

Enzymes 1

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10:26 PM

Outline:

- enzyme classification
- cofactors
- catalysts
- kinetics: M-M Equation

Learning Objectives:

- use resources to determine whether 2 enzymes catalyze the same rxn or diff rxns
- zymogen, ribozyme, coenzyme, cofactor, prosthetic group, apoenzyme, holoenzyme, isoenzyme, catalytic cycle, enzyme unit
- thermodynamics vs. enzyme catalysis
- how enzymes increase rxn rates
- effect of temp & pH on enzyme rxn
- key-lock vs. induced-fit
- M-M Equation to relate K_m , activity, & [substrate]

ZYMOGEN - proenzyme (*Trypsin is part of Trypsinogen*)

RIBOZYME - RNA enzyme

COFACTOR - non-protein required for enzyme function

COENZYME - complex, organic cofactor

PROSTHETIC GROUP - coenzyme tightly bound to enzyme; does not leave during catalytic cycle

HOLOENZYME = APOENZYME + COFACTOR

APOENZYME - enzyme that needs a cofactor to function, but does not have one yet

ISOENZYME - multiple forms of enzymes that catalyze the same rxn

CATALYTIC CYCLE - multistep rxn with catalyst

ENZYME UNIT - 1 U Enzyme = 1 μmol product/min (at V_{max})

*enzymes = chiral

*most AAs = chiral

Key-Lock Theory

- **Key** = substrate
- **Lock** = enzyme

Induced-Fit Theory

- enzyme changes conformation when a substrate binds

Ways to $\downarrow E_a$ (TS Barrier)

- strain substrate
- align substrate & cofactors
- bind favorable configurations
- optimal positioning of active chemical groups
- exclude water & other compounds
- choose more stable TS ($\downarrow G$)

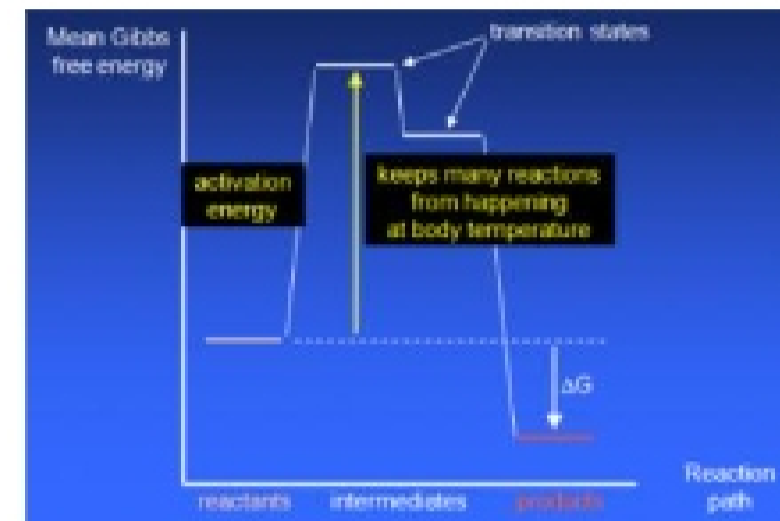
M-M Equation

$$V/V_{max} = S/(S+K_m)$$

$\uparrow K_m, \downarrow V_{max}$

$\uparrow K_m, \uparrow V/V_{max}$

K_m = [substrate] at which the rxn rate = $V_{max}/2$



SUMMARY

- Enzymes are identified by systematic names, EC number, or recommended names
- Enzymes sometimes use coenzymes / cofactors / prosthetic groups.
- Isoenzymes catalyze the same reaction but have different amino acid sequence.
- Enzymes speed up thermodynamically feasible reactions.
- Michaelis-Menten equation: $v = V_{max}[s]/(s+K_m)$