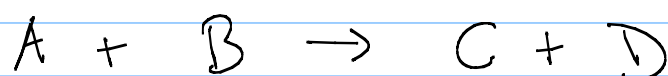


Chemical Kinetics

Note Title

2/2/2010

Understanding rate expressions:



bimolecular reaction
i.e. two reactants

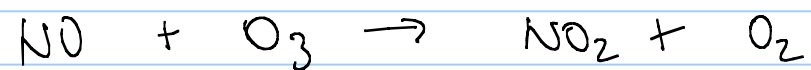
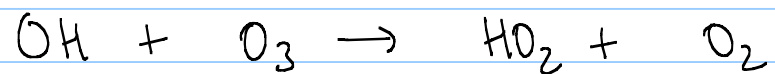
$$\frac{d[C]}{dt} = \frac{d[D]}{dt} = k[A][B]$$

$[X]$ → concentration of X (eg molecules/cm³)

k → rate constant (eg cm³/molecule sec)

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

Eg of bimolecular reactions:



Self reaction (special case of bimolecular rxn)

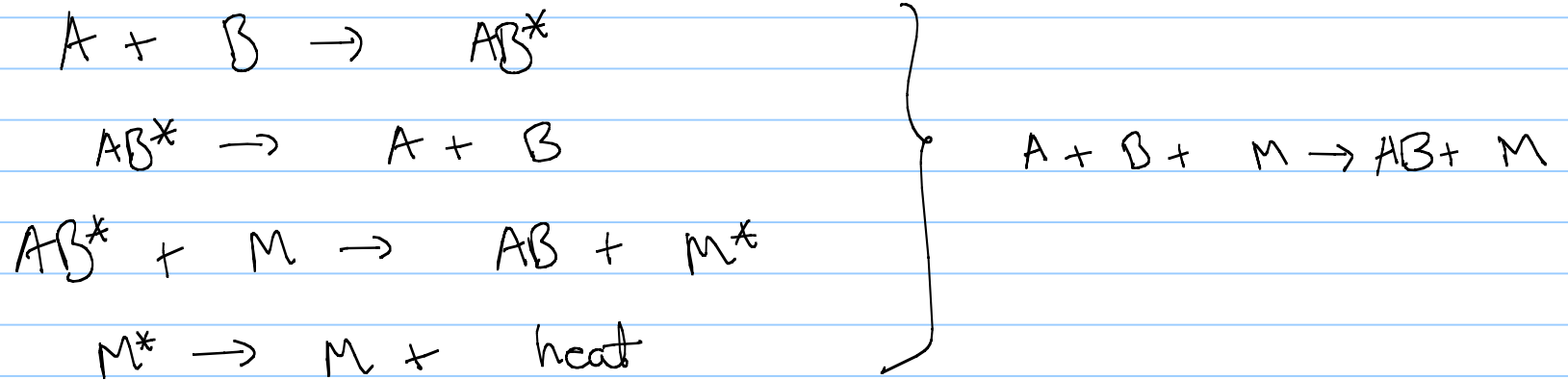


$$\frac{d[B]}{dt} = \frac{d[C]}{dt} = k[A]^2 = -\frac{1}{2} \frac{d[A]}{dt}$$

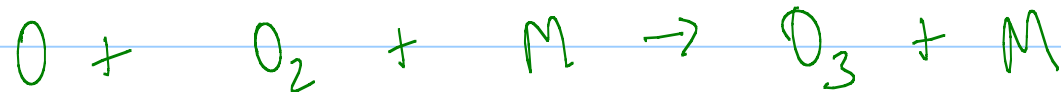
note
the square

note the $\frac{1}{2}$
term

Three body Reactions:



Eg:



$$\frac{d[O_3]}{dt} = k [O] [O_2] [M]$$

since $[M]$ is abundant.
if

Reverse Reactions and Chemical Equilibria:



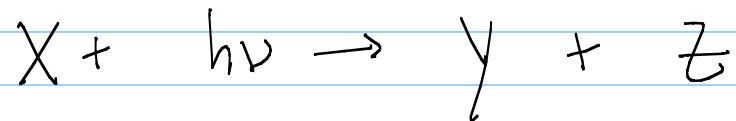
$$k_1 [A][B] = k_2 [C][D]$$

$$K = \frac{k_1}{k_2} = \frac{[C][D]}{[A][B]}$$

equilibrium constant

Photolysis:

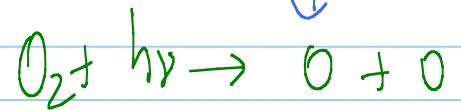
Needs energy from photon to break chemical bond



$$\frac{d[Y]}{dt} = \frac{d[Z]}{dt} = k[X] = -\frac{d[X]}{dt}$$

photolysis
rate constant

Eg:

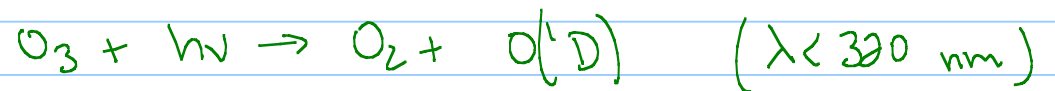
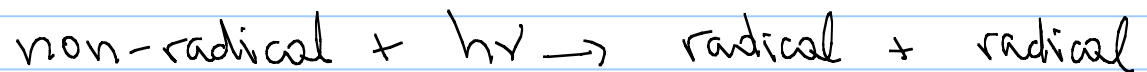


($\lambda < 240 \text{ nm}$)

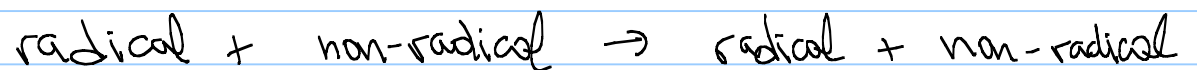
highly
reactive
↓

Chain Reactions:

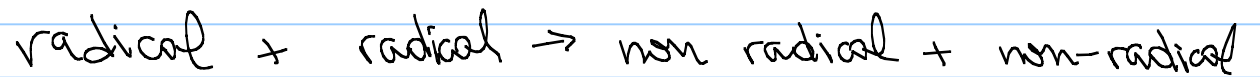
Initiation:



Propagation:



Termination:



↑ slow (since radical concentrations are too small)
dynamics