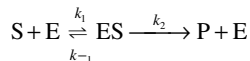


where $K_m = \frac{k_{-1} + k_2}{k_1}$ and $K_p = \frac{k_{-1} + k_2}{k_{-2}}$ and $V_s = k_2[E_0]$, $V_p = k_{-1}[E_0]$.

3.3. The enzyme, fumarase, has the following kinetic constants:



where $k_1 = 10^9 M^{-1} s^{-1}$

$k_{-1} = 4.4 \times 10^4 s^{-1}$

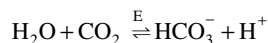
$k_2 = 10^3 s^{-1}$

a. What is the value of the Michaelis constant for this enzyme?

b. At an enzyme concentration of $10^{-6} M$, what will be the initial rate of product formation at a substrate concentration of $10^{-3} M$?

[Courtesy of D. J. Kirwan from "Collected Coursework Problems in Biochemical Engineering" compiled by H. W. Blanch for 1977 Am. Soc. Eng. Educ. Summer School.]

3.4. The hydration of CO_2 is catalyzed by carbonic anhydrase as follows:



The following data were obtained for the forward and reverse reaction rates at pH 7.1 and an enzyme concentration of $2.8 \times 10^{-9} M$.

Hydration		Dehydration	
$1/v, M^{-1}$ ($s \times 10^{-3}$)	$[CO_2]$ ($M \times 10^3$)	$1/v, M^{-1}$ ($s \times 10^{-3}$)	$[HCO_3^-]$ ($M \times 10^3$)
36	1.25	95	2
20	2.5	45	5
12	5	29	10
6	20	25	15

v is the *initial* reaction rate at the given substrate concentration. Calculate the forward and reverse catalytic and Michaelis constants.

[Courtesy of D. J. Kirwan from "Collected Coursework Problems in Biochemical Engineering" compiled by H. W. Blanch for 1977 Am. Soc. Eng. Educ. Summer School.]

3.5. An inhibitor (I) is added to the enzymatic reaction at a level of 1.0 g/l. The following data were obtained for $K_m = 9.2$ g S/l.

v	S
0.909	20
0.658	10
0.493	6.67
0.40	5
0.333	4
0.289	3.33
0.227	2.5