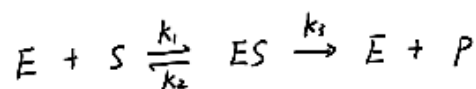


Attemptation for 8.3



$$ES \begin{cases} \text{generation rate: } v_1 = k_1[E_0] - [ES][S] & (E_0: \text{the initial concentration of } E) \\ \text{decomposition rate: } v_2 = (k_2 + k_3)[ES] \end{cases}$$

when balanced state: $v_1 = v_2 \Rightarrow \frac{[E_0][S] - [ES][S]}{[ES]} = \frac{k_2 + k_3}{k_1}$

make $\frac{k_2 + k_3}{k_1} = k_m \Rightarrow k_m[ES] + [ES][S] = [E_0][S] \Rightarrow [ES] = \frac{[E_0][S]}{k_m + [S]}$ (1)

the velocity of the enzymatic reaction $v = k_3[ES] \Rightarrow [ES] = \frac{v}{k_3}$ (2)

combine (1) and (2): $\frac{v}{k_3} = \frac{[E_0][S]}{k_m + [S]} \Rightarrow v = \frac{k_3[E_0][S]}{k_m + [S]}$

at large concentration of S: $[E_0] = [ES]$, $v = v_m = k_3[E_0]$

the velocity v as a function of the concentration of the substrate S: $v = \frac{v_m[S]}{k_m + [S]}$

($v_m = k_3[E_0]$, $k_m = \frac{k_2 + k_3}{k_1}$)