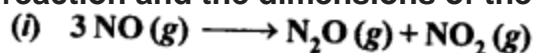
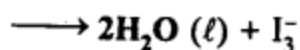
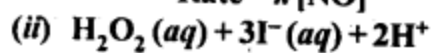


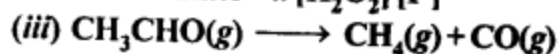
From the rate expression for the following reactions determine their order of reaction and the dimensions of the rate constants:



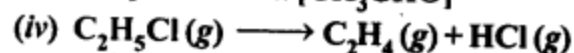
$$\text{Rate} = k [\text{NO}]^2$$



$$\text{Rate} = k [\text{H}_2\text{O}_2] [\text{I}^-]$$



$$\text{Rate} = k [\text{CH}_3\text{CHO}]^{3/2}$$



$$\text{Rate} = k [\text{C}_2\text{H}_5\text{Cl}]$$

Sol:

(i) Order = 2, dimension of

$$k = \frac{\text{Rate}}{[\text{NO}]^2} = \frac{\text{mol L}^{-1} \text{s}^{-1}}{(\text{mol L}^{-1})^2} = \text{L mol}^{-1} \text{s}^{-1}$$

(ii) Order = 2, dimension of

$$\begin{aligned} k &= \frac{\text{Rate}}{[\text{H}_2\text{O}_2] [\text{I}^-]} \\ &= \frac{\text{mol L}^{-1} \text{s}^{-1}}{(\text{mol L}^{-1}) (\text{mol L}^{-1})} = \text{L mol}^{-1} \text{s}^{-1} \end{aligned}$$

(iii) Order =  $\frac{3}{2}$ , dimension of

$$\begin{aligned} k &= \frac{\text{Rate}}{[\text{CH}_3\text{CHO}]^{3/2}} = \frac{\text{mol L}^{-1} \text{s}^{-1}}{(\text{mol L}^{-1}) (\text{mol L}^{-1})^{1/2}} \\ &= \text{L}^{1/2} \text{mol}^{-1/2} \text{s}^{-1} \end{aligned}$$

(iv) Order = 1, dimension of

$$k = \frac{\text{Rate}}{[\text{C}_2\text{H}_5\text{Cl}]} = \frac{\text{mol L}^{-1} \text{s}^{-1}}{(\text{mol L}^{-1})} = \text{s}^{-1}$$