3/4/2019 ~~2018~~

Homogeneous catalyst : same phase as reactants

vs.

Heterogeneous catalyst : different phase " ——— "

ex: $H_2O_2(aq) \xrightarrow{cat} H_2O(l) + \frac{1}{2}O_2(g)$

cat : $I^-(aq)$ homog.

$Pt(s)$ heterog.

Ch 15 : Chemical equilibrium

Ch 14 : How FAST chem rxn occurs

Ch 15 : How FAR chem rxn goes.

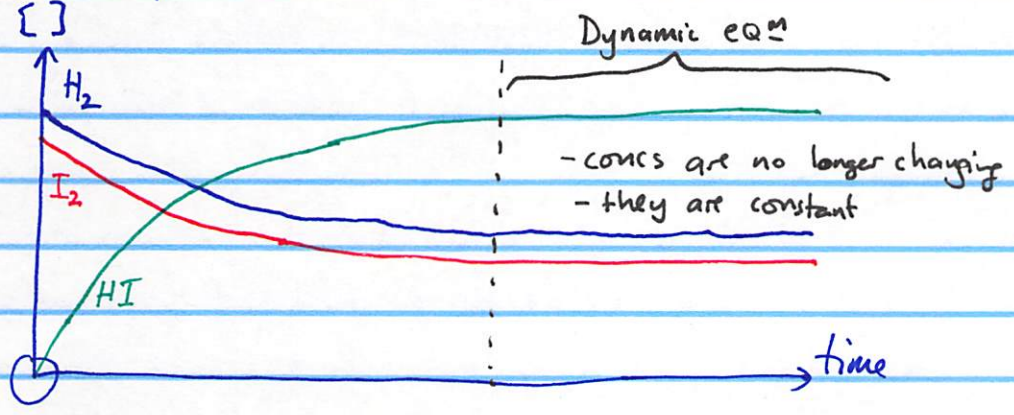
Dynamic eqm

——→ fwds rxn

ex: $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

←—— rvse rxn.

When fwd rate = rvse rate @ EQm !



The equilibrium constant, K

K = rate constant
K = eqm constant

Suprisingly, concs @ eqm satisfy:

if $aA + bB \rightleftharpoons cC + dD$

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

K_c: eqm constant; concentrations: conc (molar); denominator: eqm [ ]'s

The law of Mass Action

given: $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

what's $K_c = \frac{[NH_3]^2}{[N_2][H_2]^3}$

Meaning of K?

$$K_c \sim \frac{[\text{Products}]}{[\text{Reactants}]}$$

($\sim$ = roughly speaking)

if $K_c \gg 1$, [Products] > [Reactants] (@ eqm)

$K_c \ll 1$, [Products] < [Reactants] "

$K_c \sim 1$ [Products] ~ [Reactants] "

ex: $H_2(g) + Br_2(g) \rightleftharpoons 2HBr(g)$; $K_c = 1.9 \times 10^{19}$ @ 25°C

mainly prods @ eqm

$K \gg 1$

R ⟶ P

ex: $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$; $K_c = 4.1 \times 10^{-31}$ @ 25°C

mainly reactants @ eqm

$K \ll 1$

R ⟵ P

How K varies w/ the way we write the chem eq

consider: $A + 2B \rightleftharpoons 3C$, $K = \dfrac{[C]^3}{[A][B]^2}$

① reverse chem eq:

$3C \rightleftharpoons A + 2B$, $K_1 = \dfrac{[A][B]^2}{[C]^3}$

K's have inverted when eq is reversed! $K_1 = 1/K$