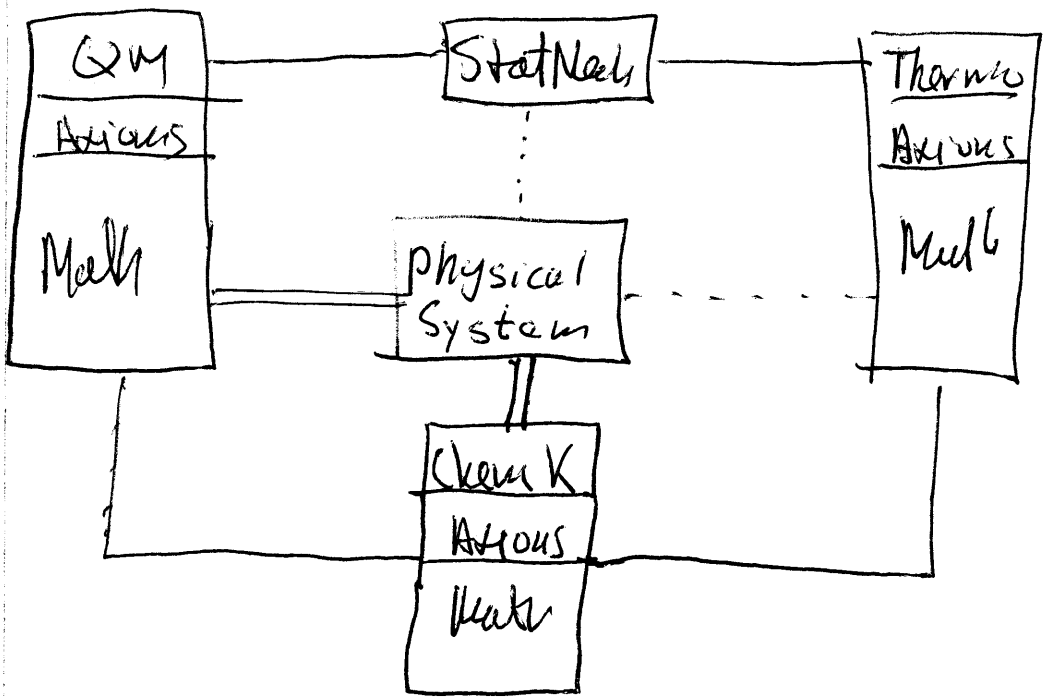
QM
Axioms
Math
StatMech
Physical System
Thermo
Axioms
Math
Chem K
Axioms
Math

OVERALL RXN

$$aA + bB \longrightarrow xX + yY$$

$$\xi \equiv -\frac{1}{a}\frac{dN_A}{dt} = \frac{1}{x}\frac{dN_X}{dt} = \frac{1}{y}\frac{dN_Y}{dt} = -\frac{1}{b}\frac{dN_B}{dt}$$

IF Volume, V, is CONSTANT

$$r \equiv \frac{\xi}{V} = -\frac{1}{a}\frac{d[A]}{dt}$$

$$r \equiv -\frac{1}{\nu_R}\frac{d[R]}{dt} = \frac{1}{\nu_P}\frac{d[P]}{dt}$$

RATE LAW (EXPERIMENTAL)

$$r = A^{\alpha} B^{\beta} X^{\gamma} Y^{\lambda}$$

INTEGRATED LAWS

Zeroth

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

$$\Rightarrow \quad [A](t) = A_0 + kt$$

PLOT $[A(t)]$ vs $t \Rightarrow$ straight line

FIRST ORDER

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

$$[A(t)] = A_0 e^{kt}$$

PLOT $\ln[A(t)]$ vs $t \Rightarrow$ STRAIGHT LINE

$$\ln[A(t)] = \ln A_0 + kt$$

SECOND ORDER

$$\frac{d[A]}{dt} = k[A]^2$$

$$\frac{1}{[A(t)]} = \frac{1}{A_0} + kt$$

PLOT $1/[A(t)]$ vs $t \Rightarrow$ STRAIGHT LINE

THIRD ORDER VERY RARE PROCESS.