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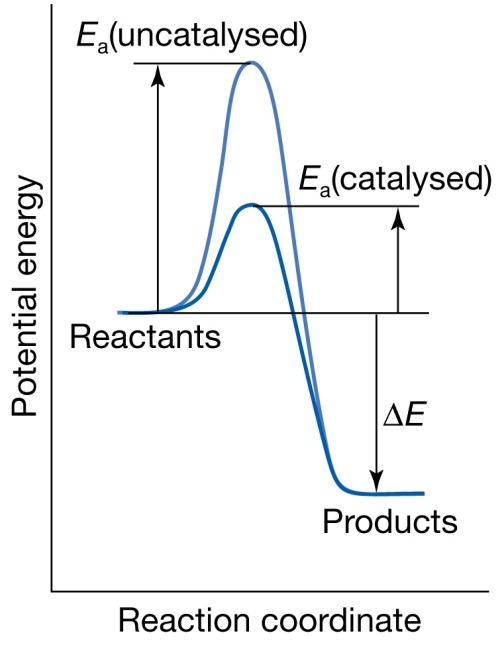

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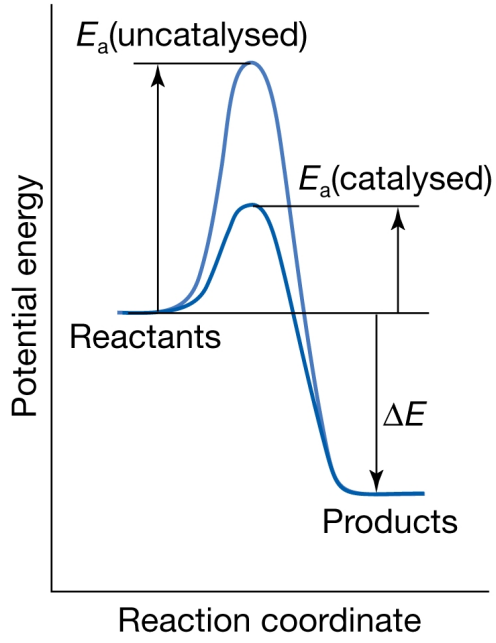

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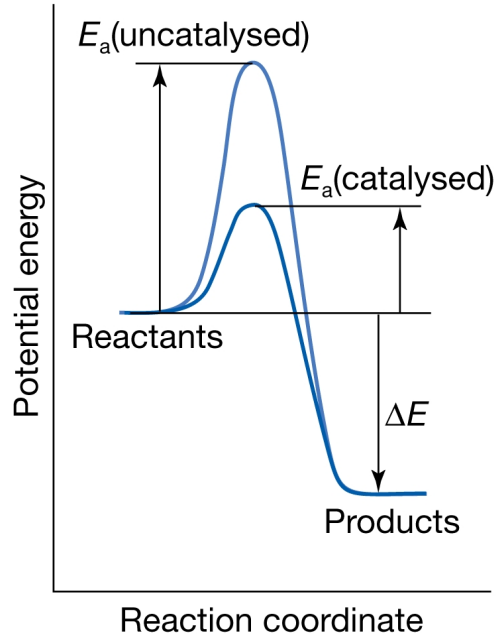

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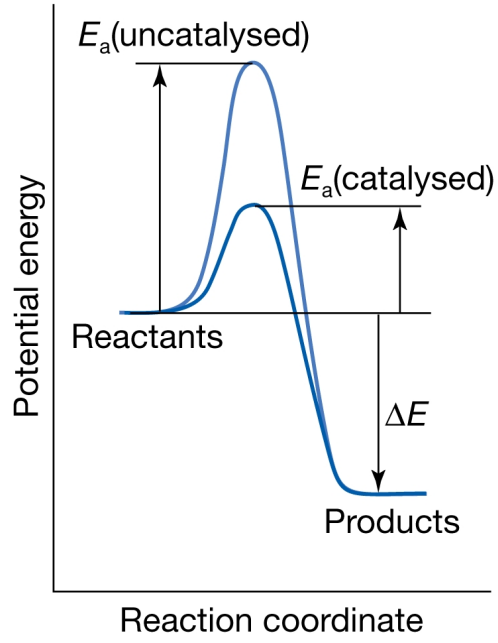

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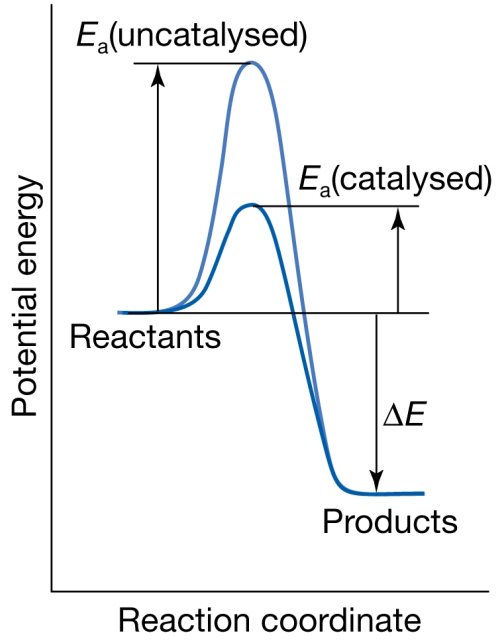

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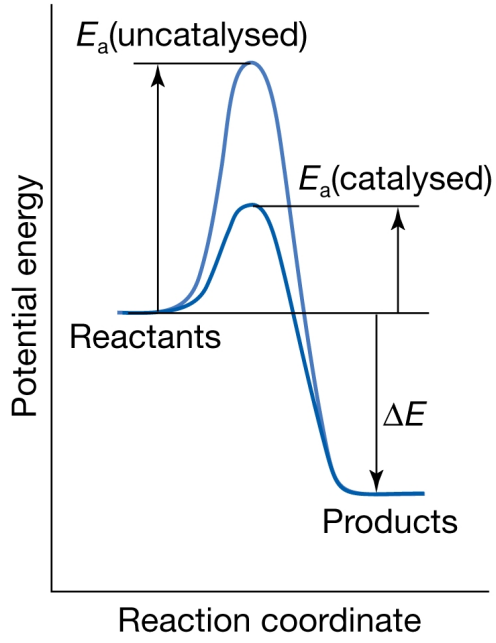

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binding facilitates encounters between reactants and increases rxn rate

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Other examples: Acid/base catalysis

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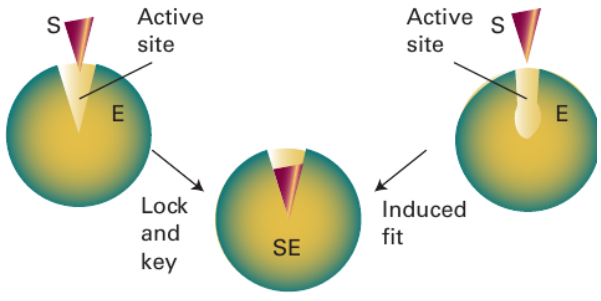

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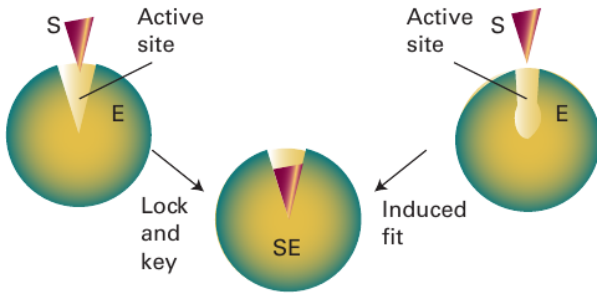

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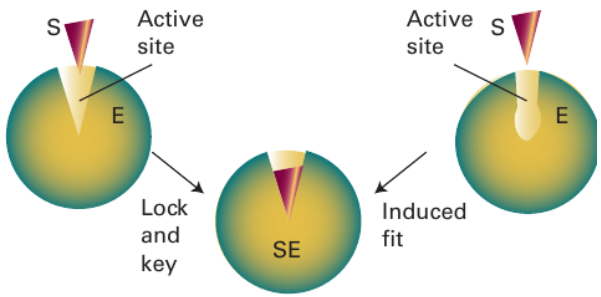

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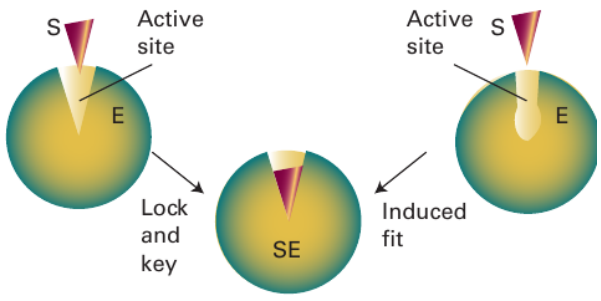

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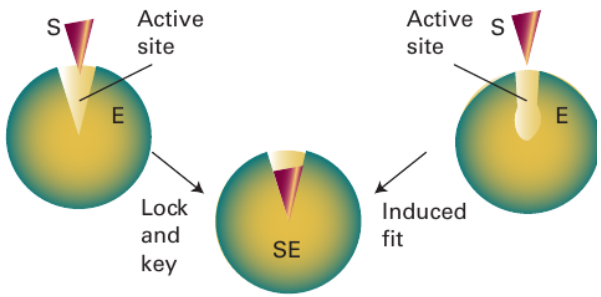

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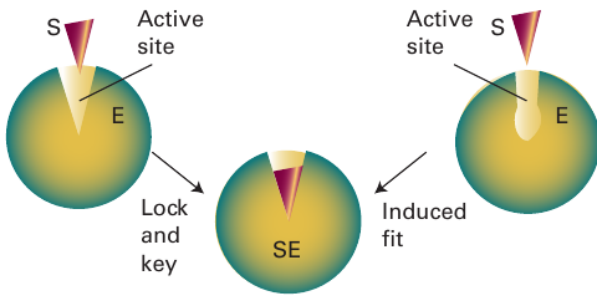

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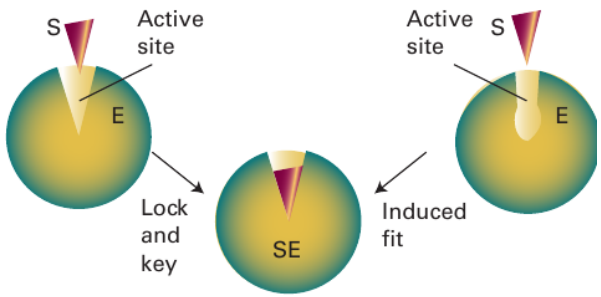

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example of ribozyme $\Rightarrow$ ribosome, large assembly of proteins and catalytically active RNA molecules responsible for synthesis of proteins in cell

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rate of product formation : independent of $[S]_0$
reaches maximum velocity, v_{max}

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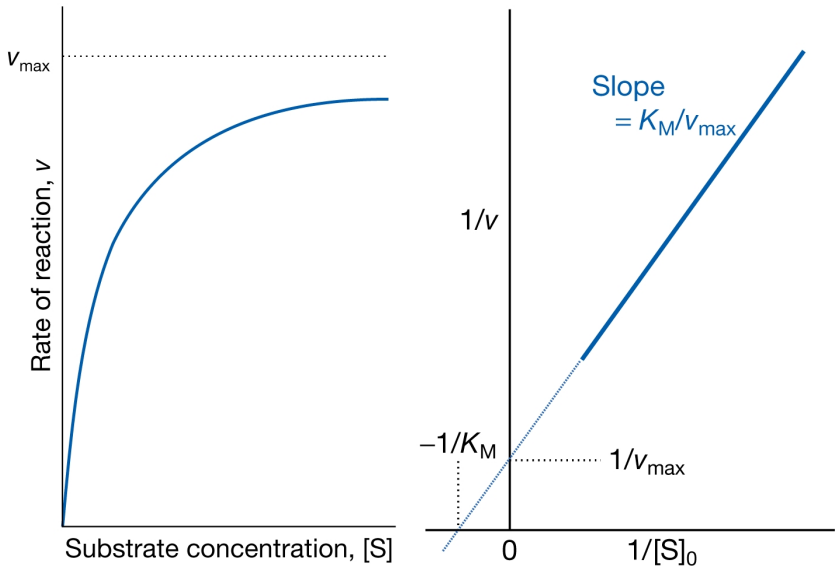

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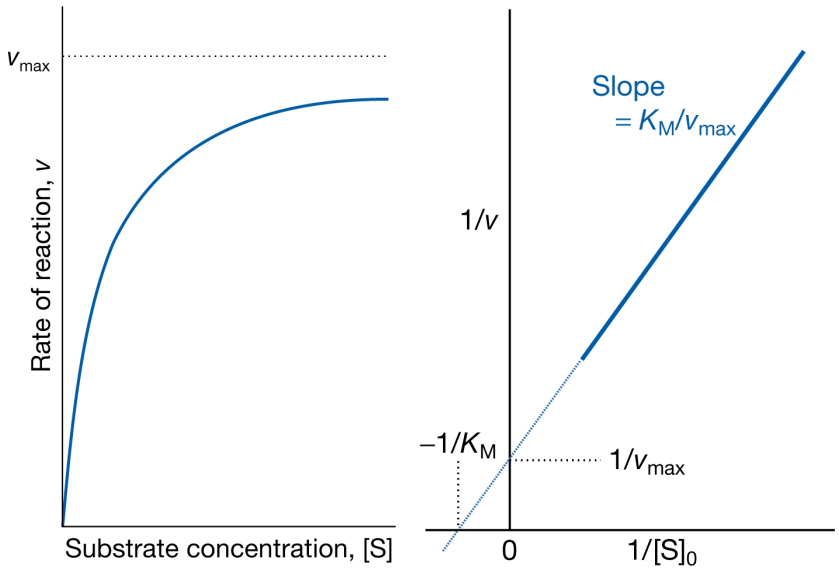

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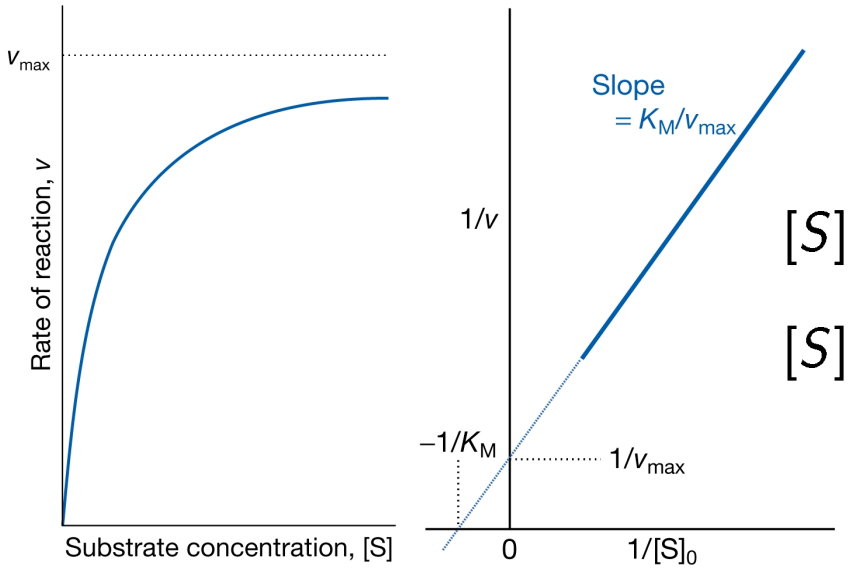

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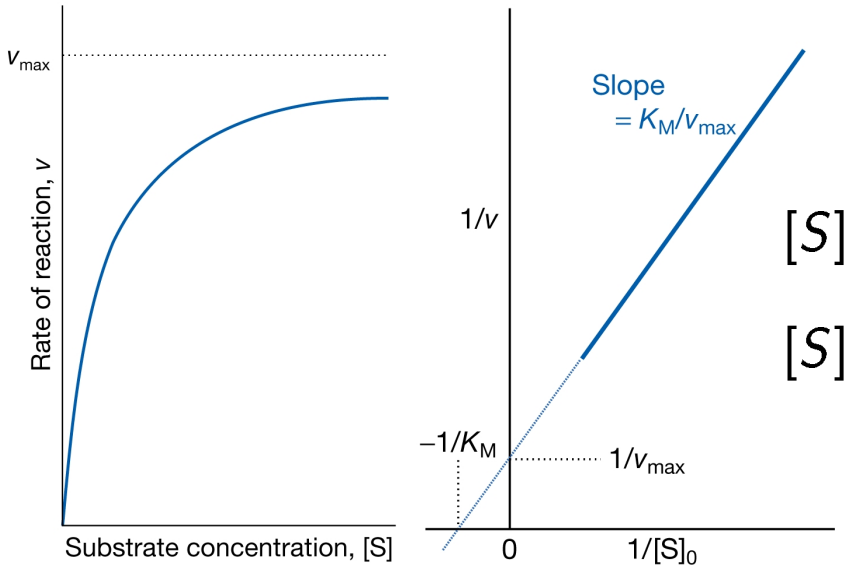

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$1/([CO_2]/(\text{mmol dm}^{-3}))$	0.800	0.400	0.200	0.0500
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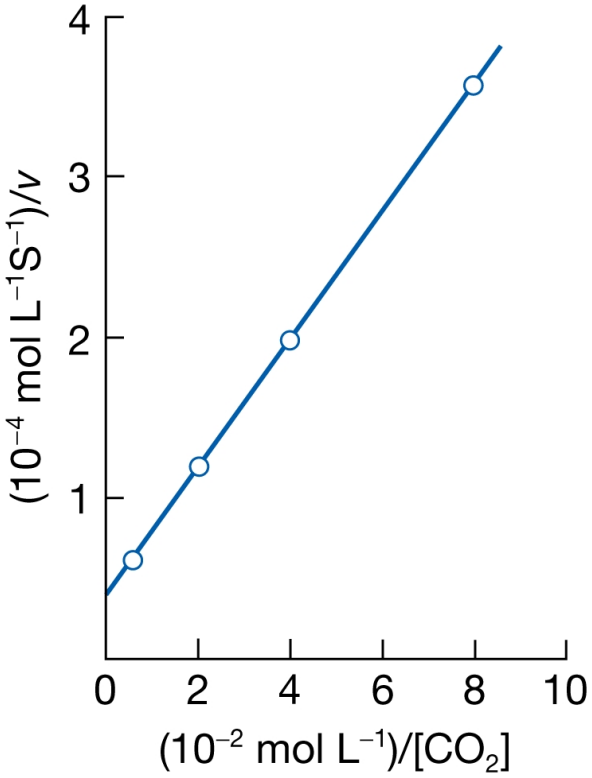

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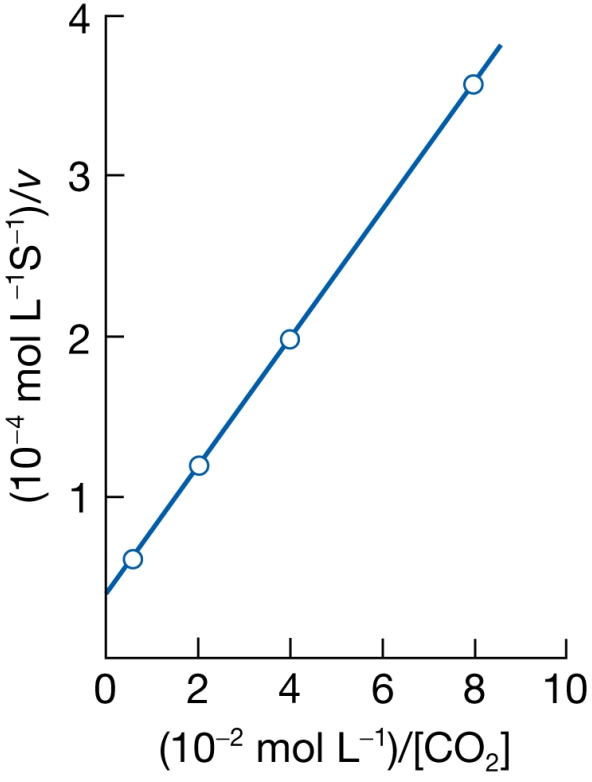

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Lineweaver-Burk plot

catalysis of hydration of CO_2 in red blood cells by carbonic anhydrase

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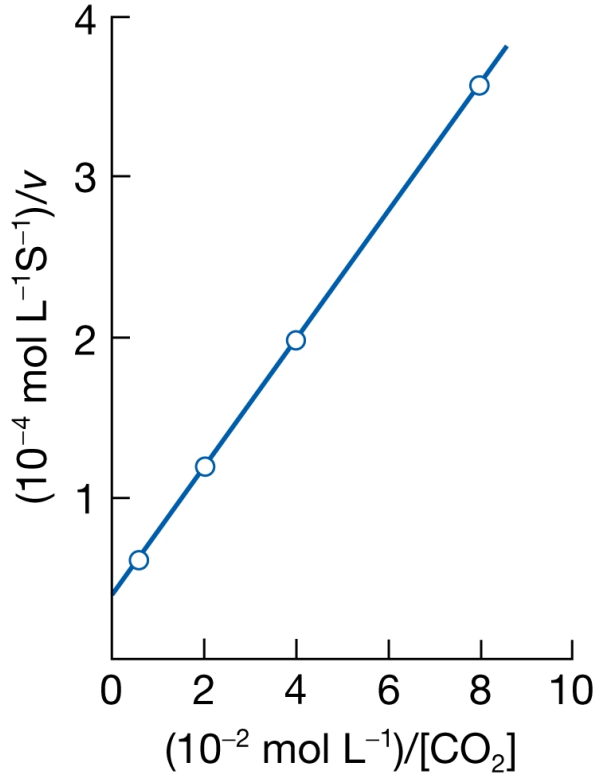

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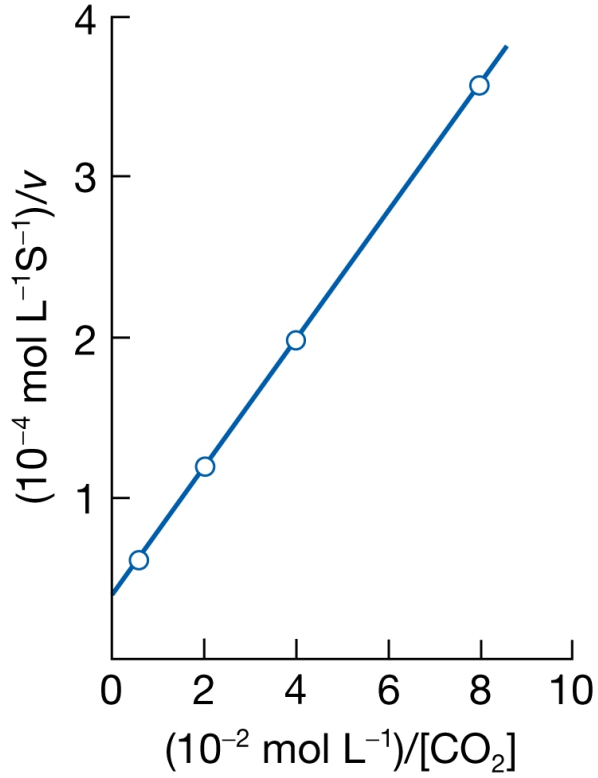

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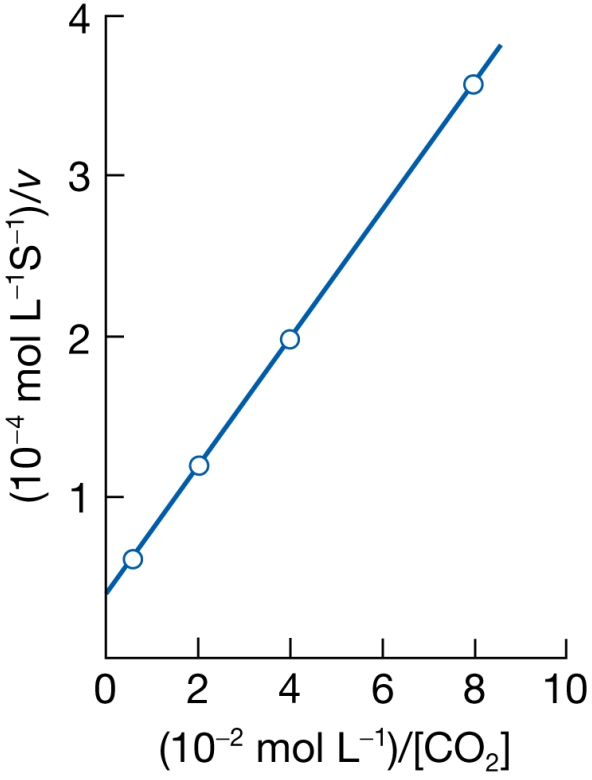

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max efficiency related to max rate of diffusion of E and S in solution
$\implies$ rate constants$\approx 10^8 - 10^9$ $\text{dm}^3\text{mol}^{-1}\text{s}^{-1}$(catalytic perfection)

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&\mathrm{ES} \rightarrow \mathrm{E+P} && k_b \\
&\mathrm{EI} \rightleftharpoons \mathrm{E+I} && K_I = \frac{[E][I]}{[EI]} \\
&\mathrm{ESI} \rightleftharpoons \mathrm{ES+I} && K_I' = \frac{[ES][I]}{[ESI]}
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$[\mathrm{E}]_0 = \frac{K_M[ES]}{[S]_0}\alpha + [\mathrm{ES}]\alpha' = [ES]\left(\frac{\alpha K_M}{[S]_0} + \alpha'\right)$

$v = k_b[ES] = \frac{k_b[E]_0}{\frac{\alpha K_M}{[S]_0} + \alpha'} = \frac{v_{max}}{\alpha' + \frac{\alpha K_M}{[S]_0}}$

or, $\frac{1}{v} = \frac{\alpha'}{v_{max}} + \alpha\left(\frac{K_M}{v_{max}}\right)\frac{1}{[S]_0}$

Lineweaver-Burk plots characteristic of three modes of enzyme inhibition:

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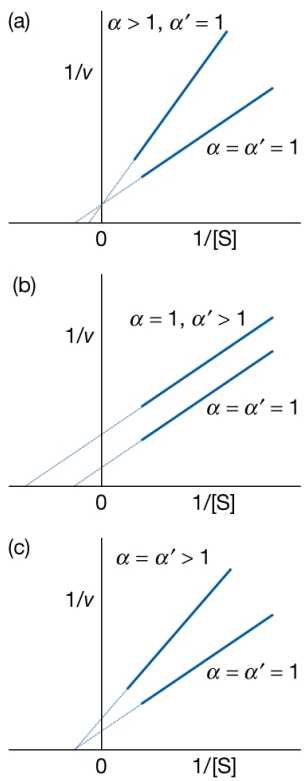

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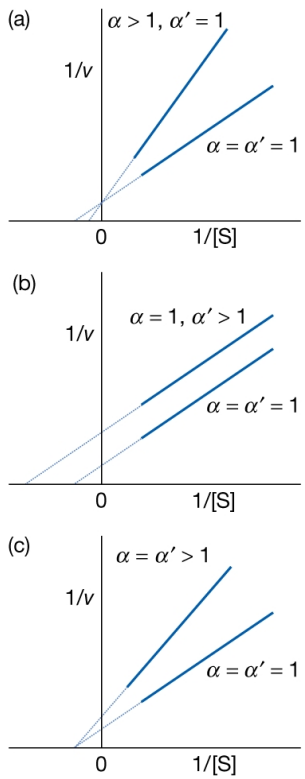

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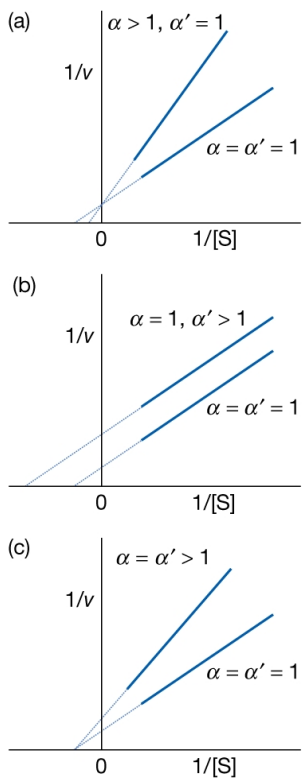

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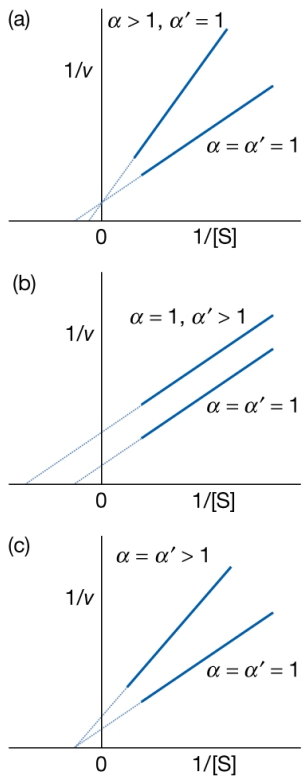

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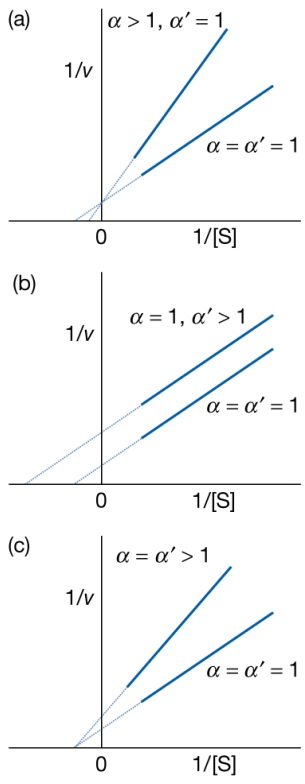

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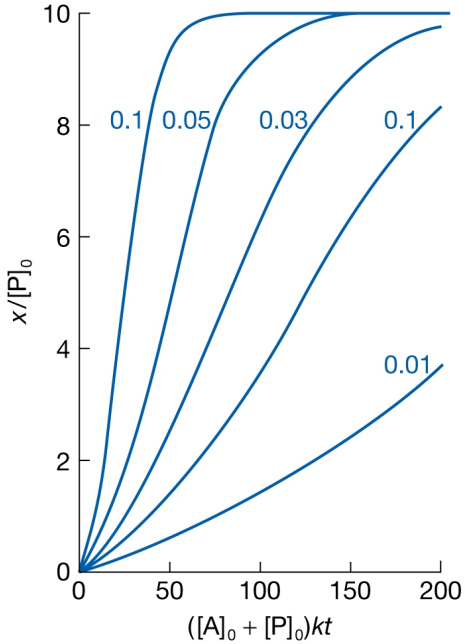
Slope and y-intercept of Lineweaver-Burk plot increase upon addition of inhibitor. Fig. c : special case : $K_I = K_I'$; and $\alpha = \alpha'$, which results in intersection of lines on x-axis

Autocatalysis:



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labelled by b

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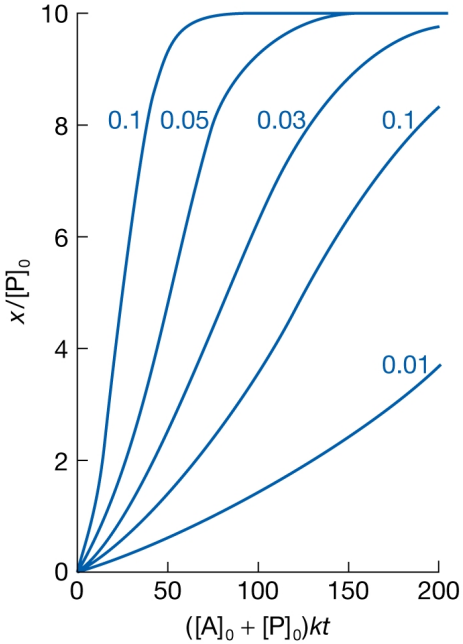

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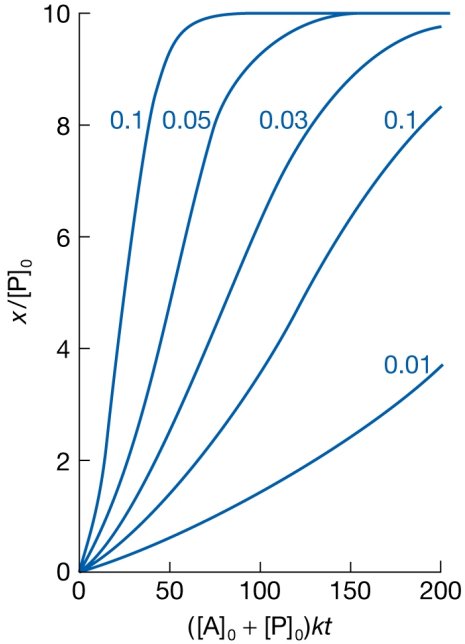

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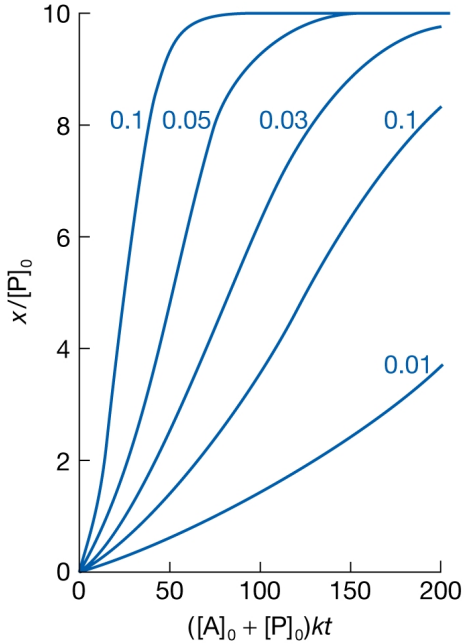

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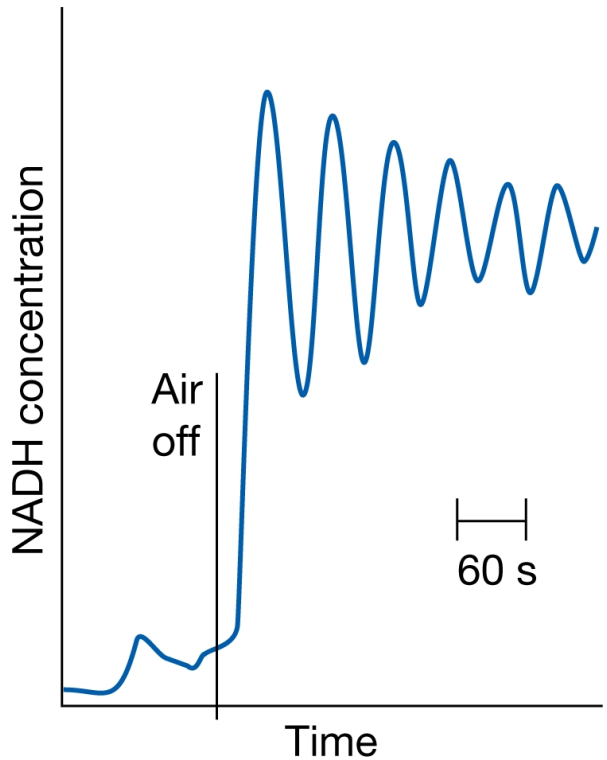
or, $\frac{x}{[P]_0} = \frac{e^{at}-1}{1+be^{at}}$, where $a = \left([A]_0 + [P]_0\right)k$

and $b = \frac{[P]_0}{[A]_0}$

oscillating reactions: Feedback mechanism in which a product either increases or decreases the reaction rate

- can be sustained indefinitely only if the reaction is carried at far from equilibrium conditions (continuous supply and dissipation of species)



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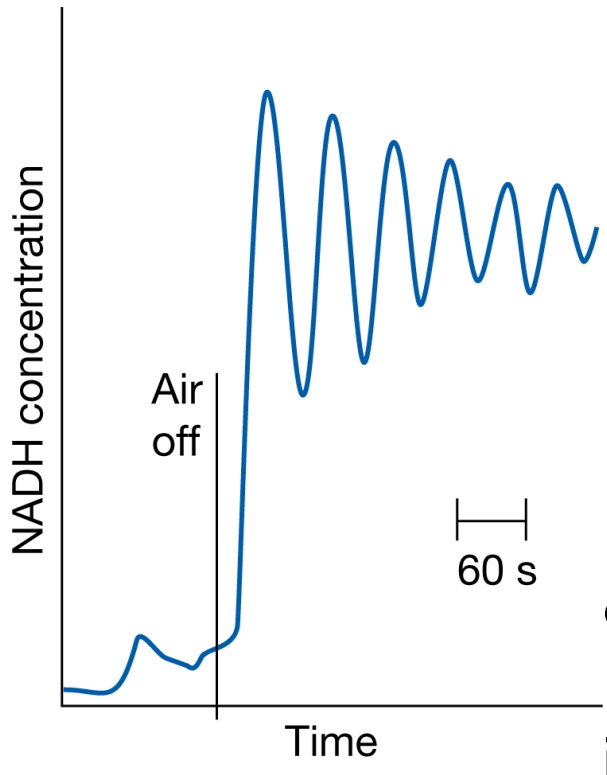

under anerobic conditions, oscillations in [NADH] can occur in glycolytic cycle in yeast cells because of inhibition of the enzyme phosphofructokinase by high levels of ATP and its activation by high levels of ADP

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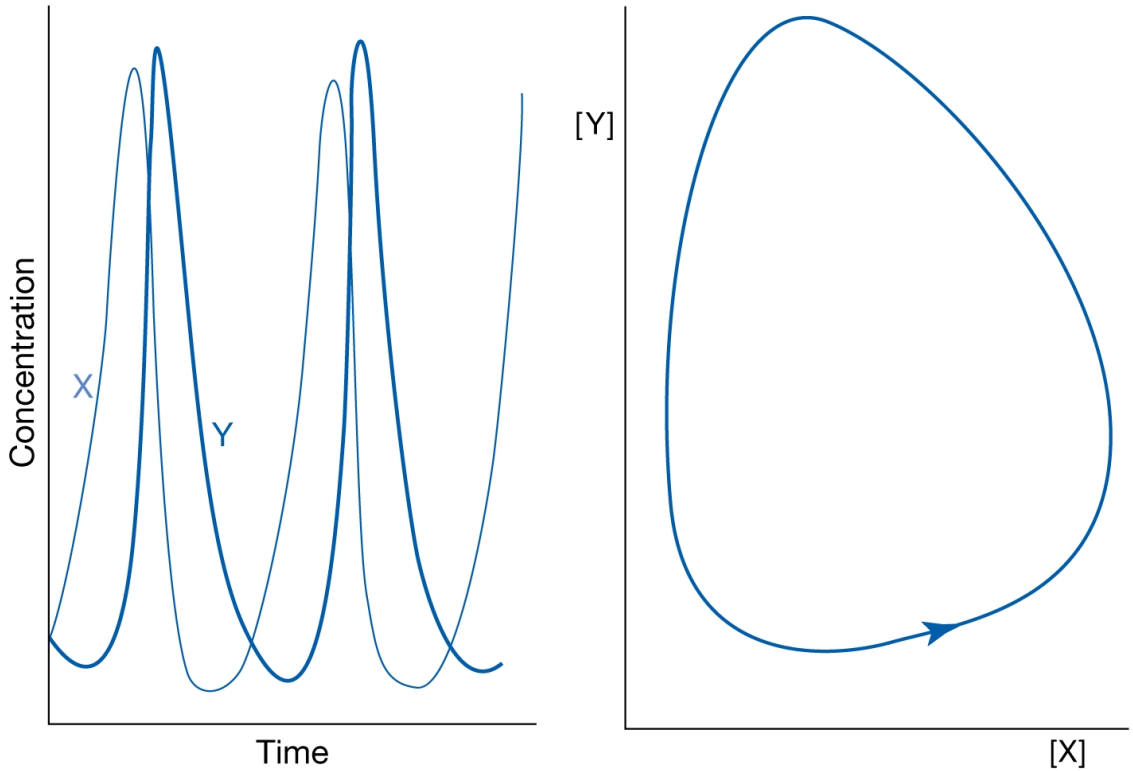
$Y \xrightarrow{k_c} P$



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product $HBrO_2$is a reactant in first step and provides a feedback mechanism tha enhances rate of formation of $HBrO_2$

https://en.wikipedia.org/wiki/Brusselator

$A \rightarrow X$

$2X + Y \rightarrow 3X$

$B + X \rightarrow Y + D$

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https://en.wikipedia.org/wiki/Oregonator

$$A + Y \longrightarrow X + P$$
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