Nishant Jindal

O-I 16-38

S-I 11-16

21

$$K_p = K_c (RT)^{-1}$$

18

$$2NH_3 \longrightarrow N_2 + 3H_2 \quad 1/K_1$$

$$N_2 + O_2 \longrightarrow 2NO \quad K_2$$

$$3H_2 + \tfrac{3}{2}O_2 \longrightarrow 3H_2O \quad K_3^3$$

$$\frac{K_2 \times K_3^3}{K_1}$$

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(31) $A + 2B \longrightarrow 2C + 1D$

$2a$	$3a$		
$2a-x$	$3a-2x$	$2x$	x
a	a	$2a$	a

$2a - x = x$

$\underline{a = x}$

(35) $A + 2B \longrightarrow 2C$

$2/2$	$3/2$	$2/2$
1	1.5	1
$1+x/2$	$1.5+x$	$1-x = 0.5$
		$x = 0.5$
1.25	2	0.5

$x_C = \frac{\cancel{0.5}^{2}}{1.25 \times 4}\ \frac{1}{4}$

$= \frac{1}{20}$

37

$$\frac{k_f}{k_b} = 1$$

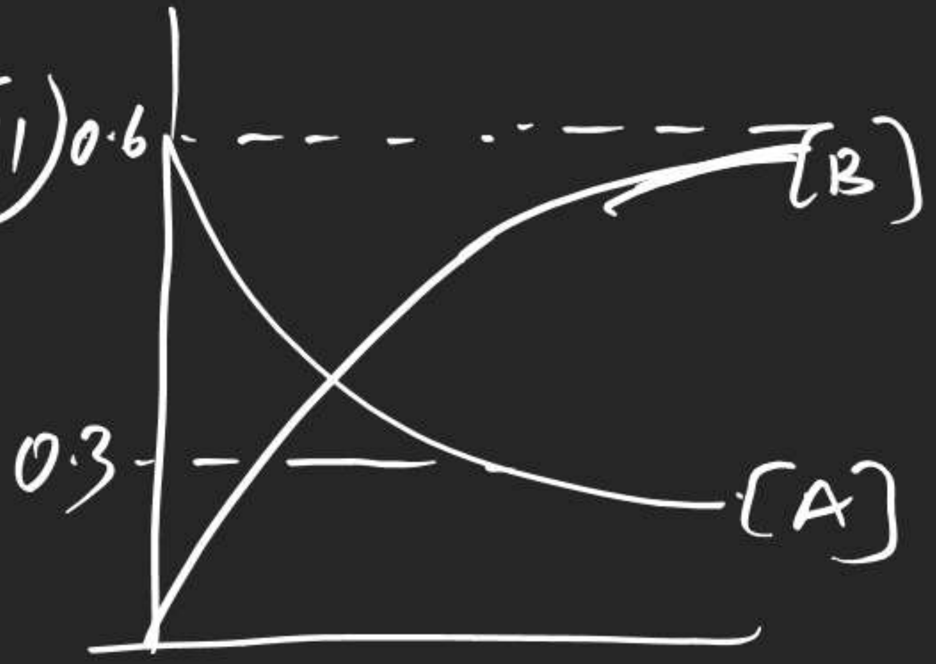
$$H_2 + I_2 \longrightarrow 2HI$$

$$1-x \qquad 1-x \qquad 2x$$

$$\frac{(2x)^2}{(1-x)^2} = 1$$

$$x = 1/3$$

11



$$A \longrightarrow 2B$$

$$0.3 \qquad 0.6$$

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(16)

$$A \longrightarrow B + C$$

$$\begin{array}{ccc} 1 & 2 & 2 \\ 0.5 & 1 & 1 \end{array}$$

$$K_c = \frac{2 \times 2}{1} = 4$$

$$Q = \frac{1 \times 1}{0.5} = 2$$

$$Q < K_c$$

$$\begin{array}{ccc} 0.5-x & 1+x & 1+x \end{array}$$

$$\frac{(1+x)(1+x)}{0.5-x} = 4$$

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Q. find K_p if eqlbm mixture contains 5 mol NH_3, 3 mol N_2 & 2 mol H_2 at 20 atm.

$$N_2 + 3H_2 \longrightarrow 2NH_3 \qquad K_p = ?$$

5/6
25/6
1
25/12
1/20

$$P_{N_2} = \left(\frac{3}{10}\right) \times 20 = 6\,atm$$

$$K_p = \frac{P_{NH_3}^2}{P_{N_2} \times P_{H_2}^3} = \frac{(5)^2}{3 \times (2)^3} \times \left(\frac{20}{10}\right)^{-2}$$

$$= \frac{25}{3 \times 8} \times \frac{1}{4} = 25/96$$

$$K_p = \frac{(10)^2}{6 \times (4)^3}$$

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Q. find K_p for the given Rxn

$$NH_2COONH_4(s) \longrightarrow CO_2(g) + 2NH_3(g)$$

P   2P $3P = 9$

3 atm   6 atm $P = 3\,atm$

if Total pressure at eq lb^m obtained by the decomposition of $NH_2COONH_4(s)$ is 9 atm.

$$K_p = P_{CO_2} \times P_{NH_3}^2$$

$$= (3)(6)^2$$

$$= 108$$

x   2x   9 atm

$$P_{NH_3} = \frac{2\cancel{x}}{3\cancel{x}} \times 9$$

$$= 6\,atm$$

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Q.

$$CuSO_4 \cdot 5H_2O(s) \longrightarrow CuSO_4(s) + 5H_2O(g)$$

P

$K_p = 2.43 \times 10^{-13}$ $(atm)^5$

find Pressure at eq^lbm

$$K_p = (P_{H_2O})^5 = 243 \times 10^{-15}$$

$$P = P_{H_2O} = 3 \times 10^{-3}\ atm$$

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Q. find vapour pressure of $H_2O(l)$ at 25°C

Given at 25° $H_2O(l) \rightarrow H_2O(g)$ $K_p = 40$ torr.

$$40 = K_p = \underbrace{P_{H_2O}}$$

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Relationship betⁿ K_p or K_c and α

α = degree of dissociation

= no of moles reacted per mole of reactant

$$A \longrightarrow B + C$$

$$\begin{array}{ccc} a \text{ mol} & & \\ \Rightarrow a - x & x & x \\ \Rightarrow a(1-\alpha) & a\alpha & a\alpha \end{array}$$

$$K_c = \frac{(a\alpha)(a\alpha)}{a(1-\alpha)}\left(\frac{1}{V}\right)^1 = \frac{a\alpha^2}{1-\alpha} \times \frac{1}{V}$$

$$P_c = \frac{\cancel{a}\alpha}{\cancel{a}(1+\alpha)} \times P_T$$

$$\underline{K_p} = \frac{(\cancel{a}\alpha)(\cancel{a}\alpha)}{\cancel{a}(1-\alpha)} \times \left(\frac{P_T}{\cancel{a}(1+\alpha)}\right) = \frac{\alpha^2}{1-\alpha^2} P_T$$

$$\boxed{\begin{array}{c}\text{If } \Delta n_g = 0 \\ K_p = K_c\end{array}}$$

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$$2HI_{(g)} \longrightarrow H_2(g) + I_2(g)$$

$$1-\alpha \qquad \alpha/2 \qquad \alpha/2$$

$$K_p = \frac{(\alpha/2)(\alpha/2)}{(1-\alpha)^2}\left(\frac{P_T}{1}\right)^0$$

$$K_c = K_p = \frac{(\alpha/2)^2}{(1-\alpha)^2}$$

if $\Delta n_g = 0$

'α' depends only on temperature.

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find K_p for the Rxn if PCl_5 decomposes 50%. at 10 atm.

$\alpha = 0.5$

$$PCl_5(g) \longrightarrow PCl_3(g) + Cl_2(g)$$

$$1-\alpha \qquad \alpha \qquad \alpha$$

$$K_p = \frac{\alpha \cdot \alpha}{1-\alpha}\left(\frac{10}{1+\alpha}\right)$$

$$= \frac{\alpha^2}{1-\alpha^2} \times 10 = \frac{0.25}{0.75} \times 10 = 10/3$$

(b) find the pressure at which α becomes 0.2.

$$K_p = 10/3 = \frac{\alpha^2}{1-\alpha^2} P_T = \frac{0.04}{1-0.04} \times P_T$$

$$10/3 = \frac{1}{24} P_T \qquad P_T = 80$$