$$A \underset{k_2}{\overset{k_1}{\rightleftharpoons}} B$$

$$t=0 \quad [A]_0 \qquad [B]_0$$

$$t=t \quad [A] \qquad [B]$$

$$= [A]_0 - x \qquad = [B]_0 + x$$

$$t \geqslant t_{eq} \quad [A]_{eq} \qquad [B]_{eq}$$

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

$$A + B \longrightarrow P$$

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

$$-\frac{dx}{dt} = k_1([A]_0 - x)([B]_0 - x)$$

$$x = \xi$$

$$\underbrace{k_1[A]_{eq} = k_2[B]_{eq}}$$

HW

$$[A]_{eq} = [A]_0 - x_{eq}$$

$$[B]_{eq} = [B]_0 + x_{eq}$$

$$-\frac{dx}{dt} = -k_1([A]_0 - x) + k_2([B]_0 + x)$$

$$= -k_1([A]_{eq} + x_{eq} - x)$$

$$+ k_2([B]_{eq} - x_{eq} + x)$$

$$= \underbrace{-k_1[A]_{eq} + k_2[B]_{eq}}_{\equiv 0} - k_1(x_{eq} - x) + k_2(-x_{eq} + x)$$

$$= -(k_1 + k_2)(x_{eq} - x)$$

$$\frac{dx}{dt} = (k_1 + k_2)(x_{eq} - x)$$

$$\frac{dx}{x_{eq} - x} = (k_1 + k_2)\,dt$$

$$-\int_{\ln x_{eq}}^{\ln(x_{eq}-x)} d\ln(x_{eq} - x) = (k_1 + k_2)\int_0 dt$$

$$\int_0^x \frac{dx}{x_{eq} - x} = (k_1 + k_2)\int_0^t dt$$

$$-\ln \frac{x_{eq} - x}{x_{eq}} = (k_1 + k_2)t$$

$$x_{eq} - x = x_{eq}\, e^{-(k_1+k_2)t}$$

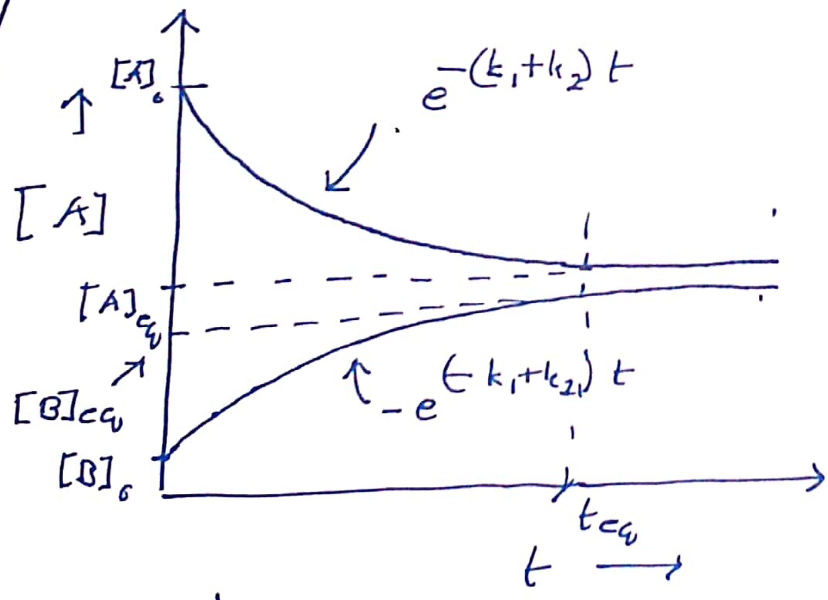
$$x = x_{eq}\left\{1 - e^{-(k_1+k_2)t}\right\}$$

$[A] = [A]_0 - x$

$[B] = [B]_0 + x$

$$\underbrace{[A_0] - x}_{} = [A]_0 - x_{eq}\left\{1 - e^{-(k_1+k_2)t}\right\}$$

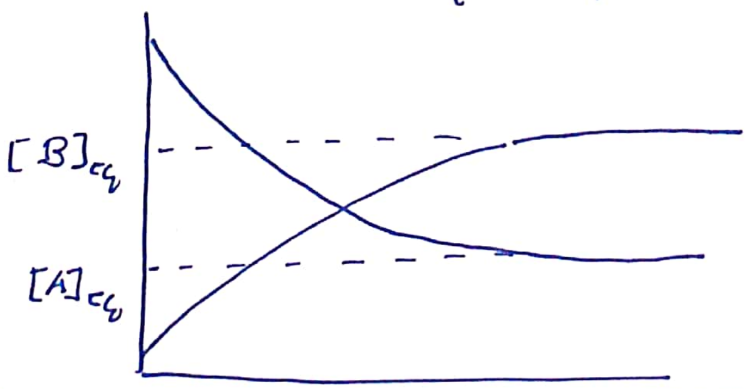
$$\boxed{[A] = [A]_{eq} + x_{eq}\, e^{-(k_1+k_2)t}}$$



At eqm

$$v_f = v_r$$

$$\frac{[A]_{eq}}{[B]_{eq}} = \frac{k_2}{k_1} = \frac{1}{K_{eq}}$$



$$\left.\frac{[B]}{[A]}\right|_{eq} > 1$$

$$\boxed{[B] = [B]_{eq} - x_{eq}\, e^{-(k_1+k_2)t}}$$

$$A \xrightarrow{k_1} B \qquad A \xrightarrow{k_2} C$$

$$-\frac{d[A]}{dt} = k_1[A] + k_2[A] = (k_1+k_2)[A]$$

$$\boxed{[A] = [A]_0\, e^{-(k_1+k_2)t}}$$

$$\frac{d[B]}{dt} = k_1[A] = k_1[A]_0\, e^{-(k_1+k_2)t}$$

$$\int_0^{[B]} d[B] = k_1[A]_0 \int_0^t e^{-(k_1+k_2)t}\, dt$$

$$\cancel{[B] = k_1[A]_0 \left\{ e^{-(k_1+k_2)t} - 1 \right\}}$$

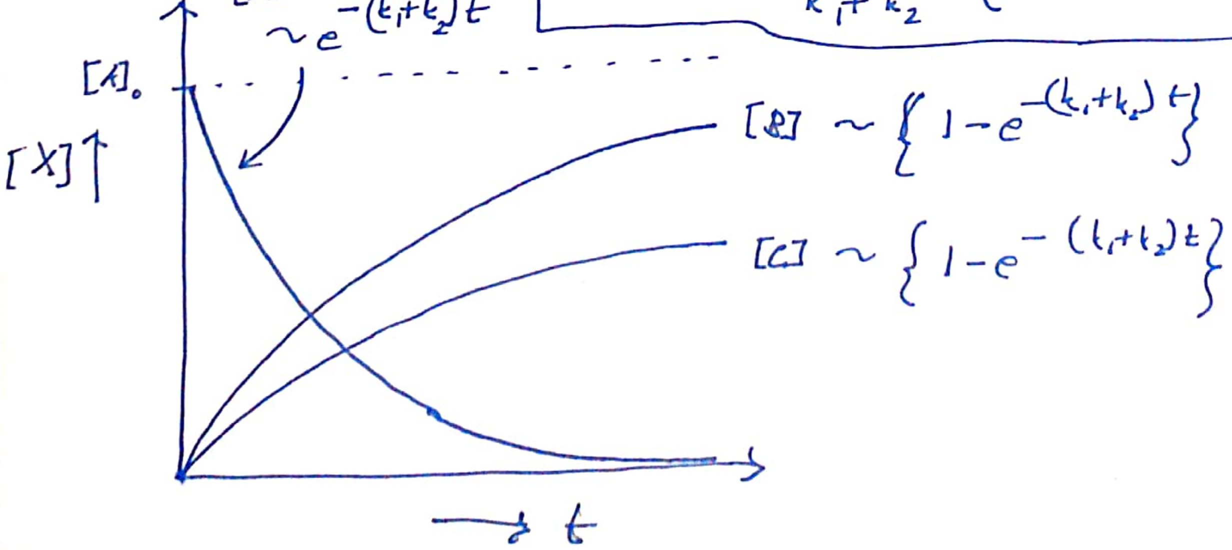
$$\cancel{[C] = k_2}$$

$$[B] = k_1[A]_0 \left. \frac{e^{-(k_1+k_2)t}}{-(k_1+k_2)} \right|_0^t$$

$$\boxed{[B] = \frac{k_1[A]_0}{k_1+k_2}\left\{1 - e^{-(k_1+k_2)t}\right\}}$$

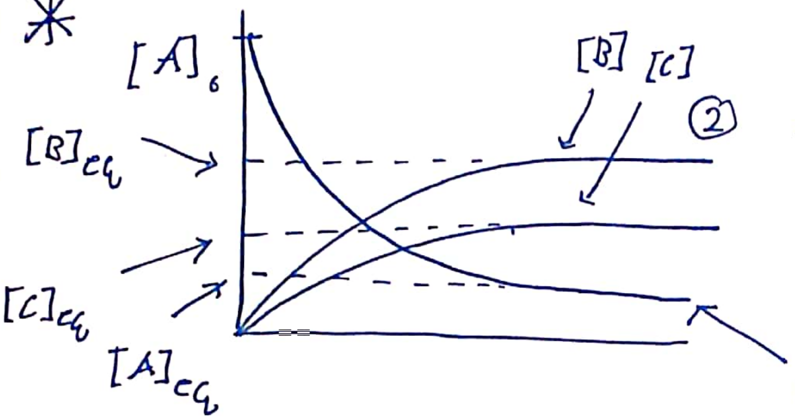
$$\boxed{[C] = \frac{k_2[A]_0}{k_1+k_2}\left\{1 - e^{-(k_1+k_2)t}\right\}}$$

$$[B]/[C] = k_1/k_2$$



$$A \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} B \qquad A \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} C$$

$\underline{k_1 > k_2}$



① $A \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} B$

$$[B]_{eq} = (K_{eq})_1 [A]_{eq} = \frac{k_1}{k_{-1}} [A]_{eq}$$

② $A \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} C$

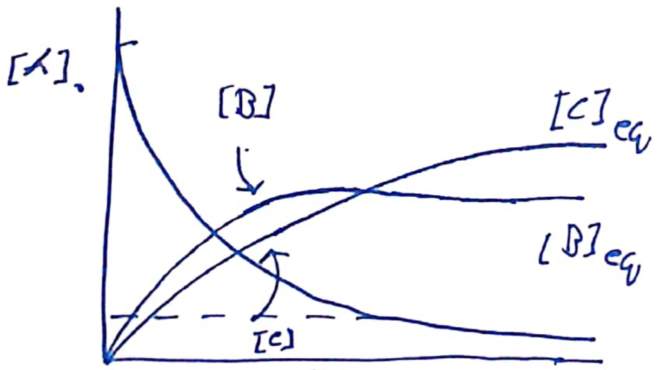
$$[C]_{eq} = (K_{eq})_2 [A]_{eq} = \frac{k_2}{k_{-2}} [A]_{eq}$$

$A \rightleftharpoons B$, $A \rightleftharpoons C$

$$\frac{[B]_{eq}}{[C]_{eq}} = \frac{(K_{eq})_1}{(K_{eq})_2} = \frac{k_1/k_{-1}}{k_2/k_{-2}}$$

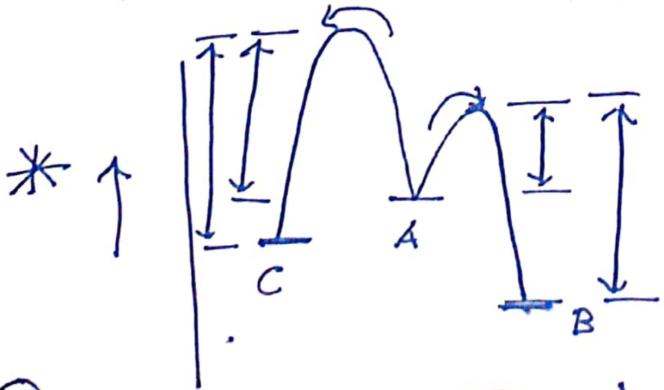
$A \rightarrow B$, $A \rightarrow C$

$$\frac{[B]}{[C]} = \frac{k_1}{k_2}$$



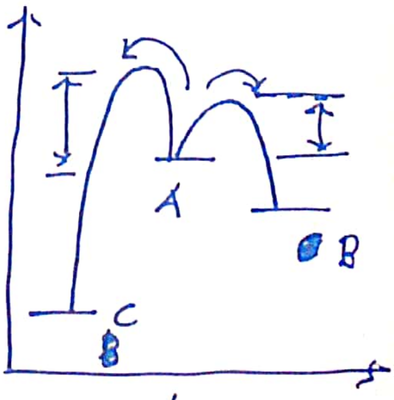
$A \overset{k_1}{\rightleftharpoons} B$ $t=0$, $[B]=0$

$A \underset{k_2}{\rightleftharpoons} [C]$ $t=0$, $[C]=0$



$(E_a)_1 < (E_a)_2$

$k_1 > k_2$



④ B is both KCP & TCP

B is KCP / C is TCP