

ENZYMES & KINETICS

rvsd 10/12/92, 10/6/93, 10/7/94, 10/2/95, 8 Oct 01, 8 Oct 03, 6 Oct 04, 3 Oct 07, 5 Oct 07, 8Oct08, 7Oct09
 BKH: pp: 134-159, BKH 5th: 130-153, 6th: 127-150, 7th: 129-152

If $\Delta G =$ negative [spontaneous reaction], why doesn't a reaction go?
Activation energy required

Reaction energy versus activation energy:

Illustrate profile of chemical reaction (p 130)
metastable state: lack of stable intermediates slows reaction

catalysts stabilize intermediates, reduce activation energy, therefore speed up reactions

In biological systems, catalysis is performed by
enzymes = protein catalyst

Enzyme:
 apoenzyme = protein component
 prosthetic group = cofactor
 holoenzyme = entire enzyme

Active site, binds substrate(s), specificity high in biological systems
 substrate binding to enzyme: Lock and key (p 132) versus induced fit (p 137)
 Steps: substrate binding, activation

Enzyme activity dependant on proper folding of enzyme:
 pH, temperature (p 134: draw optimum for each)

Allosteric site binds non-competitive or allosteric inhibitors

KINETICS: (p. 137) velocity = either reactant consumed or product made per unit time.

LINEAR GRAPH: rate or **velocity vs [S]** shows substrate saturation Show V_{max} (p. 139 & 143)

Then add inhibitors: competitive & non competitive (p 145)
 overcoming of competitive inhibition, but not allosteric inhibition

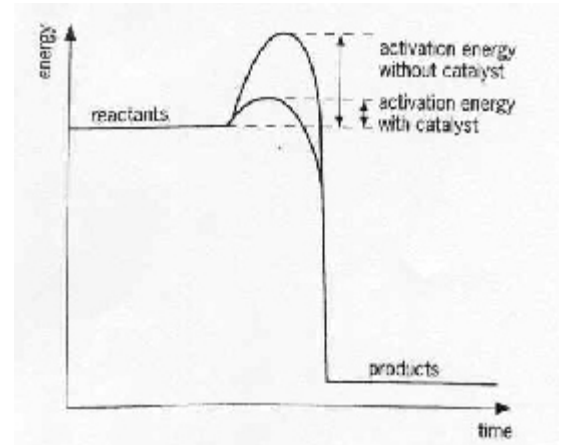
Examples:
Competitive: pABA and sulfanilamide
Allosteric: histidine biosynthetic pathway
 Isoleucine biosynthetic pathway (p 144)

Michaelis-Menten: $v = V_{max}[S]/(K_m + [S])$
 K_m is Michaelis Menten constant, = [S] yielding $1/2 V_{max}$
 Lineweaver-Burk plot, double reciprocal plot (p. 142 and 144)
 x intercept = $-1/K_m$
 y intercept = $1/V_{max}$

Note that **end-product inhibition** in metabolic pathways:
 Regulates commitment of resources.
 Example: G enzyme, first in histidine biosynthetic pathway, is inhibited by histidine
 also isoleucine inhibition of threonine deaminase (p. 147)

Glycogen phosphorylase: (p 149)
 active when phosphorylated by phosphorylase kinase. Not without.

Irreversible inhibition by heavy metals, halogens, alkylating agents, bind covalently to enzyme, destroy catalytic activity.



(if organic = coenzyme)

