CHEMICAL KINETICS, REACTION RATES:

$CaF_2(s) \rightleftharpoons Ca^{2+}(aq) + 2F^{-}(aq)$(precipitation)

Kps = $[Ca^{2+}][F^{-}]^2$is $[F^{-}]$the determinant

$\frac{[F^{-}]}{2}$= $[Ca^{2+}]$= solubility.

A + 2B →products.

t= 0 [A]= $[A]_0$ and [B]= $[B]_0$

t= t' [A]= $[A]_0$-x [B]= $[B]_0$-2x

Returning to the mechanics of the velocity equations, we have that dx/ dt = k. ($[A]_0$-x). ($[B]_0$-2x) ^{2} (*)

remember that in acid-base we also use the rate constants "k" and they follow the same criterion when it comes to exponents:

aA + bB →cC+ dD K= equilibrium $\frac{[C]^c.[D]^d}{[A]^a.[B]^b}$constant =

(*) is solved using the method of *rational integrals* :

we have dx/($[A]_0$-x). ($[B]_0$-2x) ^{2} = k.dt then

$$\int \frac{dx}{(A_0 - x)(B_0 - 2x)^2} = \int k.dt$$

Which we will solve using rational integrals:

$$\int \frac{dx}{(A_0 - x)(B_0 - 2x)^2} = \int \frac{Mdx}{([A]_0 - x)} + \int \frac{Ndx}{([B]_0 - 2x)} + \int \frac{Qdx}{([B]_0 - 2x)^2}$$

$$\frac{M(B_0-2x)^2}{(A_0-x)(B_0-2x)^2} + \frac{N(A_0-x)(B_0-2x)}{(A_0-x)(B_0-2x)^2} + \frac{Q(A_0-x)}{(A_0-x)(B_0-2x)^2}$$

1= $M(B_0 - 2x)^2$+ $N(A_0 - x)(B_0 - 2x)$+$Q(A_0 - x)$

$1 = M.B_0^2 - M.4.B_0x + M.4.x^2 + N.A_0B_0 - N.A_0 2x - N.B_0x +$
$+ M.4.x^2 + Q.A_0 - Qx$

$$\left.\begin{array}{l} M.4.x^2 + +2.N.x^2 = 0 \\ M.4.B_0x - N.A_0 2x - N.B_0x - Qx = 0 \\ M.B_0^2 + N.A_0B_0 + Q.A_0 = 1 \end{array}\right\}$$

M= -N/2 , -N/2.4 $B_0 - N.2A_0 - N.B_0 - Q = 0,$

$-\frac{N}{2}.B_0^2 + N.A_0B_0 + Q.A_0 = 1$

N($2B_0 + A_0^2$)+Q= 0 $\frac{-Q}{(2B_0+A_0^2)}$.($2B_0 + A_0^2$)+Q . A_0= 1

Q= $\frac{2B_0+A_0^2}{(B_0^2+A_0B_0+2B_0+A_0^2)}$ N=$\frac{-1}{(B_0^2+A_0B_0+2B_0+A_0^2)}$

M=$\frac{1}{2.(B_0^2+A_0B_0+2B_0+A_0^2)}$

Therefore:

$\int \frac{dx}{(A_0-x)(B_0-2x)^2} = \int \frac{Mdx}{([A]_0-x)} + \int \frac{Ndx}{([B]_0-2x)} + \int \frac{Qdx}{([B]_0-2x)^2} =$

= - M.Ln ($[A]_0 - x$)+ M.Ln ($[B]_0 - 2x$)- $\frac{Q}{2.([B]_0-2x)}$= kt