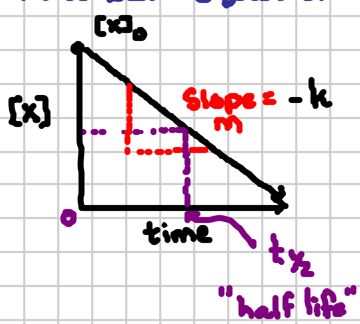
Note Title — 1/5/2012

Lecture 4+: Integrated Rate Equations

- **Rate Law Equation:** How FAST a reaction is going. $rate_{rxn} = k[A]^x[B]^y[C]^z$
- **Integrated Rate Equation:** How much reactant is LEFT OVER at time
- **Half Life Equation:** How long for half of the reactant to be used.

Zeroth order integrated rate equations.

Rate Law Equation: $rate_{rxn} = k[X]^0$



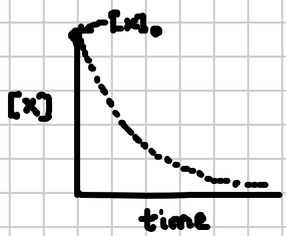
- $[X]_t = -k\,t + [A]_0$ (conc (t), time, initial)

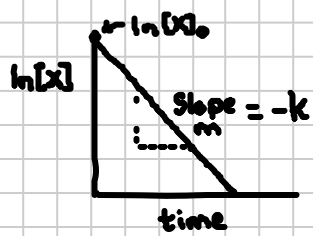
$y = m\,x + b$

- $t_{1/2} = \dfrac{[X]_0}{2k}$ ← dep. on initial X conc

First order integrated rate equations

Rate Law Equation: $rate = k[X]^1$

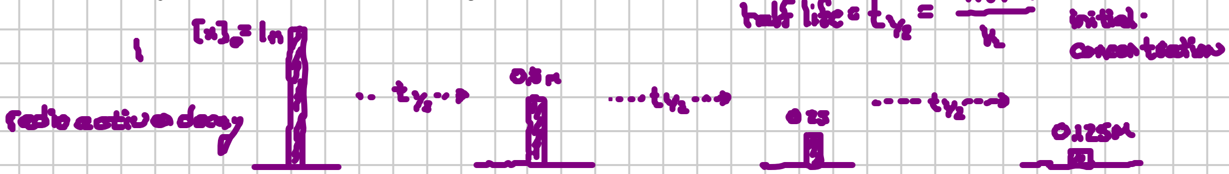




$\ln[X]_t = -k\,t + \ln[X]_0$

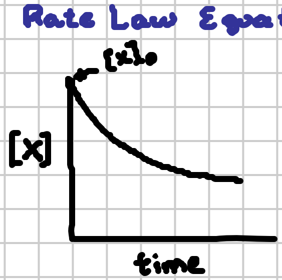
$y = m\,x + b$

half life $= t_{1/2} = \dfrac{\ln(2)}{k}$ ind. of initial concentration



Second order integrated rate equations.

Rate Law Equation: $rate = k[X]^2$



$\dfrac{1}{[x]_t} = k\,t + \dfrac{1}{[x]_0}$

$y = m\,x + b$

$t_{1/2} = \dfrac{1}{k[X]_0}$ dep. on initial concentration.