Ministry of Higher Education and Scientific Research
AL-Mustaqbal University College of Science
Department of Biochemistry

Physical Chemistry

Lecture 4

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First semester

Kinetic of Second Order Reaction

By

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2nd order reaction with different initial concentration of reactant

- Initial conc. of A and B are a and b and after time t (a-x) and (b-x) are left , so

$$\frac{dx}{dt} = k[A][B]$$

$$\frac{dx}{dt} = k(a-x)(b-x)$$

Then ,after integration

$$\frac{1}{(a-b)}\left[\ln\frac{b.(a-x)}{a.(b-x)}\right] = kt$$

2nd order reaction with equal concentration of reactant

- Initial conc. of A and B are mole/dm-3 and after time t (a-x) are left for both

$\frac{dx}{dt}$ = k [A][B]

$$\frac{dx}{dt} = k(a-x)(a-x)$$

= $k(a-x)^2$

Then, after integration

$$\frac{x}{a(a-x)} = kt$$

Half life and second order reaction

- If conc. Are same, then
- kt = $\frac{x}{a(a-x)}$

$$t = \frac{1}{k} \cdot \frac{x}{a(a-x)}$$

when , x = $\frac{a}{2}$ $then$, t= $\frac{t}{2}$

So, $t_2^1 = \frac{1}{k} \cdot \frac{a/2}{a(a-\frac{a}{2})}$

$$[t^1/_2]_2 = \frac{1}{ka}$$

The half life depends on initial concentration 'a'

If k and k' are same then order is second


Thank
you