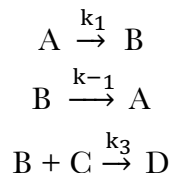


Dynamics and Kinetics. Exercise 4

Problem 1

Set up the rate expressions for all species in the following mechanism:



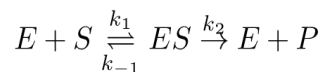
If the concentration of B is small compared with the concentrations of A, C, and D, the steady-state approximation may be used to derive the rate law. Show that this reaction may follow first-order kinetics at high pressures and second-order kinetics at low pressures.

Problem 2

The reaction $A + B \rightarrow C$ takes place in two steps by the mechanism $2A \rightleftharpoons D$ followed by $B + D \xrightarrow{k_2} A + C$. The first step comes to a rapid equilibrium (constant K_1). Derive an expression for the rate of formation of C in terms of K_1 , k_2 , $[A]$ and $[B]$.

Problem 3

Given the Michaelis-Menten mechanism:



use the rate equations to prove mathematically that $[E](t)$ has a minimum and $[ES](t)$ has a maximum. Determine the relation between $[E](t)$, $[S](t)$ and $[ES](t)$ at the extrema.

Problem 4

Given the Michaelis-Menten mechanism shown in Problem 3, examine what would happen if you assumed that S or E or P reaches a steady-state. Would you obtain conflicting results?