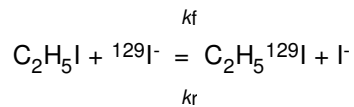


(18.7) A sodium iodide solution contains some radioactive ^{131}I . An ethanol solution was prepared containing 0.135 M of this sodium iodide and 0.910 M inactive $\text{C}_2\text{H}_5\text{I}$. In the exchange reaction



the reaction rate constant is assumed 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 30°C. After 50 min ethyl iodide was separated from both solutions. The concentration of radioactive iodine in $\text{C}_2\text{H}_5\text{I}$ in B was found to be only 64.7% of that in A. Calculate k ($k_f = k$, $a = 0.910$, $b = 0.135$ in §9.4.2).

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$$a = (\text{AX}) + (\text{AX}^*)$$

$$b = (\text{BX}) + (\text{BX}^*)$$

$$x = (\text{AX}^*)$$

$$y = (\text{BX}^*)$$

$$F = x_t / x_{\text{inf}}$$

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

$$F := \frac{64.7}{100} \quad \ln F := \ln(1 - F) \quad a := 0.910 \quad b := 0.135 \quad t := 50 \cdot 60 \quad \text{s}$$

$$k_r := - \frac{\ln F}{t \cdot \frac{a+b}{a \cdot b}} \quad k := \frac{k_r}{a \cdot b} \quad k = 3.321 \cdot 10^{-4} \quad \text{s}^{-1} \text{ M}^{-1}$$