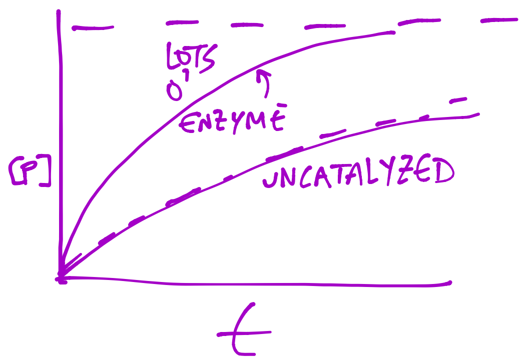
$S \rightarrow P$



$$E + S \underset{k_r}{\overset{k_f}{\rightleftharpoons}} ES \underset{\cancel{k_{back}}}{\overset{k_{cat}}{\rightleftharpoons}} E + P$$

MICHAELIS-MENTEN:

VELOCITY

$$V_0 = k_{CAT} \cdot [E]_0 \cdot \frac{[S]_0}{K_m + [S]_0}$$

$\frac{dP}{dt}$ — RXN RATE — ENZYME CONC — ??

ASSUME k_{BACK} VERY SLOW.

$$\frac{dP}{dt} = k_{cat}[ES] - k_B \cancel{k[E][P]}$$

$$[ES] = [E]_0 \times \frac{[S]}{[S]+K_M} \times \frac{1/[S]}{1/[S]}$$

$$= [E]_0 \frac{[S]/[S]}{[S]/[S] + K_m/[S]}$$

$$= [E]_0 \times \frac{1}{1 + K_m/[S]} \Leftarrow \frac{1}{1 + K_D/L} = \Theta!$$

RATE OF RXN DEPENDS ON:

$V_0 = k_{CAT} \times [E]_0 \times \Theta_S$ ← BINDING OF S AND E

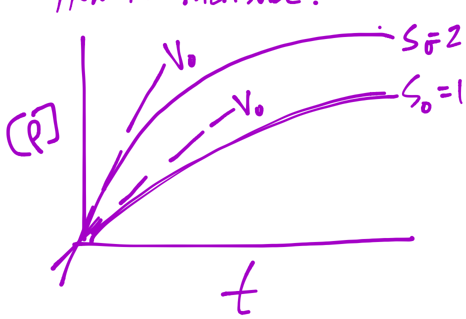
ENZYME AROUND

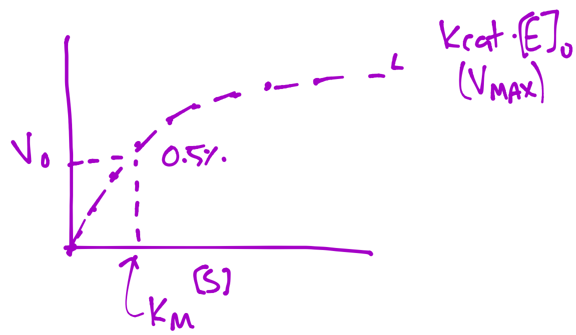
HOW FAST RXN CAN GO WHEN EVERYTHING BOUND

IF WE KNOW k_{cat} AND K_m, WE KNOW ENZYME!

WE WANT TO KNOW K_{CAT} AND K_M. HOW TO MEASURE?

NOTE AXES





ASSUMPTIONS:

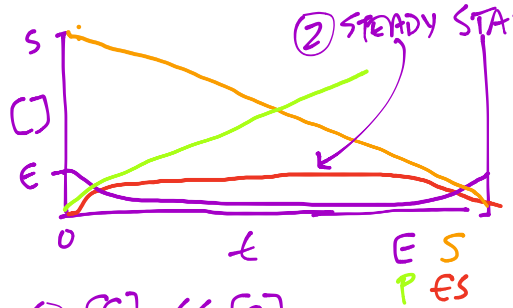
$$V = k_{CAT} \cdot [E]_0 \cdot \frac{[S]}{K_m + [S]}$$

$\frac{dP}{dt}$ — RXN RATE — ENZYME CONC — Θ

$$E + S \underset{k_r}{\overset{k_f}{\rightleftharpoons}} ES \underset{\cancel{k_{back}}}{\overset{k_{cat}}{\longrightarrow}} E + P$$

①

② STEADY STATE.



③ $[E]_0 \ll [S]$

$\frac{k_{cat}}{K_m}$ = CATALYTIC EFFICIENCY

HIGHER IS BETTER.

k_{cat} → HIGHER IS FASTER

K_m → LOWER IS TIGHTER

HIGHEST VALUES ARE ~10^8/M·s

DIFFUSION IS SLOW STEP.

COMBINE KINETICS WITH BINDING