HALF-LIFE TIME OF THE REACTION AND ZERO ORDER REACTION

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DEFINITION

- The required time for the reaction to be half completed is called half-life time of the reaction.
- It denoted by $t_{1/2}$

First order rate constant reaction

$K_1 = 1/t \ln a/a-x$ ------- 1

Let as consider at initial concentration the reactant will be

a.

After the time taken t will be $t_{1/2}$ and x will be a/2

Substitute the value in equation 1

The equation 1 will be

$K1 = 1/t_{1/2} \ln a/a-a/2$ ---------2

$K1 = 1/ t_{1/2} \ln 2$ ----------3

Where ln 2= 0.693

So that the equation will be

$K1 = 0.693/t_{1/2}$ ----------4

This equation 4 is the half life period for the 1st order reaction

Zero order reaction

- The reaction rate is not affected by changes in the concentration of one or more reactants
- It is called zero order reaction
- In such reaction, the rate may be determined by some other limiting factor
- Such as amount of catalyst used in catalytic reaction or the intensity of light absorbed in photochemical reaction

Consider the simplest equation

---------1

rate expressed as

$$r = -d[A]/dt = k_0 \text{ ----------2}$$

Rearranging the equation 2

$$-d[A] = k_0\, dt \text{ ----------3}$$

Where k_0 is the zero order rate constant

Let as consider at initial t=0 so that reactant is $[A_0]$

After time taken t=t and so that reactant is [A]

Integrate the equation

$$\int_{[A_o]}^{[A]} d[A] = k0 \int_{t=0}^{t=t} dt \quad \text{---------4}$$

$$- [A] + [A_0] = k_0 t$$

$$k_0 t = [A_0] - [A]$$

$$k_0 = 1/t\,[A_0] - [A] \quad \text{------- 5}$$

This is the integrated rate equation for a zero order reaction


THANK YOU