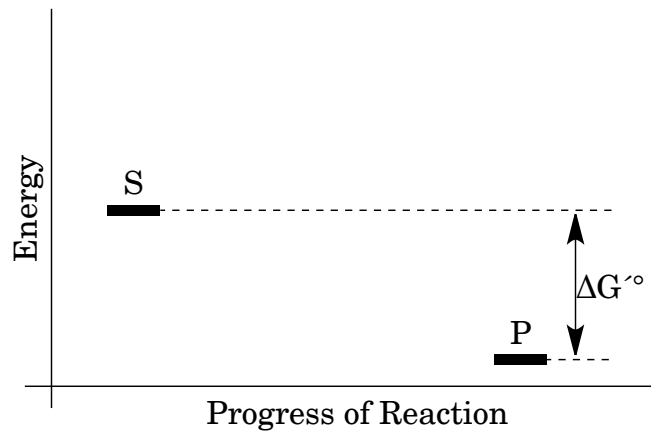


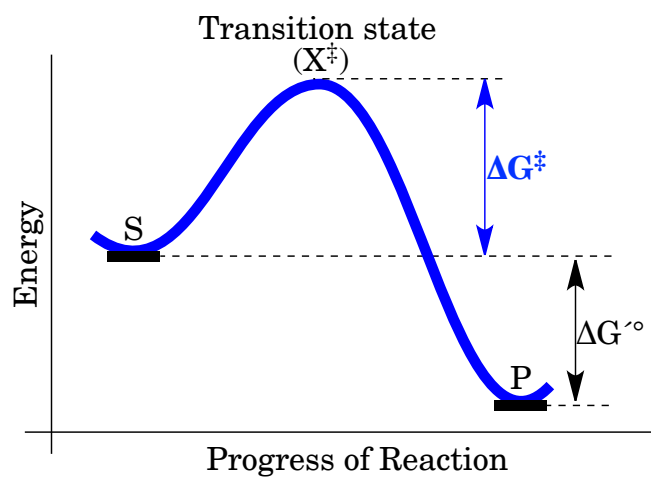
Enzyme Kinetics

Purpose:

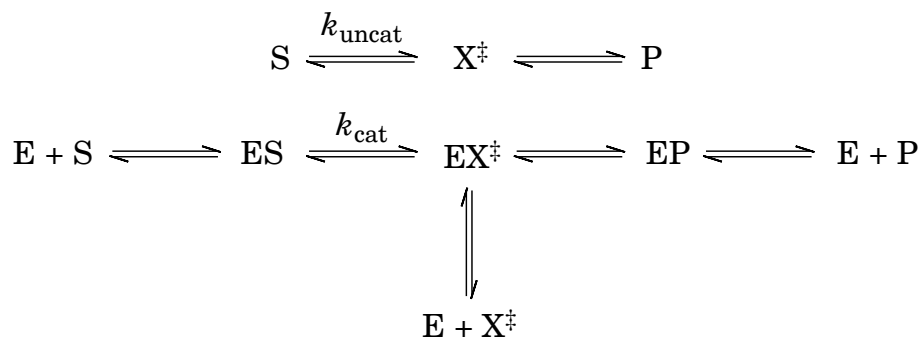
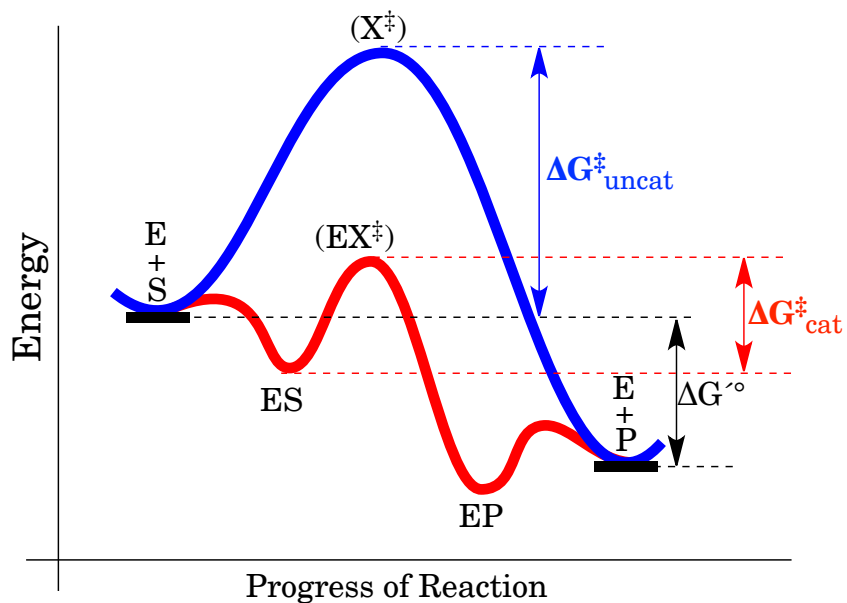
Thermodynamics



Transition State Theory



Transition State Theory (with enzymes)



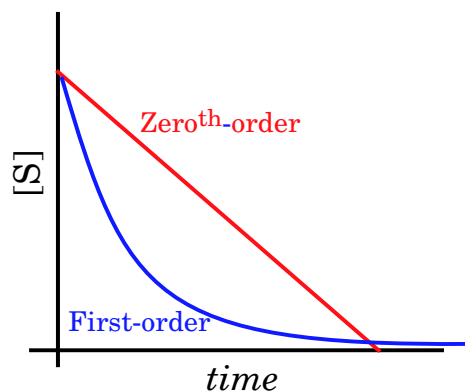
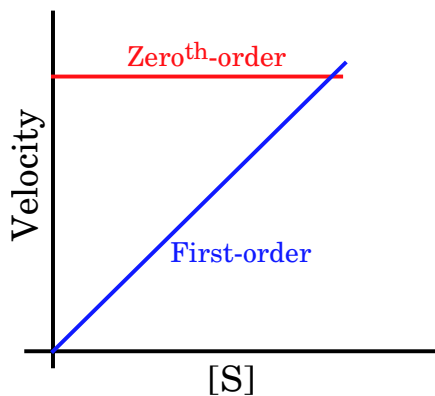
$$\frac{k_{\text{cat}}}{k_{\text{uncat}}} = e^{\frac{\Delta G^{\ddagger}_{\text{uncat}} - \Delta G^{\ddagger}_{\text{cat}}}{RT}} = \frac{K_{eq}^{\ddagger}}{K_{eq}}$$

Chemical kinetics

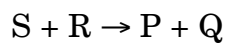
$$v = \frac{d[P]}{dt} = \frac{-d[S]}{dt}$$

zeroth-order reaction: $v = k$ $[S] = [S]_0 - k t$

first-order reaction: $v = k[S]$ $[S] = [S]_0 e^{-kt}$



Second order kinetics

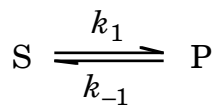
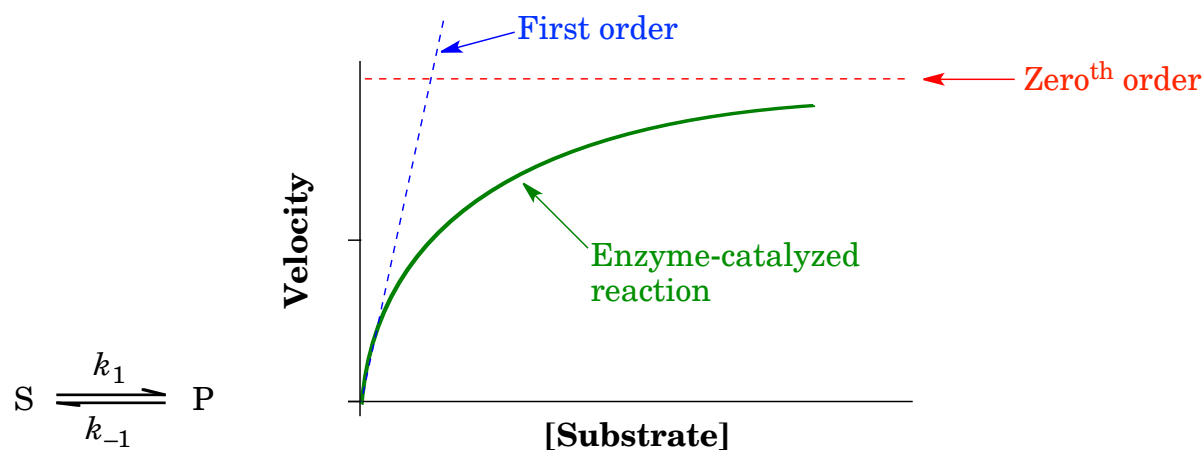


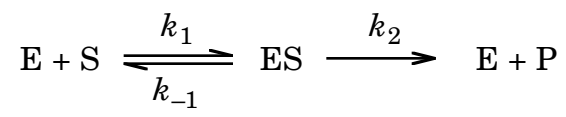
$$v = \frac{d[P]}{dt} = \frac{d[Q]}{dt} = \frac{-d[S]}{dt} = \frac{-d[R]}{dt}$$

$$v = k[S][R]$$

Second-order rate constants have units of $M^{-1} \cdot \text{sec}^{-1}$.

Michaelis-Menten kinetics





$$v = \frac{d[\text{P}]}{dt} = k_2[\text{ES}]$$

Assumptions

$$v = \frac{V_{max}[\text{S}]}{K_m + [\text{S}]}$$