



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

Ans:

$$\begin{aligned} \text{Average rate} &= \frac{-\Delta[R]}{\Delta t} = \frac{-[(R)_2 - (R)_1]}{t_2 - t_1} \\ &= \frac{(0.02 - 0.03)}{25} = \frac{-(-0.01)}{25} \\ &= 4 \times 10^{-4} \text{ M min}^{-1} \\ &= 6.66 \times 10^{-6} \text{ M s}^{-1} \end{aligned}$$

4.2. 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 minutes. Calculate the rate during this interval?

Ans:

$$\begin{aligned} \text{Average Rate} &= \frac{-1}{2} \frac{\Delta[A]}{\Delta t} = \frac{-1}{2} \frac{[A]_2 - [A]_1}{t_2 - t_1} \\ &= \frac{-1}{2} \frac{(0.4 - 0.5)}{10} = \frac{-1}{2} \frac{(-0.1)}{10} \\ &= 5 \times 10^{-3} \text{ M min}^{-1} \end{aligned}$$

4.3. For a reaction, $A + B \rightarrow \text{Product}$; the rate law is given by, $r = k [A]^{1/2} [B]^2$. What is the order of the reaction?

Ans: Order of reaction. = $1/2 + 2 = 2^{1/2}$ or 2.5

4.4. The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times how will it affect the rate of formation of Y ?

Ans:

The reaction is : $X \rightarrow Y$

According to rate law,

$$\text{rate} = k[X]^2$$

If [X] is increased to 3 times, then the new rate is

$$\text{rate}' = k[3X]^2$$

$$\text{rate}' = 9 k [X]^2 = 9 \text{ rate}$$

Thus, rate of reaction becomes 9 times and hence rate of formation of Y increases 9-times.

***** END *****

