

All You Ever Wanted To Know About Enzymes

What is an enzyme?

- Simple definition=organic catalyst
- More complex definition= an organic substance(usually a globular protein) that lowers the activation energy needed for a reaction to occur(be sure to check out the graph of activation energy that is in your biology text book.)
- Substrate= the substance that the enzyme acts upon.

Enzyme structure.

- An enzyme's 3 dimensional structure is critical to its function. The "lock and key" analogy is often used, a substrate fits an enzyme like a key fits a lock.
- The site on the enzyme that "fits" the substrate is called the active site.

Basic Information.

- An enzyme has only one function, it catalyzes only one reaction or one specific type of reaction. There are thousands on enzymes in living things, each doing only one thing.
- Enzymes are not used up in the reaction.
- Enzymes work on a variety of reactions; syntheses, lysis, energy transfers, etc.
- Enzymes do not change the equilibrium state of the reaction, they just speed up the time to equilibrium.
- Enzymes cannot cause a reaction to occur that does not otherwise occur.
- The suffix -ase often is used in enzyme names.(e.g. maltase, catalase, reverse transcriptase, etc.)

Factors affecting the rate of enzyme catalyzed reactions.

- Enzyme concentration
- Substrate concentration
- Product concentration
- pH
- Temperature
- Concentration of salts
- Presence of cofactors(inorganic) and coenzymes(organic)
- Presence(or absence) of enzyme inhibitors

Enzyme Inhibition

- Enzyme inhibitors are substances that inactivate the enzyme by changing the shape of the enzyme molecule or blocking the active site.
- Competitive inhibitors block the active site(they "compete" with the substrate).
These competitive inhibitors resemble the shape of the substrate and fit into the active site.
- Noncompetitive inhibitors change the shape of the enzyme by binding to the molecule at a site other than the active site.
- Many poisons are enzyme inhibitors(e.g. pesticides, antibiotics, cyanide, etc.)

Enzyme Turnover

Enzyme activity is measured by **turnover number**, the number of molecules acted upon per unit of time. The following table gives some turnover numbers in molecules per second. (From McMurry and Castellion.1992. General, Organic, and Biological Chemistry. Prentice Hall.)

Enzyme	Turnover number(per second)
Carbonic anhydrase	600,000
Acetylcholinesterase	25,000
Amylase	18,000
Penicillinase	2,000
DNA Polymerase	15

Prepared by [P. Vanderschaegen](#)