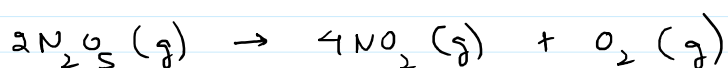


Question

The decomposition of N_2O_5 in CCl_4 at 318K has been studied by monitoring the concentration of N_2O_5 in the solution. Initially the concentration of N_2O_5 is 2.33 mol L^{-1} and after 184 min, it is reduced to 2.08 mol L^{-1} . The reaction takes place according to the equation:



Calculate the average rate of this reaction in terms of hours, minutes and seconds. What is the rate of production of NO_2 during this period?

Ans:

$$\begin{aligned} \text{i) Average rate} &= \frac{1}{2} \left(- \frac{\Delta[N_2O_5]}{t} \right) \\ &= \frac{1}{2} \left(- \frac{(2.08 - 2.33) \text{ mol L}^{-1}}{184 \text{ min}} \right) \\ &= 6.79 \times 10^{-4} \frac{\text{mol}}{\text{L min}} \\ &= 6.79 \times 10^{-4} \frac{\text{mol}}{\text{L 60s}} \\ &= 1.13 \times 10^{-5} \frac{\text{mol}}{\text{L s}} \\ &= 1.13 \times 10^{-5} \frac{\text{mol}}{\text{L } \frac{1}{3600} \text{ h}} \\ &= 4.07 \times 10^{-2} \frac{\text{mol}}{\text{L h}} \end{aligned}$$

$$\text{ii) Average rate} = \frac{1}{4} \left(\frac{\Delta[NO_2]}{t} \right)$$

$$\begin{aligned} \frac{\Delta[NO_2]}{t} &= 4 \times \text{Average rate} \\ &= 4 \times 6.79 \times 10^{-4} \\ &= 2.72 \times 10^{-3} \frac{\text{mol}}{\text{L min}} \end{aligned}$$

L min

Question

For the reaction $R \rightarrow P$, the concentration of a reactant changes from $0.03M$ to $0.02M$ in 25 min . Calculate the average rate of reaction using units of time both in minutes and seconds.

Answer

$$\begin{aligned} \text{Average rate} &= - \frac{\Delta[R]}{t} = - \frac{(0.02 - 0.03) \frac{\text{mol}}{L}}{25 \text{ min}} \\ &= 4 \times 10^{-4} \frac{\text{mol}}{L \text{ min}} \\ &= 4 \times 10^{-4} \frac{\text{mol}}{L \cdot 60 \text{ s}} \\ &= 6.67 \times 10^{-6} \text{ mol L}^{-1} \text{ s}^{-1} \end{aligned}$$

Question

In a reaction, $2A \rightarrow \text{products}$, the concentration of A decreases from 0.5 mol L^{-1} to 0.4 mol L^{-1} in 10 min . Calculate the rate during this time interval.

Answer:

$$\begin{aligned} \text{Average rate} &= \frac{1}{2} \left(- \frac{\Delta[A]}{t} \right) \\ &= \frac{1}{2} \left(- \frac{(0.4 - 0.5) \frac{\text{mol}}{L}}{10 \text{ min}} \right) \\ &= 5 \times 10^{-3} \text{ mol L}^{-1} \text{ min}^{-1} \end{aligned}$$