CHM 262

If the equil. conc. of $COCl_2$ & Cl_2 are the same at 395°C find the equil conc. of CO in the reactn

$$CO_{(g)} + Cl_{2(g)} \rightleftharpoons COCl_{2(g)}$$

$K_c = 1.2 \times 10^3$ at 395°C

$$K_c = \frac{[COCl_2]}{[CO][Cl_2]} = 1.2 \times 10^3$$

$$K_c = \frac{1}{[Cl_2]} = 1.2 \times 10^3$$

$[Cl_2]$ molar conc.

$$[Cl_2] = \frac{1}{1.2 \times 10^3} = \boxed{8.3 \times 10^{-4}\ M}$$

$$2\,NO_{(g)} + O_{2(g)} \rightleftharpoons 2\,NO_{2(g)}$$

$K_c = 4.67 \times 10^{13}$ at 298 K

$$2\,NO_{2(g)} \rightleftharpoons 2\,NO_{(g)} + O_{2(g)} \quad \text{reverse}$$

$$K' = \frac{1}{K_c} = \frac{1}{4.67 \times 10^{13}} = 2.14 \times 10^{-14}$$

$2\,NO_{(g)} + O_{2(g)} \rightleftharpoons 2\,NO_{2(g)}$

$K_c = 4.67 \times 10^{13}$ (298 K)

Consider

$NO_{2(g)} \rightleftharpoons NO_{(g)} + \frac{1}{2} O_{2(g)}$

$K_c'' = ?$ $\left[\frac{1}{K_c}\right]^{1/2} = \sqrt{2.14 \times 10^{-14}} = 1.46 \times 10^{-7}$

$\frac{1}{2} H_{2(g)} + \frac{1}{2} I_{2(g)} \rightleftharpoons HI_{(g)}$

$K = 7.07$ at 718 K

a) What is K_c for

$HI_{(g)} \rightleftharpoons \frac{1}{2} H_{2(g)} + \frac{1}{2} I_{2(g)}$

$K_c' = \frac{1}{K_c} = \frac{1}{7.07} = 0.14$

b What is K_c'' of

$H_2 + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

$K_c''' = (K)^2 = 50.0$

$N_2O_{(g)} + 3/2\ O_{2(g)} \rightleftharpoons 2NO_{2(g)}$ K_c ?

$N_2O_{(g)} + 1/2\ O_{2(g)} \rightleftharpoons 2NO_{(g)}$ $K_1 = 1.7 \times 10^{-13}$

$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)}$ $K_2 = 4.67 \times 10^{13}$

$N_2O_{(g)} + 3/2\ O_{2(g)} \rightleftharpoons 2NO_{2(g)}$

$K_c = K_1 K_2 = 7.94$

$$\frac{[NO]^2}{[N_2O][O_2]^{1/2}} \times \frac{[NO_2]^2}{[NO]^2[O_2]}$$

$$K_c = \frac{[NO_2]^2}{[N_2O][O_2]^{1/2}}$$

$aA_{(g)} + bB_{(g)} \rightleftharpoons gG_{(g)} + hH_{(g)}$

$$K_p = \frac{P_G^{\,g} P_H^{\,h}}{P_A^{\,a} P_B^{\,b}}$$

K_c & K_p $\Rightarrow$ $K_p = K_c (RT)^{\Delta n}$

Δn = mols gas products − mols of reactant products

$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

$K_c = 6.0 \times 10^{-2}$ at 773 K

what is K_p?

$\Delta n = 2 - 4 = -2$

$K_p = K_c (RT)^{\Delta n}$

$K_p = 6.0 \times 10^{-2} \left(0.0821 \frac{L \cdot atm}{mol \cdot K} \times 773 K\right)^{-2}$

$K_p = 1.5 \times 10^{-5}$

$K_c = \frac{K_p}{(RT)^{\Delta n}}$

Pure liquids Pure solids

$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

$K_c = [CO_2]$

$H_2O_{(\ell)}$ $H_2O_{(g)}$

$C_{(s)} + H_2O_{(g)} \rightleftharpoons CO_{(g)} + H_{2(g)}$

$K_c = \dfrac{[CO][H_2]}{[H_2O]}$

$K >> 1 \Rightarrow$

$K \ll 1$