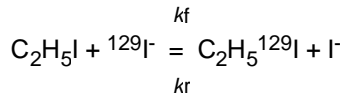


(9.7) A sodium iodide solution contains some radioactive ^{131}I . An ethanol solution was prepared containing 0.135 M of this sodium iodide and 0.910 M inactive $\text{C}_2\text{H}_5\text{I}$. In the exchange reaction



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 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 ($k_f=k_r$ in §9.4.2).

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

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

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

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

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

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

$$F := 64.7 \cdot \%$$

$$lf := \ln(1 - F)$$

$$a := 0.910$$

$$b := 0.135$$

$$t := 50 \cdot 60 \quad \text{s}$$

$$k_r := - \frac{lf}{t \cdot \frac{a+b}{a \cdot b}}$$

$$k := \frac{k_r}{a \cdot b}$$

$$k = 3.32 \cdot 10^{-4}$$

$$\text{s}^{-1} \text{M}^{-1}$$