MICHAELIS-MENTEN STEADY STATE DERIVATION

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} EP \underset{k_{-3}}{\overset{k_3}{\rightleftharpoons}} E + P \tag{8.17}$$

Assuming Transformation of ES to EP is Rate Limiting:
aka: k_1, k_{-1} , and $k_3 >> k_2$

k_{cat} = rate constant of rate-determining step (substrate to product)

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \xrightarrow{k_{cat}} E + P \tag{8.18}$$

$$\therefore\ Velocity = k_{cat} * [ES] \tag{8.19}$$

When $k_{cat} << k_{-1}$,
Equalibrium Dissociation Constant :

$$K_S = \frac{k_{-1}}{k_1} = \frac{[E]*[S]}{[ES]}$$

VARIABLES

$E + S$	Enzyme + Substrate
ES	Enzyme-Substrate Complex
EP	Enzyme-Product Complex
$E + P$	Enzyme + Product
k_1	Rate Constant of Forward Direction of Enzyme-Substrate Complex Formation
k_{-1}	Rate Constant of Reverse Direction of Enzyme-Substrate Complex Disassociation
k_2	Rate Constant of Forward Direction of Enzyme-Product Complex Formation
k_{-2}	Rate Constant of Reverse Direction of Enzyme-Product Complex Disassociation
k_3	Rate Constant of Forward Direction of Enzyme + Product Formation
k_{-3}	Rate Constant of Reverse Direction of Enzyme + Product Disassociation
k_{cat}	"Turn Over" of One Substrate Molecule ; Number of Substrate Molecules Turned Over per Enzyme Molecule per Unit Time
K_M	Michaelis Constant ; Affinity of Enzyme for Substrate ; Ratio of Rate Constants for A Specific Reaction
K_S	Equilibrium Dissociation Constant