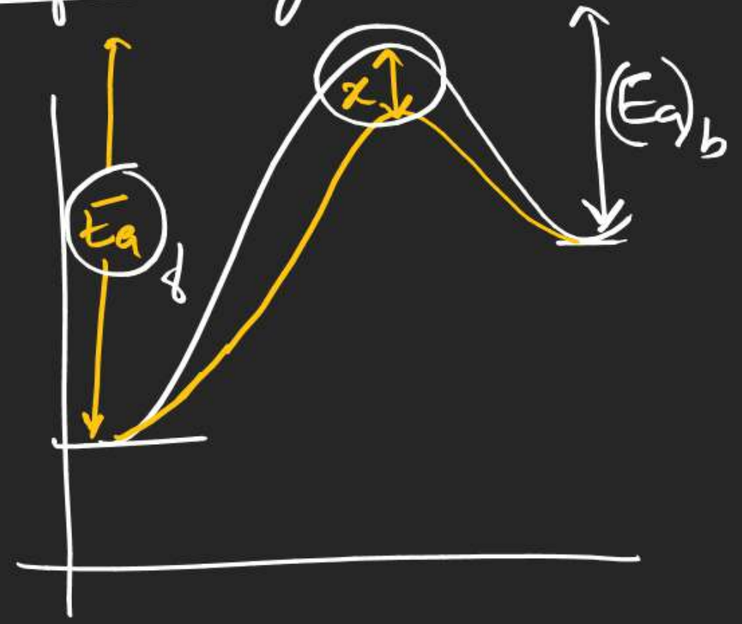
Nishant Jindal

Effect of catalyst



$$K_{eq} = \frac{k_f'}{k_b'} = \frac{k_f}{k_b} = K_{eq}$$

$$k = A e^{-E_a/RT}$$

$$k_f = A_f e^{-(E_a)_f/RT}$$

$$k_f' = A_f e^{-[(E_a)_f - x]/RT}$$

$$k_f' = A_f e^{-(E_a)_f/RT} e^{x/RT}$$

$$k_f' = k_f e^{x/RT}$$

$$k_b' = k_b e^{x/RT}$$

A catalyst has no effect on state of eqlbm but helps in attaining it rapidly.

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Question related to more than one simultaneous eqlbm

	$A \longrightarrow$	$B +$	C
	a		
eqlbm	$a-x$	x	x
	$a-x$	x	$c+x$
	$a-(x-y)$	$(x-y)$	$c+(x-y)$

$$K_{eq} = \frac{(x-y)(c+x-y)}{a-(x-y)}$$

	$A \longrightarrow$	$B +$	C
	a		c
	$a-z$	(z)	$c+(z)$

$$K_{eq} = \frac{z(c+z)}{(a-z)}$$

$$z = x-y \qquad x = y+z$$

$$\times$$

$A \longrightarrow$	$B +$	C
$a-x$	x	x

|

$A \longrightarrow$	$B +$	C
$a-z$	z	$c+z$

$$x > z$$

common ion effect

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Q.

1 lit

$A \longrightarrow B + C \qquad K = 10^{-5} M$

$0.1 - x \qquad x \qquad x$

$$\frac{x^2}{0.1 - x} = 10^{-5}$$

$$x = 10^{-3}$$

1 lit

$A \longrightarrow B + C \qquad K = 10^{-5} M$

$0.1 - y \qquad y \qquad 0.1 + y$

$$\frac{y(0.1 + y)}{(0.1 - y)} = 10^{-5}$$

$$y = 10^{-5}$$

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$R_1(s) \longrightarrow A(g) + C(g)$

$s \quad s$

$K_{p_1} = 110 \times 10^{-12}$

$R_2(s) \longrightarrow B(g) + C(g)$

$t \quad t$

$K_{p_2} = 11 \times 10^{-12}$

$R_1(s) \longrightarrow A(g) + C(g)$

$x \quad (x+y)$

$R_2(s) \longrightarrow B(g) + C(g)$

$y \quad (x+y)$

$x = 10^{-5}$

$y = 10^{-6}$

$s = 1.048 \times 10^{-5}$

$t = 3.31 \times 10^{-6}$

$s > x$

$t > y$

$\sqrt{110} = 10.48$

$\sqrt{11} = 3.31$

$= P_A P_C$

$110 \times 10^{-12} = x(x+y)$ — ①

$11 \times 10^{-12} = y(x+y)$ — ②

$121 \times 10^{-12} = (x+y)^2$

$11 \times 10^{-6} = x+y$

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K_{c_1} $\quad A \longrightarrow B + C$

$\quad\quad a-x \quad\quad x \quad\quad x-y$

K_{c_2} $\quad C \longrightarrow P$

$\quad\quad x-y \quad\quad y$

$$K_{c_1} = \frac{x(x-y)}{a-x}$$

$$k_{c_2} = \frac{y}{x-y}$$

$A \longrightarrow B + C$

$a-z \quad\quad z \quad\quad z$

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Q find K_{p_1} & K_{p_2} for the given Rxns.

$$A \longrightarrow B + C$$
$$2-x \quad x \quad x-y$$

$$C \longrightarrow 2D$$
$$x-y \quad 2y$$

if initially 'A' is added at 2 atm.
at eq$^{lb^m}$ $P_C = P_D$
and Total pressure at eq$^{lb^m}$ is 3.5 atm

$$x - y = 2y \quad \text{—} (1)$$

$$P_A + P_B + P_C + P_D = 3.5$$
$$2 - x + x + x - y + 2y = 3.5$$
$$2 + x + y = 3.5$$
$$x + y = 1.5$$
$$4y = 1.5$$
$$y = \frac{3}{8} \qquad x = \frac{9}{8}$$

$$K_{p_1} = \frac{\frac{9}{8} \times \frac{6}{8}}{\frac{7}{8}} = \frac{54}{56} = \frac{27}{28}$$

$$K_{p_2} = \frac{P_D^2}{P_C} = \frac{\left(2 \times \frac{3}{8}\right)^2}{\frac{6}{8}}$$
$$= \frac{\frac{3}{4} \times \frac{3}{4}}{\frac{6}{8} 2} = \frac{3}{4}$$

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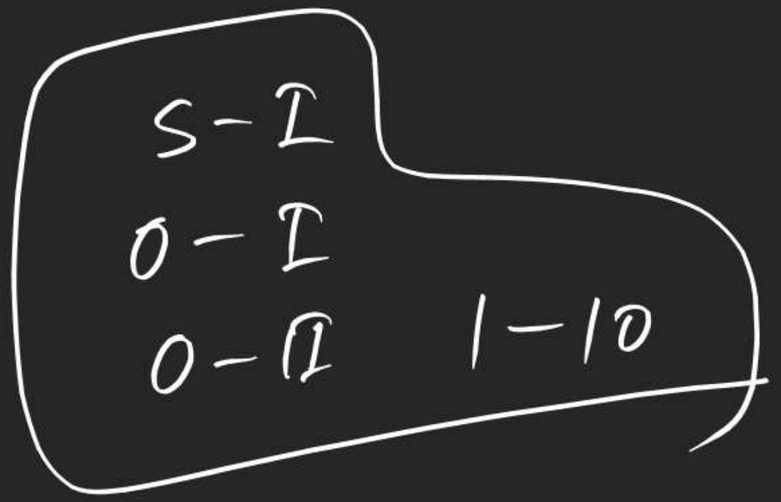

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(67) $PCl_5 \longrightarrow PCl_3 + Cl_2$

(68) $1-\alpha \qquad \alpha \qquad \alpha$

$$K_p = \frac{\alpha^2}{1-\alpha^2} P_T$$

$$\alpha = \frac{1}{\sqrt{P_T}}$$

(67) $Au(s) \longrightarrow Au(\ell)$

endo $\Delta H > 0$ $T \uparrow$ forward

(71) exo $T \uparrow$ backward

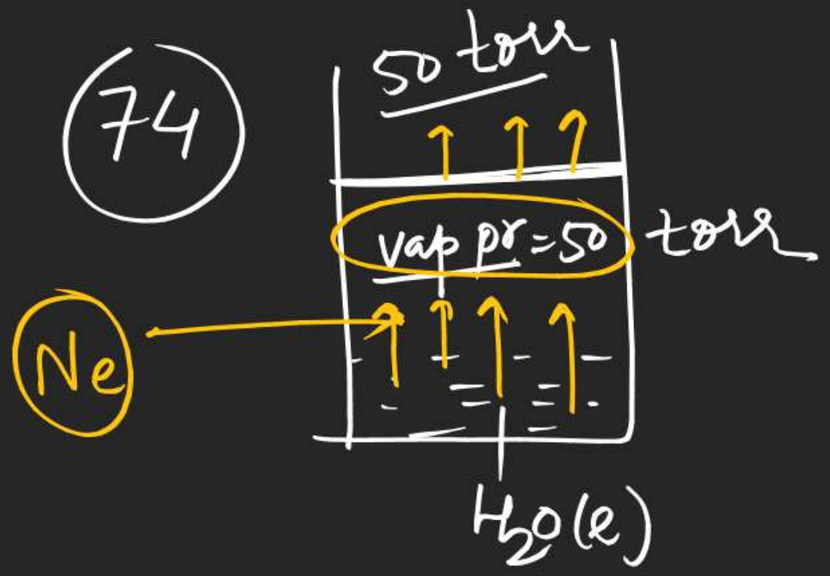
$O_2(g) \xrightarrow{H_2O(\ell)} O_2(aq)$

$P \uparrow$ forward

(77) gr ⟶ diam $\Delta H = 1.9$ kJ

endo T↑ forward

(74)



$H_2O(\ell) \longrightarrow H_2O(g)$

V↑ forward

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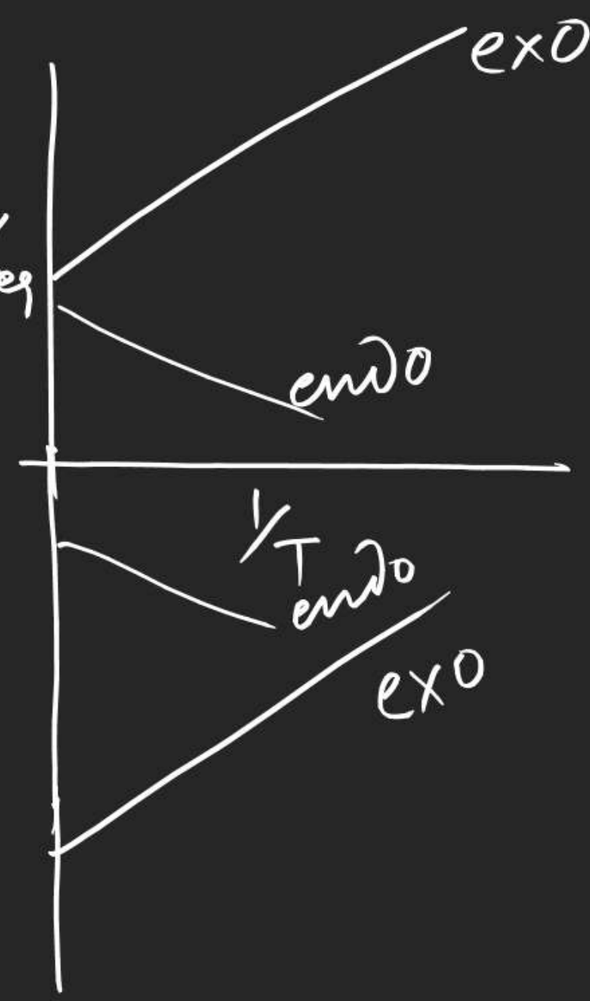
$$2.303 \log K = \ln K_{eq} = \ln \frac{A_f}{A_b} - \frac{\Delta H}{R}\left(\frac{1}{T}\right)$$

$$\text{slope} = -\frac{\Delta H}{R}$$

exo $\Delta H < 0$ slope = +ive

endo $\Delta H > 0$ slope = -ive

$$\text{slope} = \frac{-\Delta H}{2.303\,R} = 1$$



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(33)

$$K_{1400} = \frac{k_f}{k_b} = \frac{0.29}{1.1} \times 10^6 = \frac{2.9}{1.1} \times 10^5$$

$$K_{1500} = \frac{1.3}{1.4} \times 10^5$$

T ↑ K_{eq} ↓

$A \longrightarrow B + \underline{\text{heat}}$ exo

(36)

T ↑ forward

? ↑ forward

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(40) (b) (4)

P ↑

$C(s) + H_2O(g) \longrightarrow CO(g) + H_2(g)$

C(s): ↑

$H_2O(g)$: ↑

CO(g): ↓

$H_2(g)$: ↓

moles

P ↑ backward

Volume factor dominates

	CO(g)	$H_2(g)$	
↑	↑	↑	Partial pressure
↑	↑	↑	Conc