(9.7) A sodium iodide solution contains some radioactive ^{131}I. An ethanol solution was prepared containing 0.135 M of this sodium iodide and 0.910 M inactive C_2H_5I. In the exchange reaction

$$C_2H_5I + {}^{129}I^- \underset{k_r}{\overset{k_f}{=}} C_2H_5{}^{129}I + I^-$$

the reaction rate constant is assume to be the same in both directions: $k_f = k_r$. One part (a) of the solution was removed and heated to high temperature so that equilibrium was rapidly reached. Another part (B) was kept in a thermostated bath at 30ºC. After 50 min ethyl iodide was separated from both solutions. The concentration of radioactive iodine in C_2H_5I in B was found to be only 64.7% of that in A. Calculate k ($k_r = k\,a\,b$ in §9.4.2).

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a=(AX)+(AX*)

b=(BX)+(BX*)

x=(AX*)

y=(BX*)

$F = x_t / x_{inf}$

$\ln(1-F) = -k_r * t * (a+b)/(a*b)$

$F := 64.7\cdot\%$ $\qquad lf := ln(1 - F)$ $\qquad a := 0.910$ $\qquad b := 0.135$ $\qquad t := 50\cdot 60$ s

$k_r := -\dfrac{lf}{t\cdot\dfrac{a+b}{a\cdot b}}$ $\qquad k := \dfrac{k_r}{a\cdot b}$ $\qquad k = 3.32\cdot 10^{-4}$ $\qquad s^{-1}\ M^{-1}$