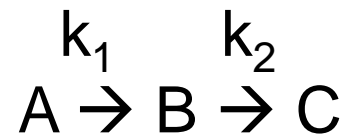


Steady-state approximation

Consider a general reaction shown in the rate scheme:

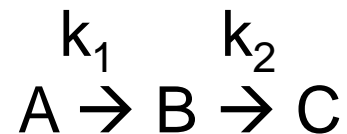


Express the rate scheme in terms of kinetic equations.

Assuming that $k_2 \gg k_1$ determine an expression for the rate of formation of product C as a function of the concentration of the starting compound A.

Steady-state approximation

Consider a general reaction shown in the rate scheme:



Express the rate scheme in terms of kinetic equations.

Assuming that $k_2 \gg k_1$ determine an expression for the rate of formation of product C as a function of the concentration of the starting compound A.

Solution: First we express the mechanistic rate scheme in terms of kinetic equations.

$$\begin{aligned}\frac{d[A]}{dt} &= -k_1[A] \\ \frac{d[B]}{dt} &= k_1[A] - k_2[B] \\ \frac{d[C]}{dt} &= k_2[B]\end{aligned}$$

Steady-state approximation

Given that $k_2 \gg k_1$ we can apply the steady state approximation.

$$\frac{d[B]}{dt} = k_1[A] - k_2[B] \approx 0$$

Therefore,

$$k_1[A] = k_2[B]$$

Finally,

$$\frac{d[C]}{dt} = k_1[A]$$