</b>           | disease                                                                                                   | pathology (study of disease and/or investigation to look for signs of disease); tauopathy (a disease characterized by misfolded and aggregated tau protein) |
| <b>-sis, -osis</b>             | disease (sometimes at least) or condition, often characterized by a chronic and/or degenerative condition | tendinosis (a chronic condition involving degeneration of tendon(s))                                                                                        |
| <b>-itis, -ites</b>            | inflammation/swelling (often acute, potentially connected to an injury)                                   | tendonitis (inflammation of a tendon, often due to an acute injury)                                                                                         |
| <b>a-, an-</b>                 | without, lacking                                                                                          | anemia (condition where there aren't enough red blood cells)                                                                                                |
| <b>-emia</b>                   | blood disorder                                                                                            | anemia (condition where there aren't enough red blood cells)                                                                                                |
| <b>carcin-, carcino-, onc-</b> | cancer                                                                                                    | carcinogenic (capable of causing cancer)                                                                                                                    |
| <b>-sclerosis</b>              | hardening                                                                                                 | atherosclerosis (build up of hard plaque on the walls of arteries, which can block blood flow)                                                              |
| <b>-uria</b>                   | when something is found in the urine (often when it shouldn't be there)                                   | glucosuria (presence of blood sugar (glucose) in urine)                                                                                                     |
| <b>pharmaco-</b>               | drug, medicine                                                                                            | pharmacology (the study of drugs); pharmacist (a person who prepares and/or provides therapeutic drugs)                                                     |