ENZYME KINETICS

ENZYME CHARACTERISTICS.

- ALL CATALYZE REACTIONS (LOWER ACTIVATION ENERGY OF A REACTION)
- REMAIN UNCHANGED THROUGHOUT REACTION (DO NOT GET USED UP!)
- BINDS SUBSTRATES.

ENZYME KINETICS PARAMETERS

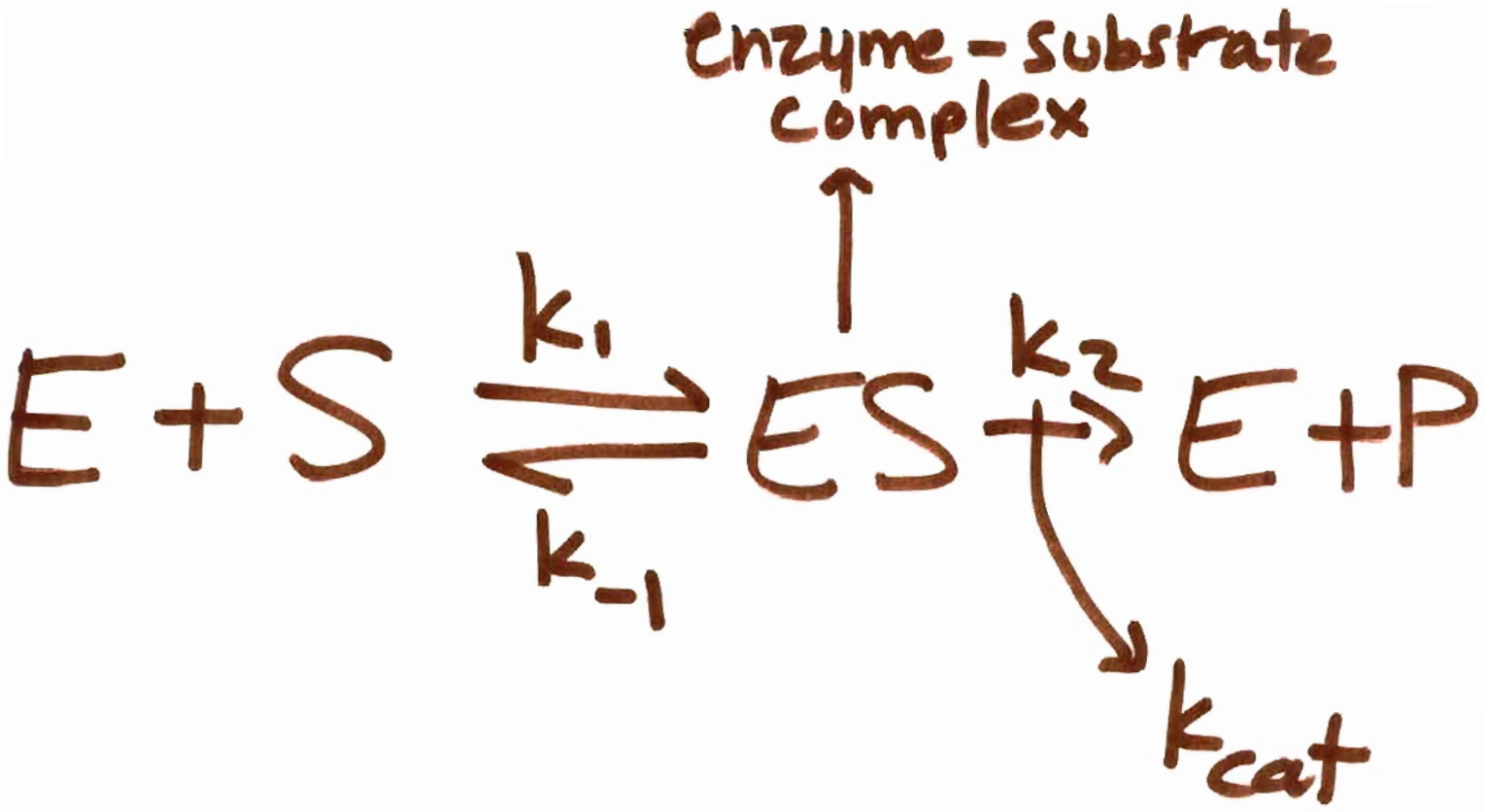
a. MAXIMUM RATE OF THE REACTION V_{max}

b. AFFINITY OF ENZYME FOR SUBSTRATE K_m

c. SUBSTRATE CONCENTRATION [S]

d. ENZYME CONCENTRATION [E]

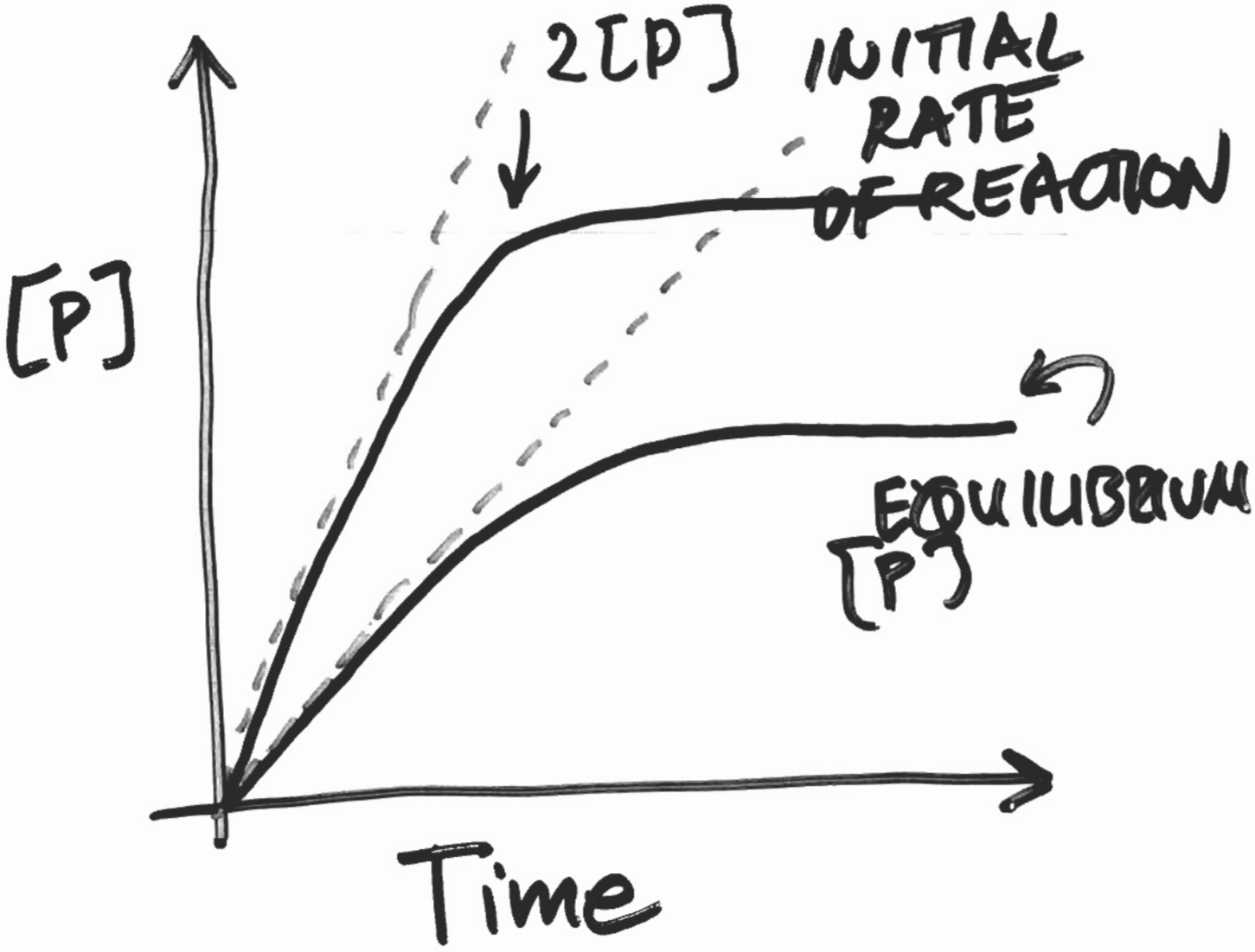
e. k_{cat} TURNOVER RATE OF THE ENZYME.



k_1 = rate constant for binding

k_{-1} = rate constant of breakdown of ES complex to E + S

k_{cat} ⇒ turnover rate
often slowest step of rxn.

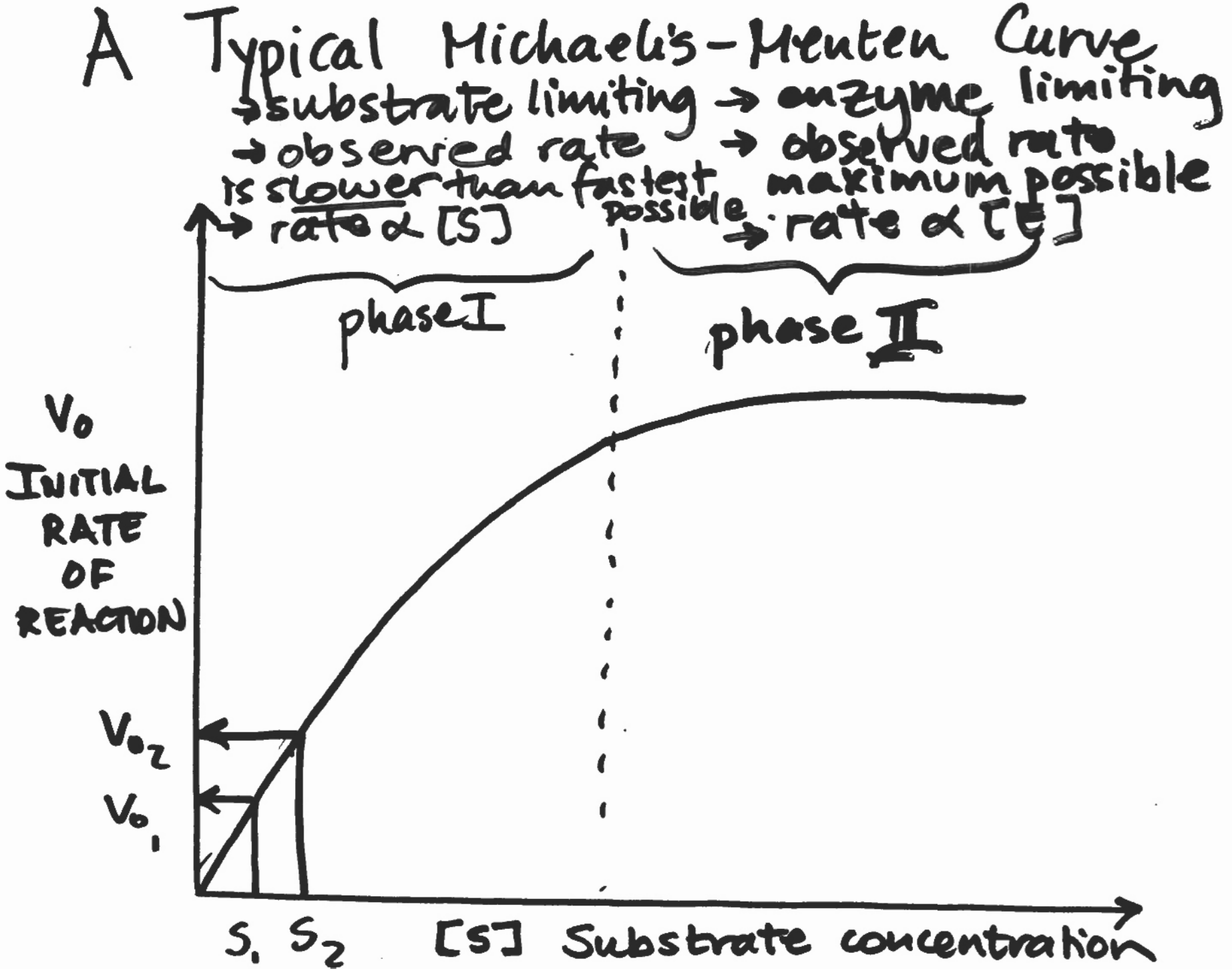


S = ONPG

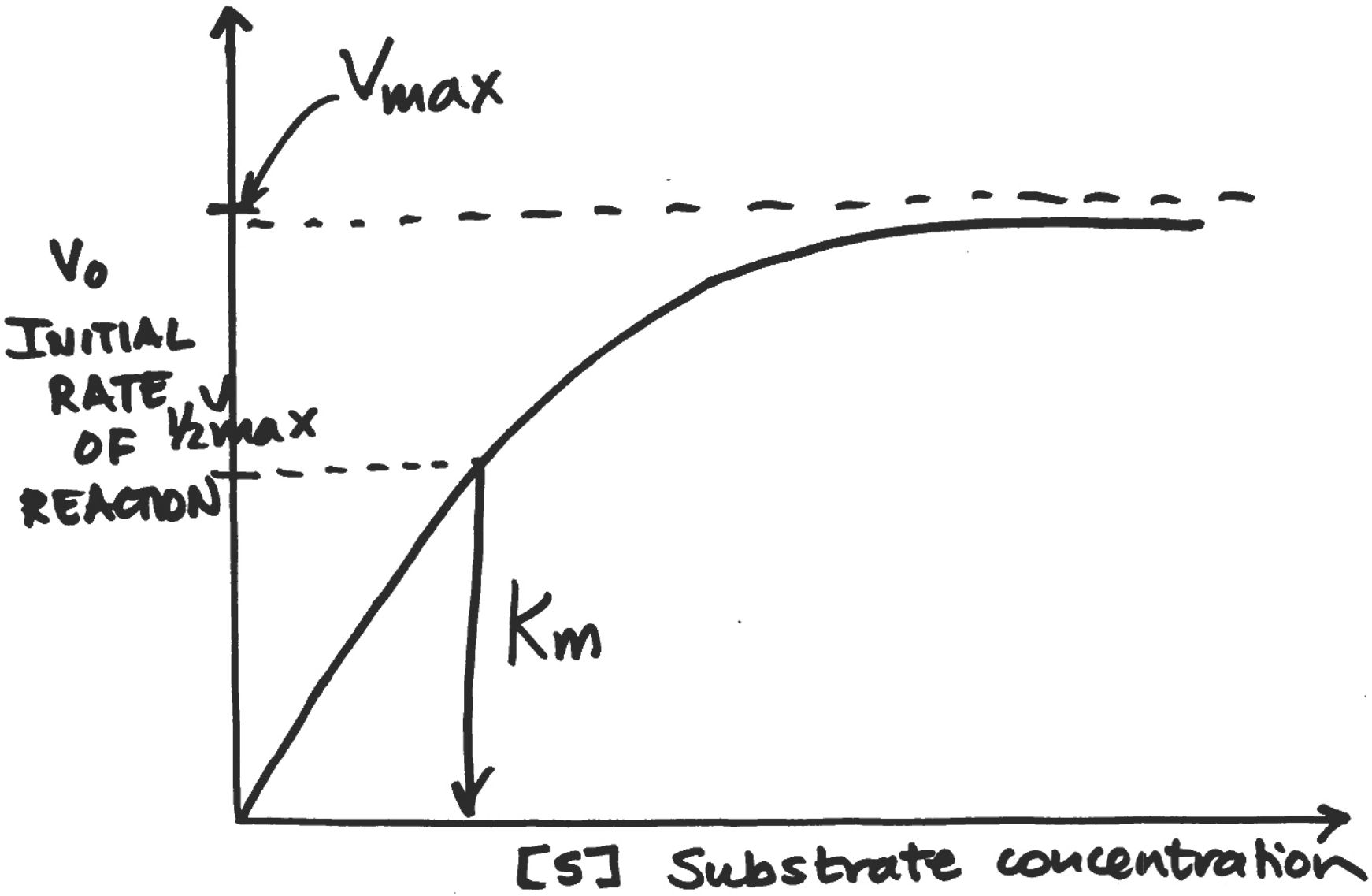
E = β-gal

P = ONP.

A Typical Michaelis-Menten Curve



A Typical Michaelis-Menten Curve



$$V_0 = \frac{V_{max}[S]}{K_m + [S]}$$

Michaelis-Menten Eqⁿ

$$V_{max} = k_{cat}[E]_{total}$$

$$K_m = \frac{k_{cat} + k_{-1}}{k_1}$$

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$$K_m \simeq \frac{k_{-1}}{k_1} \cong K_D.$$

$$[E] + [S] \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} [E:S]$$

$$K_D = \frac{[E][S]}{[E\text{-}S]}$$

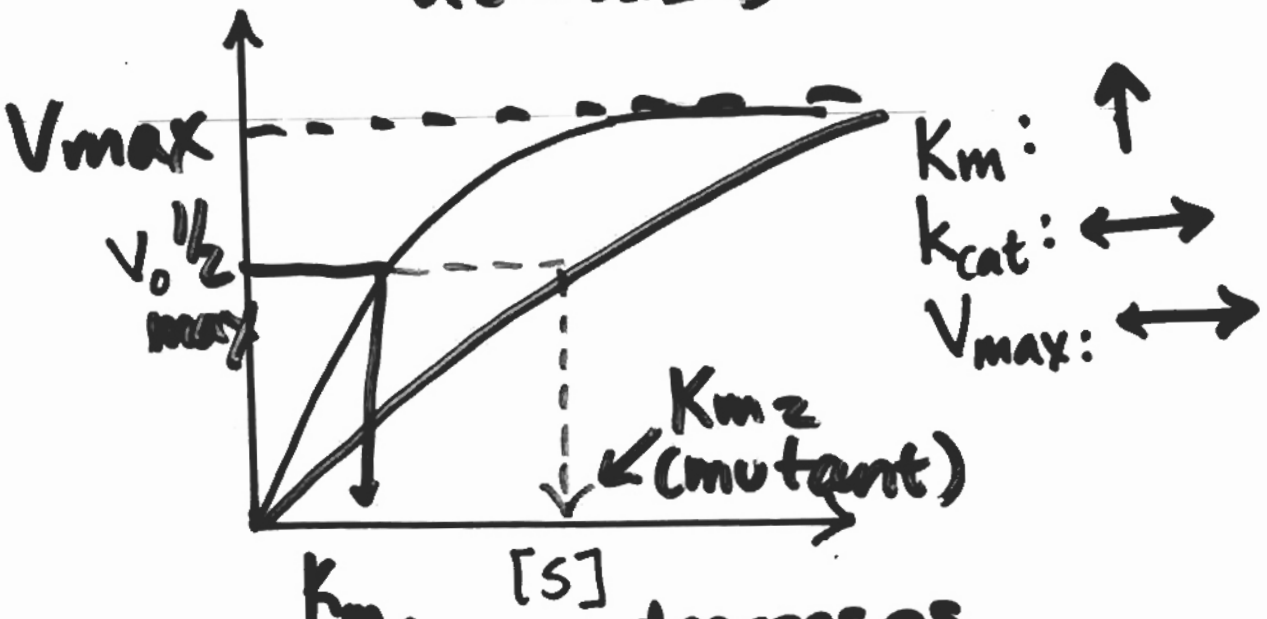
- if K_m is LARGE, then affinity of enzyme for substrate is LOW.
- if K_m is SMALL, then affinity of enzyme for substrate is high

$[E] + [S] \rightleftharpoons [E \cdot\cdot S] \rightarrow [E] + [P]$

Effects of mutations on K_m & V_{max}

1. Mutant that affects binding affinity for S

decreases



2. Mutant that affects turnover rate (assume binding not affected)

decreases