

Chapter 4

Chemical Kinetics



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$$\text{Avg. Rate} = \frac{1}{a} \frac{\Delta[A]}{\Delta t} = \frac{1}{b} \frac{\Delta[B]}{\Delta t} = \frac{1}{c} \frac{\Delta[C]}{\Delta t} = \frac{1}{d} \frac{\Delta[D]}{\Delta t}$$

Inst. Rate =

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Order of reaction

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Order is the sum of the powers of the concentration terms of the reactants in the rate law.

It is an experimental quantity.

It can have the values 0, 1, 2, 3, or a fraction.

It is applicable to both elementary and complex

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Elementary and complex reactions

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A reaction that takes place in a single step is called elementary reaction.

A reaction that occurs in more than one step is called a complex reaction.

In a complex reaction, one of the steps is slower than the other steps and this step is called the rate determining step.

The overall rate of the reaction is controlled by this slowest step.



Integrated Rate law Equation for a First order reaction

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The rate of the reaction is proportional to the concentration of the reactant.

Consider a first order reaction, $R \rightarrow P$

$$\text{Rate} = -\frac{d[R]}{dt} \quad \text{--- (1)}$$

$$\text{Rate} = k[R] \quad \text{--- (2)}$$

$$\text{(1) = (2)} \quad -\frac{d[R]}{dt} = k[R]$$

$$\frac{d[R]}{[R]} = -k dt \quad \text{--- (3)}$$





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