

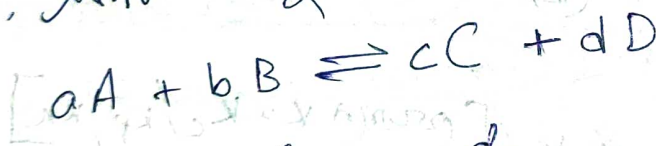
ସାଧାରଣ ବିକ୍ରियायुक्त शक्ति

परिवर्तन ( $\Delta G$ )  
↓  
Gibb's free Energy

विक्रियायुक्त स्थिरांक (K)

यदि, प्रकाश से प्रेरित विक्रिया निम्नरूप -

eq-equilibrium



$$K = \frac{[C]_{eq}^c \times [D]_{eq}^d}{[A]_{eq}^a \times [B]_{eq}^b} \quad \text{[साम्यावस्था]}$$

यथास [A]<sub>eq</sub>, [B]<sub>eq</sub>, [C]<sub>eq</sub>, [D]<sub>eq</sub> इन साम्यावस्था

समयकाल [A], [B], [C], [D] पर प्रतिक्रिया है;

विक्रियायुक्त स्थिरांक (K) शून्ये यदि विक्रियायुक्त शक्ति

ପାରମ୍ପରିକ  $\Delta G$  ଥିବା ଉପାଦାନଗୁଡ଼ିକର ସମ୍ବନ୍ଧ (Thermodynamics) ଲେଖା(ନା)

ଅର୍ଥ  $\Delta G = \Delta G^\circ + RT \ln K$   
 $= \Delta G^\circ + RT \ln \frac{[C]^c \times [D]^d}{[A]^a \times [B]^b}$  [  $K$  ସମ୍ପର୍କୀତ ]  
 $= \Delta G^\circ + RT \ln Q$  [  $Q$  - ସମ୍ପର୍କୀତ ]  
 [  $\Delta G^\circ =$  ମାନକ ଅବସ୍ଥାରେ ]

ଆନ୍ତରାଳରେ  $\Delta G = 0$  and  $Q = K$  ଥିବ -

$\therefore 0 = \Delta G^\circ + RT \ln K$

ଅ  $\Delta G^\circ = -RT \ln K$

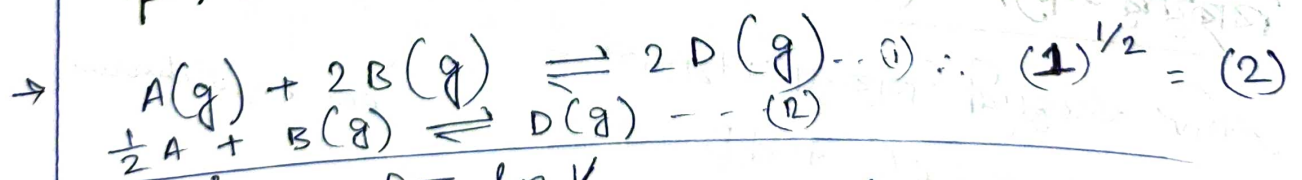
ଅ  $\ln K = -\frac{\Delta G^\circ}{RT}$

ଅ  $K = e^{-\Delta G^\circ/RT}$

$\Delta G^\circ = -2.303 RT \log K$  [  $\ln x = 2.303 \log x$  ]

1)  $A(g) + 2B(g) \rightleftharpoons 2D(g)$  ରାସାୟନ ଗତିଧାର  
 (ତାପମାନ 500 K ବ୍ୟତୀତ)  $\Delta G^\circ$  ମାନ 2 kJ/mol.  
 ଏହି ଉପାଦାନ  $\frac{1}{2} A(g) + B(g) \rightleftharpoons D(g)$  ଗତିଧାର

$K_p$  ମାନ ନିର୍ଣ୍ଣୟ କର.



$\Delta G^\circ = -RT \ln K$

ଅ  $2 = -8.314 \times 500 \times \ln K_p$  [  $\ln K = K_c / K_p / K_x$  ]  
 ଅ  $K = -\frac{4.811 \times 10^{-4}}{2.303 \log}$   
 $= -2.089 \times 10^{-4}$

$$\Delta G^\circ = -RT \ln K_p \quad [\because K = K_c / K_p / K_x]$$

$$\ln K_p = -\frac{\Delta G^\circ}{RT}$$

$$= -\frac{2 \times 10^3 \text{ J mol}^{-1}}{8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 500 \text{ K}}$$

$$= -\frac{2 \times 10^3}{8.314 \times 500}$$

$$= -0.482$$

$$2.303 \log K_p = -0.482$$

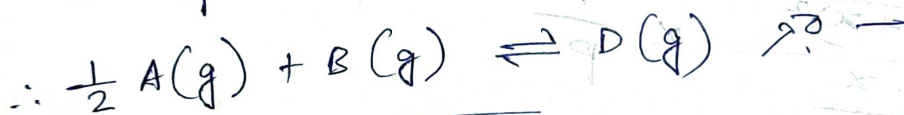
$$\log_{10} K_p = -\frac{0.482}{2.303}$$

$$\log_{10} x = a$$

$$\Rightarrow x = 10^a$$

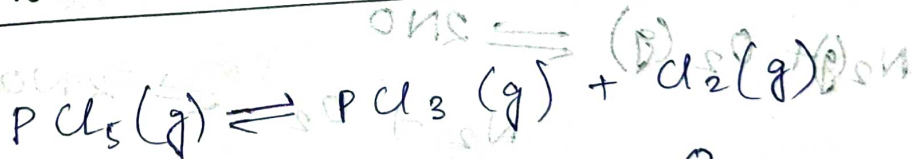
~~$$K_p = 10^{-\frac{0.482}{2.303}} \Rightarrow K_p = 10^{-0.209} = 0.6181$$~~

$$K_p = 0.6181$$



$$K_p = \sqrt{0.6181} = 0.7861 \quad (\text{Ans})$$

આવશ્યકતા વાચકાસુત્રના વિકાસમાં આજીવન સમય જાન નિર્વહ:



આવશ્યકતા:  $a$  1 0 0  
 આજીવન સમય:  $(a-x)$  1-x x x  
 આજીવન સમય:  $\frac{(a-x)}{\sqrt{v}}$   $\frac{1-x}{\sqrt{v}}$   $\frac{x}{\sqrt{v}}$   $\frac{x}{\sqrt{v}}$

$$K_c = \frac{[PCl_3][Cl_2]}{[PCl_5]} = \frac{\frac{x}{\sqrt{v}} \times \frac{x}{\sqrt{v}}}{\frac{(a-x)}{\sqrt{v}}} = \frac{x^2}{\sqrt{v}(a-x)}$$

अणुसंख्या (अणु) (मोलसंख्या) =  $a - x + x + x = a + x$

$$K_p = \frac{P_{Cu_3} \times P_{Cu_2}}{P_{Cu_5}}$$

Partial Pressure =  $\frac{\text{अणुसंख्या}}{\text{कुल अणुसंख्या}} \times \text{कुल दबाव}$

$$P_{Cu_3} = \frac{x}{a+x} \times P$$

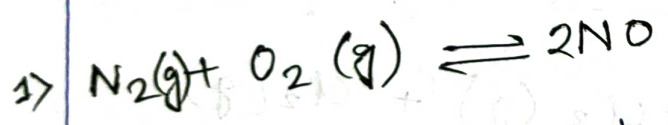
$$P_{Cu_2} = \frac{x}{a+x} \times P$$

$$P_{Cu_5} = \frac{a-x}{a+x} \times P$$

$$K_p = \frac{\left(\frac{x}{a+x} \times P\right) \times \left(\frac{x}{a+x} \times P\right)}{\left(\frac{a-x}{a+x}\right) P}$$

$$= \frac{\frac{x^2}{(a+x)^2} \times P^2}{\frac{a-x}{a+x} P}$$

$$= \frac{x^2 P}{(a-x)(a+x)} = \frac{x^2 P}{a^2 - x^2}$$



आरंभिक (मोलसंख्या):

a                      b                      0

अणुसंख्या (मोलसंख्या):

(a-x)                  (b-x)                  2x

अणुसंख्या (मोलसंख्या):

$\frac{a-x}{V}$                    $\frac{b-x}{V}$                    $\frac{2x}{V}$

$$K_c = \frac{[NO]^2}{[N_2][O_2]} = \frac{\left(\frac{2x}{V}\right)^2}{\frac{a-x}{V} \times \frac{b-x}{V}} = \frac{4x^2}{(a-x)(b-x)}$$

अणुसंख्या (कुल) (मोलसंख्या) =  $a - x + b - x + 2x = a + b$

$$\therefore K_p = \frac{P_{NO}^2}{P_{N_2} \times P_{O_2}}$$

$$P_{N_2} = \frac{a-x}{a+b} \times P$$

$$P_{O_2} = \frac{b-x}{a+b} \times P$$

$$P_{NO} = \frac{2x}{a+b} \times P$$

$$\therefore K_p = \frac{\left(\frac{2x}{a+b} \times P\right)^2}{\frac{a-x}{a+b} \times \frac{b-x}{a+b} \times P^2}$$

$$= \frac{4x^2}{(a-x)(b-x)}$$

$$\therefore K_c = K_p \left[ \frac{RT^{\Delta n}}{P^{\Delta n}} \right] \quad \Delta n = 2 - (1+1) = 0$$

H/W  
 7) एकानुपात निर्दिष्ट संतुलन  $aA + bB \rightleftharpoons dC + eD$  विचारिये।  
 आणविक संतुलन का  $K$  शून्य  $m$  संतुलन  $maA + mbB \rightleftharpoons mdC + meD$

उदा:  $\frac{1}{m} aA + \frac{1}{m} bB \rightleftharpoons \frac{1}{m} dC + \frac{1}{m} eD$  विचारिये।

आणविक संतुलन का शून्य क्या होगा?

$$aA + bB \rightleftharpoons dC + eD \quad \text{--- (1)}$$

$$maA + mbB \rightleftharpoons mdC + meD \quad \text{--- (2)}$$

$$\frac{1}{m} aA + \frac{1}{m} bB \rightleftharpoons \frac{1}{m} dC + \frac{1}{m} eD \quad \text{--- (3)}$$

$$(1) \Rightarrow K = \frac{[C]^d [D]^e}{[A]^a [B]^b}$$

$$(2) \Rightarrow K_1 = \frac{[C]^{md} [D]^{me}}{[A]^{ma} [B]^{mb}}$$

[3] ⇒

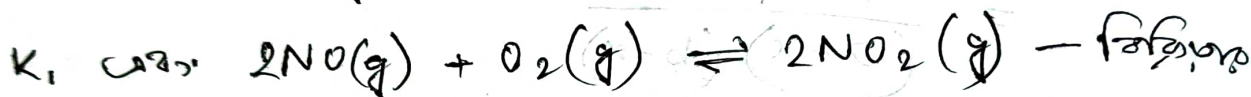
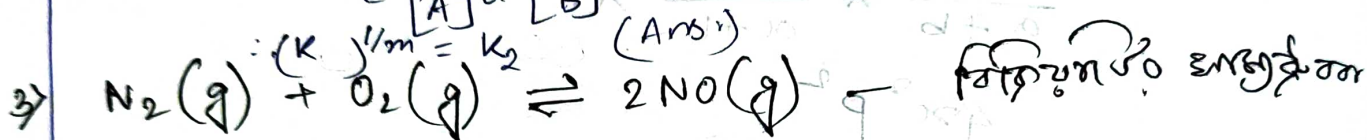
$$K = \frac{[C]^{d/m} [D]^{c/m}}{[A]^{a/m} [B]^{b/m}}$$

∴ (1) & (2) ⇒

$$\left\{ \frac{[C]^d [D]^c}{[A]^a [B]^b} \right\}^m = \frac{[C]^{md} [D]^{mc}}{[A]^{ma} [B]^{mb}}$$

∴  $(K_1)^m = K_2$

(1) & (3) ⇒  $\left\{ \frac{[C]^d [D]^c}{[A]^a [B]^b} \right\}^{1/m} = \frac{[C]^{d/m} [D]^{c/m}}{[A]^{a/m} [B]^{b/m}}$

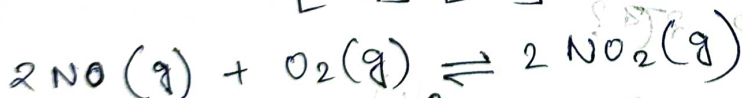


विज्ञान के अनुसार  $K$  शब्द —

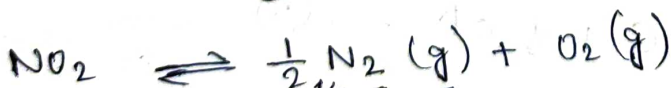
(a)  $\frac{1}{K_1 K_2}$  (b)  $\frac{1}{2 K_1 K_2}$  (c)  $\frac{1}{4 K_1 K_2}$  (d)  $\left( \frac{1}{K_1 K_2} \right)^{1/2}$



$K_1 = \frac{[NO]^2}{[N_2][O_2]}$



$K_2 = \frac{[NO_2]^2}{[NO]^2 [O_2]}$



$K = \frac{[N_2]^{1/2} [O_2]}{[NO_2]}$

$\therefore K_1 K_2 = \frac{[NO]^2}{[N_2][O_2]} \times \frac{[NO_2]^2}{[NO]^2 [O_2]} = \frac{[NO_2]^2}{[N_2][O_2]^2}$

अ.  $(K_1 K_2)^{1/2}$

$= \frac{[NO_2]}{[N_2]^{1/2} [O_2]}$

$\therefore K =$

$\frac{1}{(K_1 K_2)^{1/2}}$

$= \left( \frac{1}{K_1 K_2} \right)^{1/2} \rightarrow (d)$