

# YAKEEN NEET 2.0

2026

Chemical Equilibrium

Physical Chemistry

Lecture -06

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Physics Wallah



## Topics to be covered

- 1** MEDICS TEST, Revision of Last Class
- 2** Degree of Association, Gibbs free energy,
- 3** Simultaneous Equilibrium
- 4** Lechartilier Principle
- 5** Magarmach Practice Questions ( MPQ ) & Home work from modules



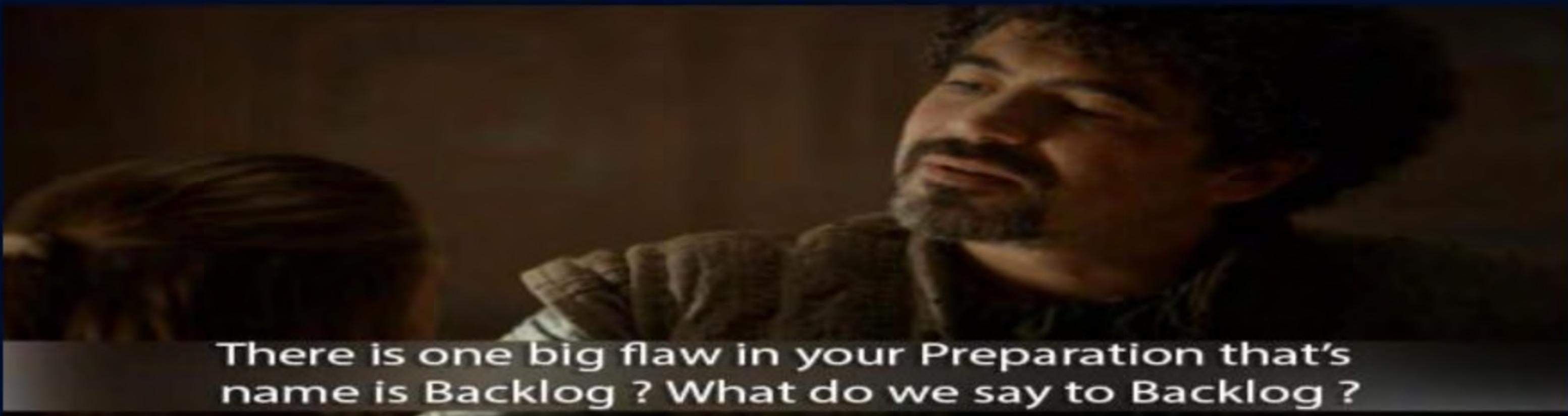
## Rules to Attend Class

1. Always sit in a peaceful environment with headphone and be ready with your copy and pen.
2. Never ever attend a class from in between or don't join a live class in the middle of the chapter.
3. Make sure to revise the last class before attending the next class & always complete your Magarmach Practice Questions.
4. Never ever engage in chat whether live or recorded on the topic which is not being discussed in current class as by doing so u can be blocked by the admin team or your subscription can be cancelled.



## Rules to Attend Class

5. Try to make maximum notes during the class if something is left then u can use the notes pdf after the class to complete the remaining class.
6. Always ask your doubts in doubt section to get answer from faculty. Before asking any doubt please check whether same doubt has been asked by someone or not.



There is one big flaw in your Preparation that's name is Backlog ? What do we say to Backlog ?



NOT TODAY !!!

# MEDICS



## **Mastery**

Checks your grasp over  
NEET-level concepts

## **Evaluation**

Judging both knowledge  
and test-smartness

## **Decision Making**

Testing your speed + accuracy under pressure

## **Intuition**

Some answers need gut + logic –  
can you spot the trick?

## **Concepts**

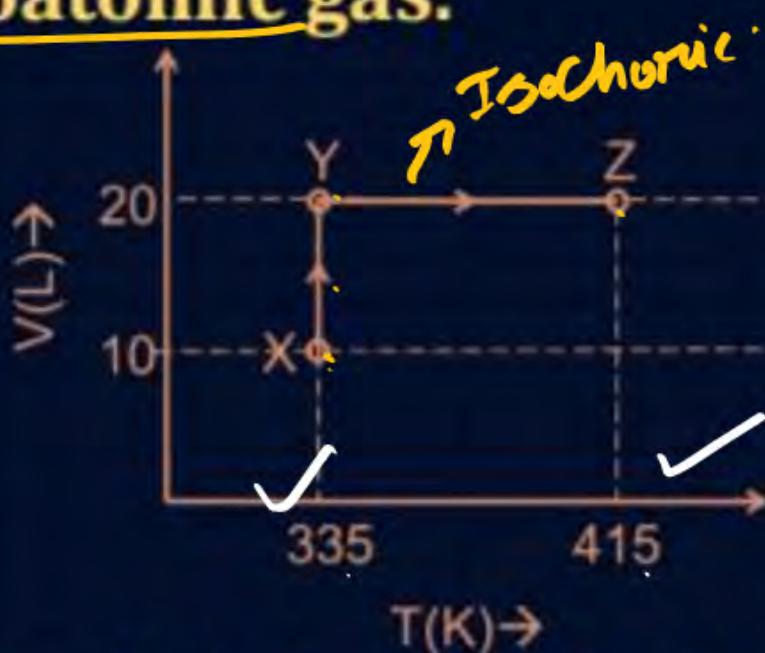
It's all about strong basics –  
no shortcuts here

## **Strategy**

The MEDICS test – built  
for those who heal,  
hustle, and hope.

## QUESTION (JEE Adv. 2024)

Consider the following volume-temperature (V-T) diagram for the expansion of 5 moles of an ideal monoatomic gas.



Considering only p-V work is involved, the total change in enthalpy (in Joule) for the transformation of state in the sequence  $X \rightarrow Y \rightarrow Z$  is.....

[Use the given data: Molar heat capacity of the gas for the given temperature range,  $C_{v,m} = 12 \text{ J K}^{-1} \text{ mol}^{-1}$  and gas constant,  $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$  ]

$$n = 5$$

$$C_V,m = 12 \text{ J K}^{-1} \text{ mol}^{-1}$$

$$R = \frac{25}{3} \text{ J K}^{-1} \text{ mol}^{-1}$$

P  
W

Monoatomic gas

$$\begin{aligned}\Delta H_{X \rightarrow Y \rightarrow Z} &= \Delta H_{X \rightarrow Y} + \underline{\Delta H_{Y \rightarrow Z}} \\ &= 0 + 8120 \\ &\approx 8120 \text{ J}\end{aligned}$$

$$\Delta H_{Y \rightarrow Z} = n C_V,m \Delta T \quad (\Delta T = 0)$$

$$\Delta H_{Y \rightarrow Z} = 0$$

$$\begin{aligned}\Delta U_{Y \rightarrow Z} &= n C_V,m \Delta T \\ &= 5 \times 12 \times (415 - 335) \\ &= 60 \times 80 = 4800 \text{ J}\end{aligned}$$

$$\begin{aligned}\Delta H_{Y \rightarrow Z} &= \Delta U_{Y \rightarrow Z} + n R \Delta T \\ &= 4800 + 5 \times 8.3 \times 80 \\ &= 8120\end{aligned}$$

## QUESTION (JEE Adv. 2016)

One mole of an ideal gas at 300 K in thermal contact with surroundings expands isothermally from 1.0 L to 2.0 L against a constant pressure of 3.0 atm. In this process, the change in entropy of surroundings ( $\Delta S_{\text{surr}}$ ) in  $\text{JK}^{-1}$  is .....

(1 L atm = 101.3 J)

A

5.763

B

1.013

C

-1.013

D

-5.763

$$\begin{cases} n = 1 \\ V_1 = 1 \text{ L} \\ T = 300 \text{ K} \\ V_2 = 2 \text{ L} \end{cases}$$

$$P = 3 \text{ atm}$$

$$\Delta S_{\text{surr}} = \frac{q_{\text{isobar}}}{T} = \frac{3 \times 101.3}{300} = \frac{3 \times 101.3}{100}$$

$$\Delta U = 0 \Rightarrow q = -w = P \Delta V$$

$$= 3(2-1) = 3 \text{ L atm}$$

$$= 3 \times 101.3 \text{ J}$$

## QUESTION (JEE Adv. 2014)

For the process,  $\text{H}_2\text{O(l)} \xrightarrow{q_{\text{absorb}}} \text{H}_2\text{O(g)}$  at  $T = 100^\circ\text{C}$  and 1 atmosphere pressure, the correct choice is

- A  $\Delta S_{\text{system}} > 0$  and  $\Delta S_{\text{surrounding}} > 0$
- B  $\Delta S_{\text{system}} > 0$  and  $\Delta S_{\text{surrounding}} < 0$
- C  $\times \Delta S_{\text{system}} < 0$  and  $\Delta S_{\text{surrounding}} > 0$
- D  $\times \Delta S_{\text{system}} < 0$  and  $\Delta S_{\text{surrounding}} < 0$

$$\Delta S = \frac{q}{T}$$

$$\Delta S_{\text{sys.}} > 0$$

$$\Delta S_{\text{sur.}} < 0$$

## QUESTION (JEE Adv. 2007)

For the process  $\text{H}_2\text{O(l)} \xrightarrow{\downarrow} \text{H}_2\text{O(g)}$  (1 bar, 373 K), the correct set of thermodynamic parameters is

- A  $\Delta G = 0, \Delta S = +\text{ve}$
- B  $\Delta G = 0, \Delta S = -\text{ve}$
- C  $\Delta G = +\text{ve}, \Delta S = 0$
- D  $\Delta G = -\text{ve}, \Delta S = +\text{ve}$

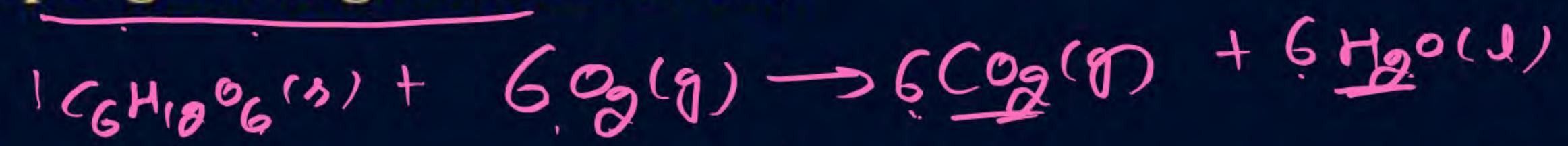
$$\Delta S_{\text{sys.}} = (+)\text{ve}$$
$$\Delta G_r = 0$$

## QUESTION (JEE Adv. 2020)



The standard enthalpies of formation of  $CO_2(g)$ ,  $H_2O(l)$  and glucose( $s$ ) at  $25^\circ C$  are  $-400\text{ kJ/mol}$ ,  $-300\text{ kJ/mol}$  and  $-1300\text{ kJ/mol}$ , respectively. The standard enthalpy of combustion per gram of glucose at  $25^\circ C$  is

- A + 2900 kJ
- B -2900 kJ
- C -16.11 kJ
- D +16.11 kJ



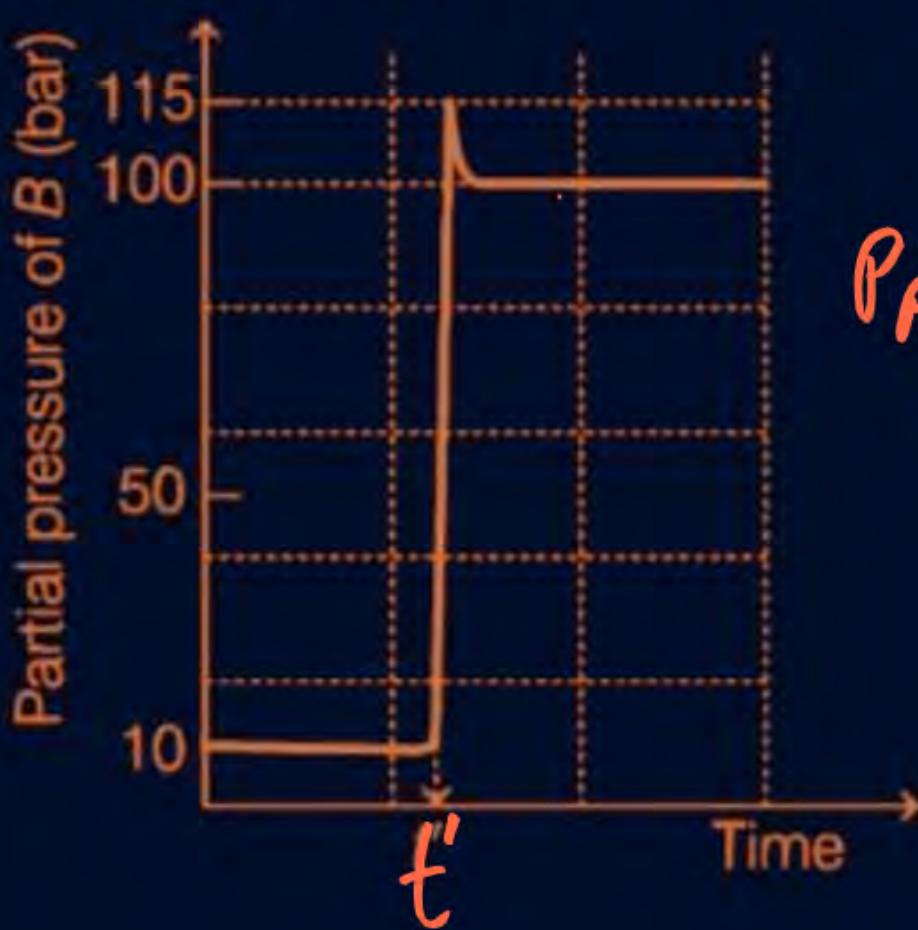
$$\Delta H = [6 \times -400 + 6 \times -300] - [1 \times -1300 + 6 \times 0]$$

$$= -4200 + 1300 = -2900 \text{ kJ/mole}$$

$$\Delta H = \frac{-2900}{180} \text{ kJ/g}$$

## QUESTION (JEE Adv. 2020)

Consider the reaction,  $A \rightleftharpoons B$  at 1000 K. At time  $t'$ , the temperature of the system was increased to 2000 K and the system was allowed to reach equilibrium. Throughout this experiment the partial pressure of A was maintained at 1 bar. Given, below is the plot of the partial pressure of B with time. What is the ratio of the standard Gibbs energy of the reaction at 1000 K to that at 2000 K?



$$T_1 = 1000\text{ K}, T_2 = 2000\text{ K}$$

$$\left. \begin{array}{l} P_A^1 = P_A = 1 \text{ bar} \\ P_B^1 = 10 \text{ bar} \end{array} \right| \quad \left. \begin{array}{l} P_A^2 = 1 \text{ bar} \\ P_B^2 = 100 \text{ bar} \end{array} \right|$$

$$\frac{\Delta G_{11}^{\circ}}{\Delta G_{12}^{\circ}} = \frac{-RT_1 \ln K_P}{-RT_2 \ln K_P}$$

$$= \frac{1000 \ln 10}{2000 \ln 100}$$

$$= \frac{1 \log_{10} 10}{2 \log_{10} 100}$$

$$\frac{\Delta G_{11}^{\circ}}{\Delta G_{12}^{\circ}} = \frac{1 \times 1}{2 \times 2} = \frac{1}{4}$$

$$K_{P1} = \frac{P_B}{P_A} = \frac{10}{1}$$

$$K_{P2} = \frac{P_B}{P_A} = \frac{100}{1}$$

$$\begin{aligned} \log_{10} 10 &= 1 \\ \log_{10} 100 &= \log_{10}(10)^2 = 2 \underline{\log_{10} 10} \end{aligned}$$

$$\Delta H = \Delta U + \Delta q_{RT}$$

$$\Delta U = \gamma c$$

$$\Delta q = \gamma y$$

RT

3  
6

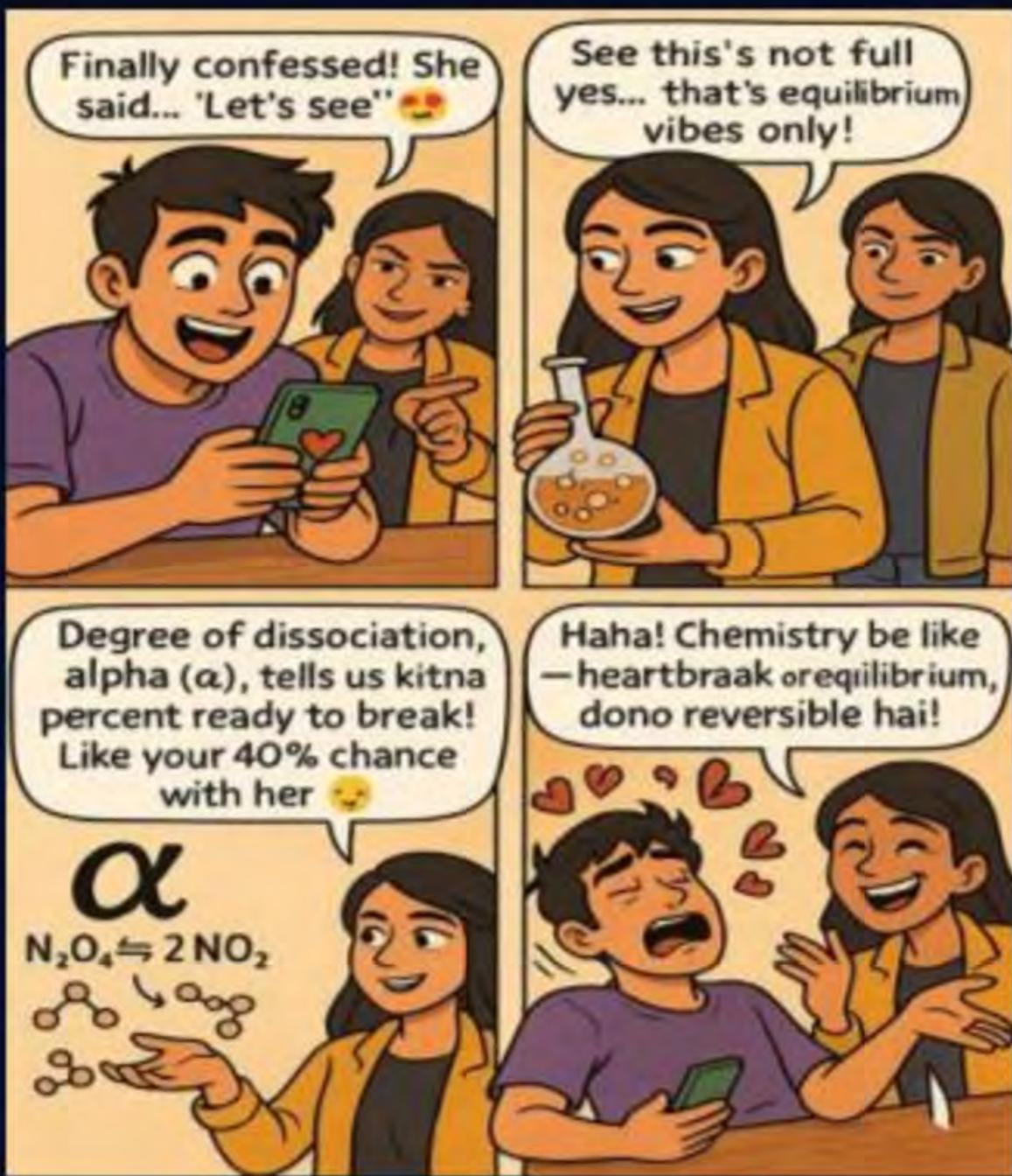
MEDICS Test

↓  
Lec-11 to Lec-13

↓  
tomorrow



# Revision of Last Class





## Degree of Association

$\frac{V}{2}$



# MIT

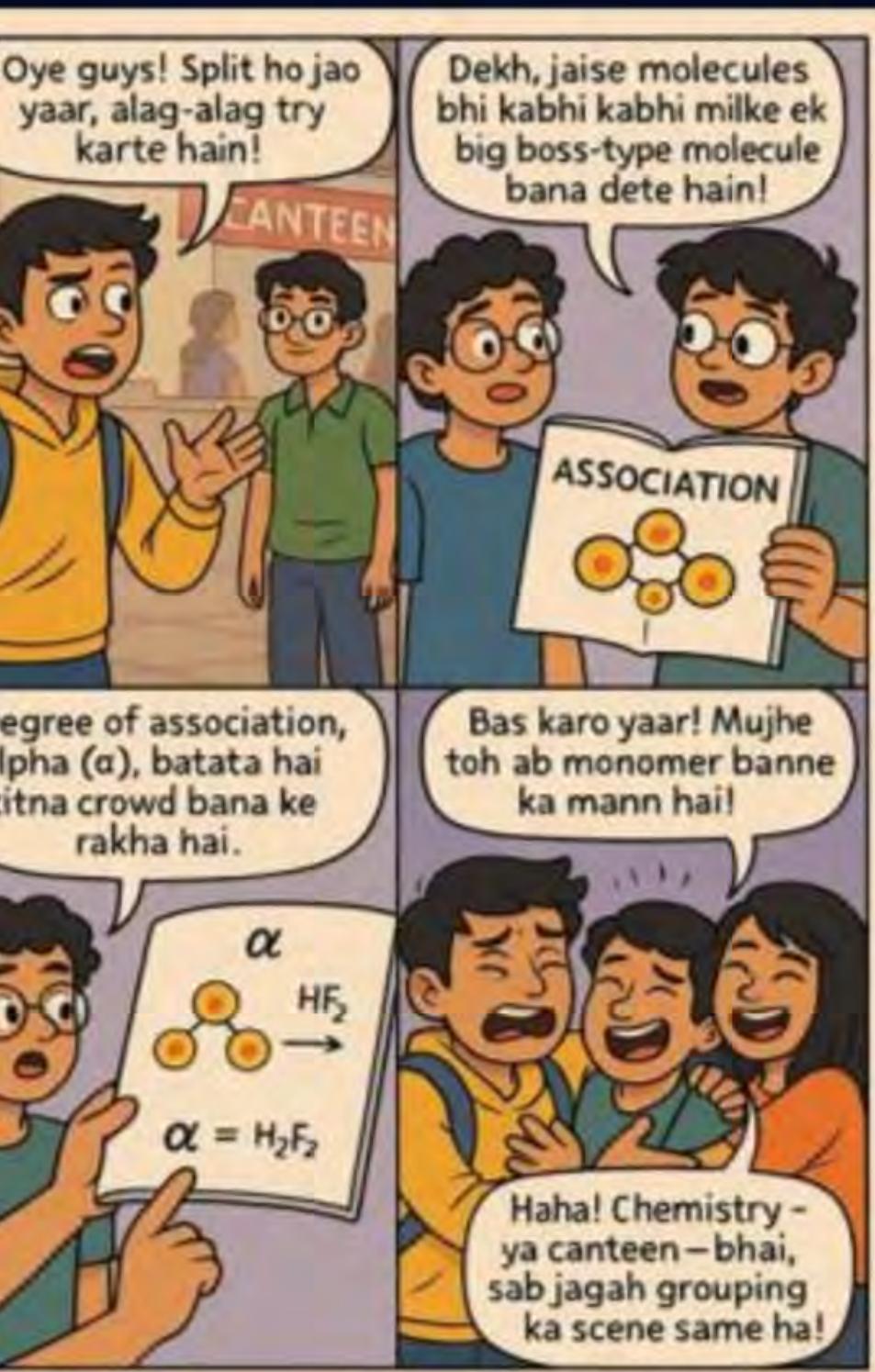
$$\alpha = \frac{D - d}{d(\frac{1}{n} - 1)} = \frac{M_t - M_o}{M_o(\frac{1}{n} - 1)}$$

$n$  = no. of gas molecule Combine to form 1 molecule

dimer  $\Rightarrow n = 2$

trimer  $\Rightarrow n = 3$

%age association =  $\alpha \times 100$



QUESTION

$$\frac{24 \times H}{25 \times M} = \frac{96}{100} = 0.96$$



Determine degree of association and percentage association if observed molar mass of HCHO and  $C_6H_{12}O_6$  is 150.

$$\text{Ans} \quad \alpha = 0.96$$

$$\begin{aligned} \text{1. degree association} &= \alpha \times 100 \\ &= 0.96 \times 100 \\ &= 96\% \end{aligned}$$



$$\begin{aligned} M_t &= 2 + 12 + 16 \\ &= 30 \text{ g} \quad n = 6 \end{aligned}$$

$$\alpha = \frac{M_t - M_0}{M_0 \left( \frac{1}{n} - 1 \right)} = \frac{30 - 150}{150 \left( \frac{1}{6} - 1 \right)}$$

$$= \frac{-120 \times 6}{150 \left( \frac{1}{6} - 1 \right)}$$

$$= \frac{1440}{150 \times 5} = \frac{288}{150} = 0.96$$



# Gibbs Free Energy

$$+5 \times -3 = -15$$

$$-5 \times -3 = +15$$

# MIT

$$\Delta G_r = \Delta G_r^\circ + RT \ln Q$$

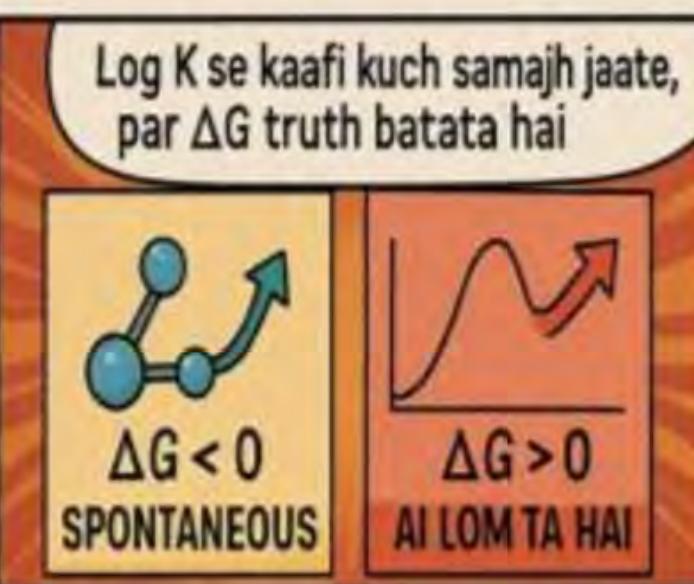
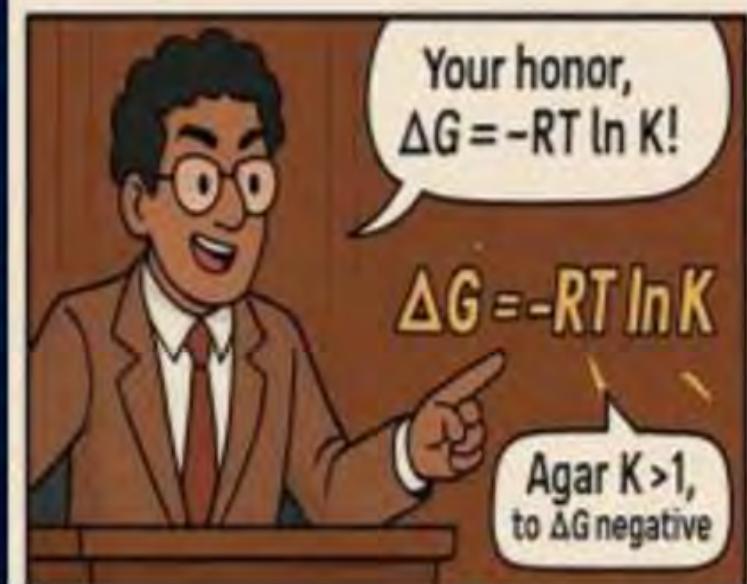
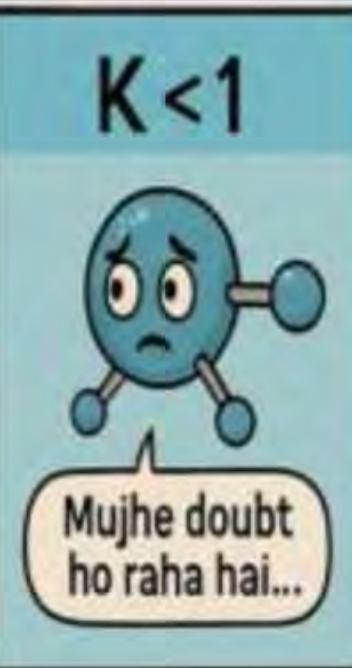
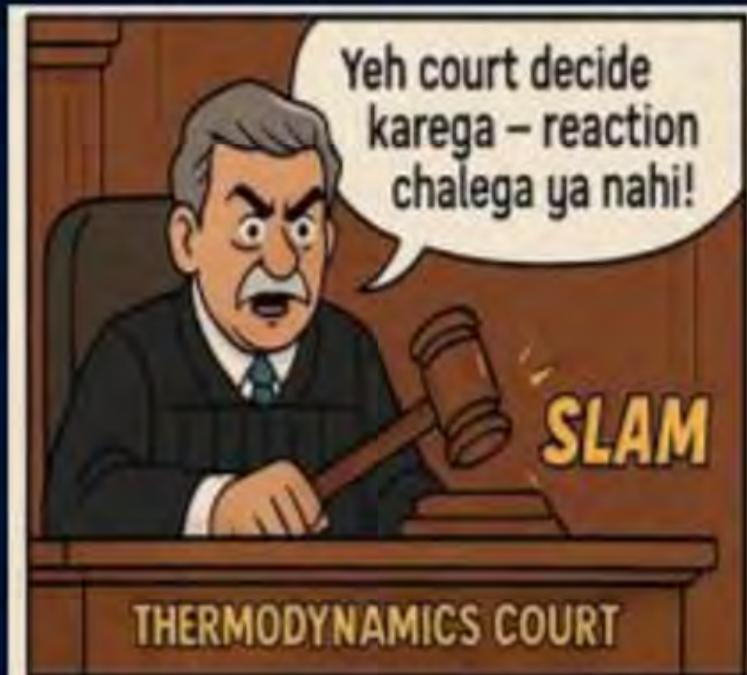
at eq.  $\Rightarrow \Delta G_r = 0$

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

if  $K > 1 \Rightarrow \ln K = (+)ve \Rightarrow \Delta G_r^\circ = (-)ve \Rightarrow \text{in spont.}$

if  $K < 1 \Rightarrow \ln K = (-)ve \Rightarrow \Delta G_r^\circ = (+)ve \Rightarrow \text{in non-spont.}$

if  $K = 1 \Rightarrow \ln K = 0 \Rightarrow \Delta G_r^\circ = 0$



QUESTION

$$\lg 32.7 \quad \text{antilog } 10.312$$



Value of  $\Delta G^\circ$  for phosphorylation of Glucose in Glucolysis is 13.8 kJ/mol.  
Find value of  $K_c$  at 298 K.

Ans

$$\Delta G^\circ = 13.8 \text{ kJ/mol} = 13800 \text{ J/mol}$$

$$K_c = ? \quad T = 298 \text{ K}$$

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

$$13800 = -8.3 \times 298 \times 2.3 \log K_c$$

$$\log K_c = -\frac{13800}{8.3 \times 298 \times 2.3}$$

$$K_c = \text{antilog} \left( \frac{-13800}{8.3 \times 298 \times 2.3} \right)$$

## QUESTION – (NEET 2020)

Hydrolysis of sucrose is given by the following reaction:



If the equilibrium constant ( $K_c$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\circ$  at the same temperature will be:

- A  $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln (2 \times 10^{13})$
- B  $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln (3 \times 10^{13})$
- C  $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln (4 \times 10^{13})$
- D  $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln (2 \times 10^{13})$

$$\begin{aligned}\Delta_r G^\circ &= -RT \ln K_c \\ &= -8.314 \times 300 \ln 2 \times 10^{13} \quad \boxed{\text{J}}\end{aligned}$$

## QUESTION

At 320 K, a gas  $A_2$  is 20% dissociated to  $A_{(g)}$ . The standard free energy change at 320 K and 1 atm in  $J\ mol^{-1}$  is approximately. ( $R = 8.314\ JK^{-1}\ mol^{-1}$ ;  $\ln 2 = 0.693$ ;  $\ln 3 = 1.098$ )

- A 4281       $\alpha = \frac{20}{100} = 0.2$
- B 4763
- C 2068
- D 1844

$$T = 320\ K$$

$$4281$$

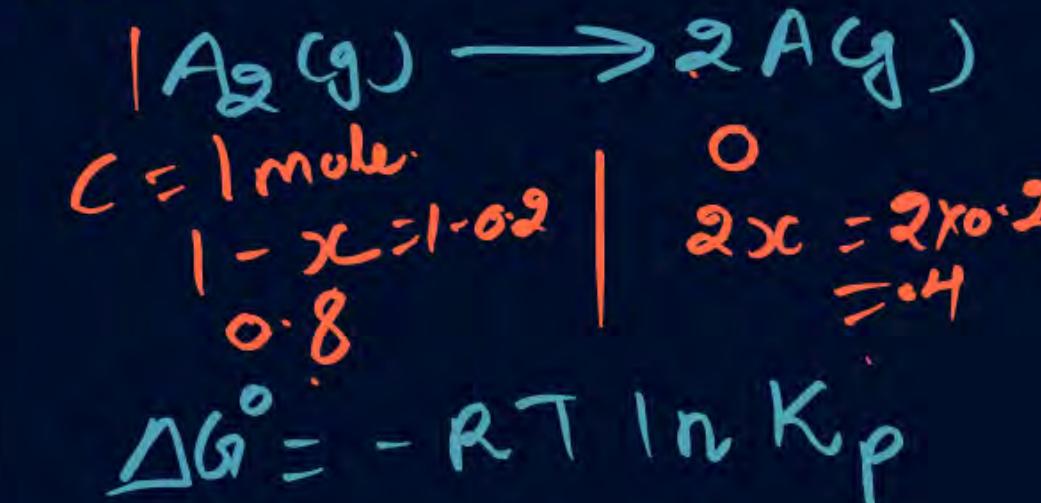
$$\alpha = 20\%$$

$$4763$$

$$\alpha = \frac{20}{100} = 0.2$$

$$2068$$

$$1844$$



$$\alpha = \frac{x}{C}$$

$$\alpha = x = 0.2$$

$$K_p = \frac{(P_A)^2}{(P_{A_2})^1}$$

$$K_p = \frac{(X_A \times P_T)^2}{(X_{A_2} \times P_T)^1}$$

$$\alpha_A = \frac{0.4}{0.4+0.8} = \frac{0.4}{1.2} = \frac{1}{3}$$

$$\alpha_{A_2} = \frac{0.8}{1.2} = \frac{2}{3}$$

$$P_A = \left(\frac{1}{3}\right) \times 1$$

$$P_{A_2} = \frac{2}{3} \times 1$$

$$2660.48$$

$$\log \frac{1}{6} = \log 1 - \log 6 \\ = -\log 6$$

$$K_P = \left(\frac{1}{3}\right)^2 \times \frac{3}{2}$$

$$= \frac{1 \times 1 \times 3}{3 \times 3 \times 2} = \frac{1}{6}$$

$$\Delta G^\circ = - 8.3 \times 320 \times \ln \frac{1}{6} \\ = 8.3 \times 320 \ln \frac{2 \times 3}{2+3} \\ = 8.3 \times 320 (\ln 2 + \ln 3) \\ = 8.3 \times 320 (0.693 + 1.098) \\ = 4765 \text{ J}$$

**QUESTION**

For the chemical reaction  $X \rightleftharpoons{ } Y$ , the standard reaction Gibbs energy depends on temperature T (in K) as  $\Delta_r G^\circ(\text{in kJ mol}^{-1}) = 120 - \frac{3}{8}T$ . The major component of the reaction mixture at T is:

- A X if  $T = 315 \text{ K}$
- B Y if  $T = 280 \text{ K}$
- C X if  $T = 350 \text{ K}$
- D Y if  $T = 300 \text{ K}$

$$\Delta_r G^\circ \\ (+) \text{ve}$$

$$120 - \frac{3}{8} \times 315$$

$$120 - \frac{94.5}{8}$$

QUESTION – [NCERT : PL-178 | NV, JEE Mains April 8, 2025 (II)]

The equilibrium constant for decomposition of  $\text{H}_2\text{O(g)}$

$\text{H}_2\text{O(g)} \rightleftharpoons \text{H}_2\text{(g)} + \frac{1}{2} \text{O}_2\text{(g)}$  ( $\Delta G^\circ = 92.34 \text{ kJ mol}^{-1}$ ) is  $2.80 \times 10^{-3}$  at 2300 K and total pressure at equilibrium is 1 bar. Under this condition, the degree of dissociation ( $\alpha$ ) of water is \_\_\_\_  $\times 10^{-2}$  (nearest integer value).

[Assume  $\alpha$  is negligible with respect to 1]

$$\begin{aligned} 1 - \alpha &\approx 1 \\ 1 + \alpha &\approx 1 \end{aligned}$$



## Simultaneous Equilibrium

MIT #

2 or n g  $\rightleftharpoons$  1 product

Common

$$x(s) \approx Y(g) + Z(g)$$

$$M(s) \approx Y(g) + W(g)$$

$$\text{Total P} = \alpha \left( \sqrt{K_{P_1} + K_{P_2}} \right)$$

$$P_1 = P_2 = \frac{K_{P_1}}{\sqrt{K_{P_1} + K_{P_2}}}$$

$$P_Q = P_W = \frac{K_{P_2}}{\sqrt{K_{P_1} + K_{P_2}}}$$

$$P_1 + P_Q = P_T = \frac{\sqrt{K_{P_1} + K_{P_2}}}{\sqrt{K_{P_1} + K_{P_2}}}$$

P<sub>W</sub>

$$IX(s) \Leftrightarrow Y(g) + Z(g)$$

$$\cancel{P_1} \quad (P_1 + P_2) \quad P_1$$

$$IM(s) \Leftrightarrow Y(g) + W(g)$$

$$\cancel{\text{latm}} \quad (P_1 + P_2) \quad P_2$$

$$P_2 = P_1 = \frac{K_{P_1}}{P_1 + P_2} = \frac{K_{P_1}}{\sqrt{K_{P_1} + K_{P_2}}}$$

$$P_W = P_S = \frac{K_{P_2}}{P_1 + P_2} = \frac{K_{P_2}}{\sqrt{K_{P_1} + K_{P_2}}}$$

$$\text{Total P} = P_1 + P_2 + P_1 + P_2 = 2(P_1 + P_2) = 2\left(\sqrt{K_{P_1} + K_{P_2}}\right)$$

$$K_{P_1} = P_Y \cdot P_Z = (P_1 + P_2) P_1$$

$$K_{P_2} = P_Y \cdot P_W = (P_1 + P_2) \underline{P_2}$$

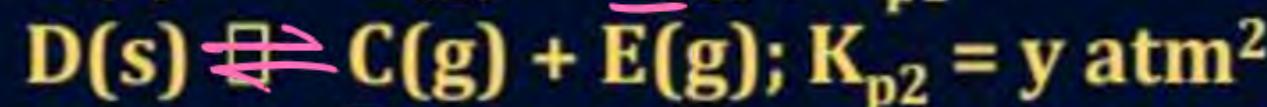
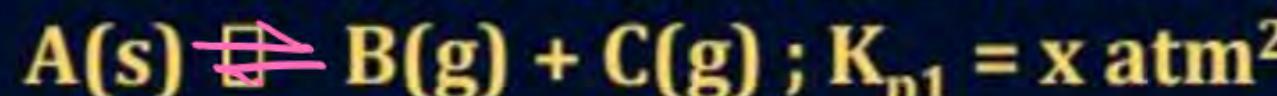
$$K_{P_1} + K_{P_2} = \underline{(P_1 + P_2)} P_1 + \underline{(P_1 + P_2)} \underline{P_2}$$

$$K_{P_1} + K_{P_2} = (P_1 + P_2)^2$$

$$\sqrt{K_{P_1} + K_{P_2}} = P_1 + P_2 = P_Y$$

## QUESTION

Two slides dissociate as follows :



The total pressure when both the solids dissociate simultaneously is:

- A  $\sqrt{x+y}$  atm
- B  $x^2 + y^2$  atm
- C  $(x+y)$  atm
- D  $2(\sqrt{x+y})$  atm

$$\begin{aligned}\text{Total } P &= 2 \left( \sqrt{K_{p1} + K_{p2}} \right) \\ &= 2 \left( \sqrt{x + y} \right)\end{aligned}$$

**QUESTION**

The equilibrium constants  $K_{p_1}$  and  $K_{p_2}$  for the reactions



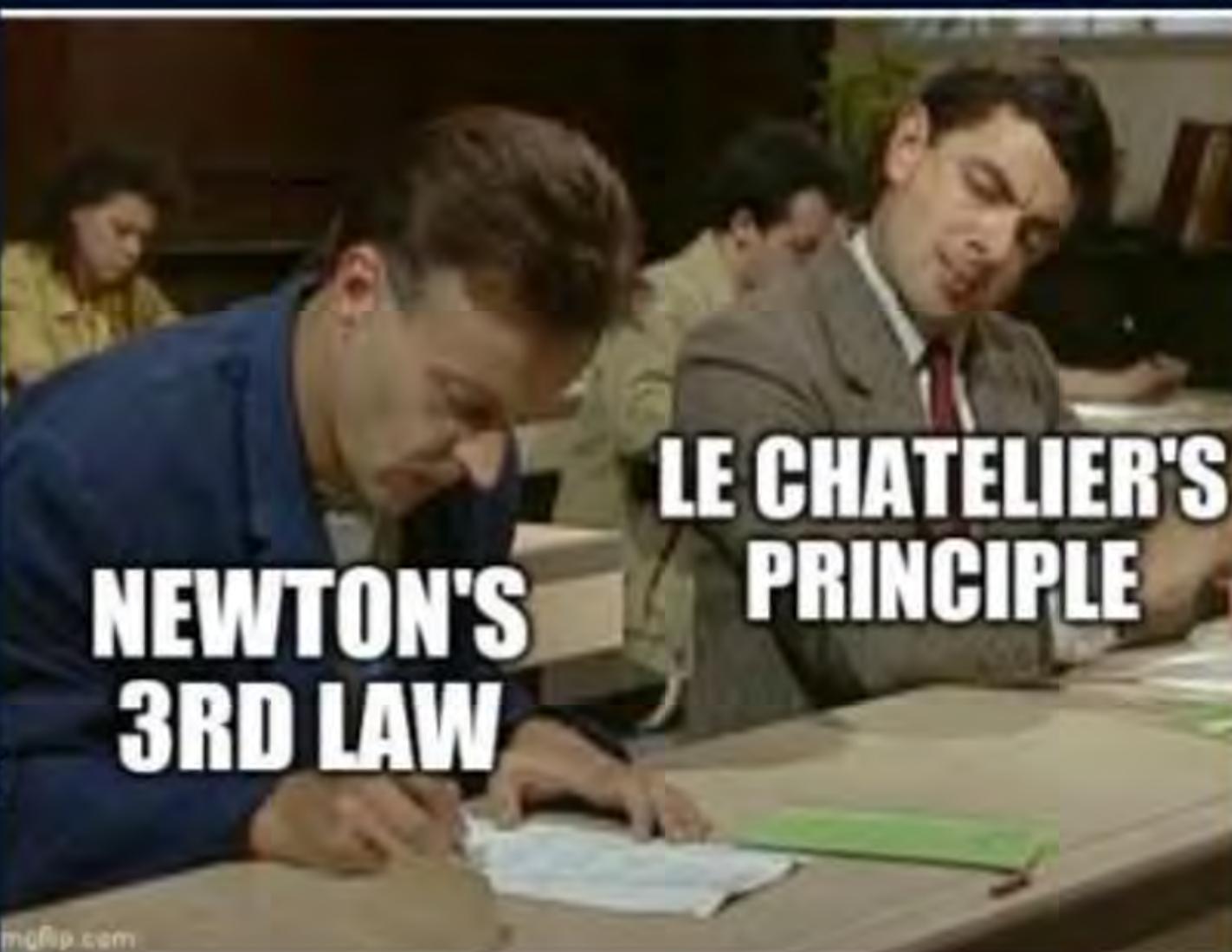
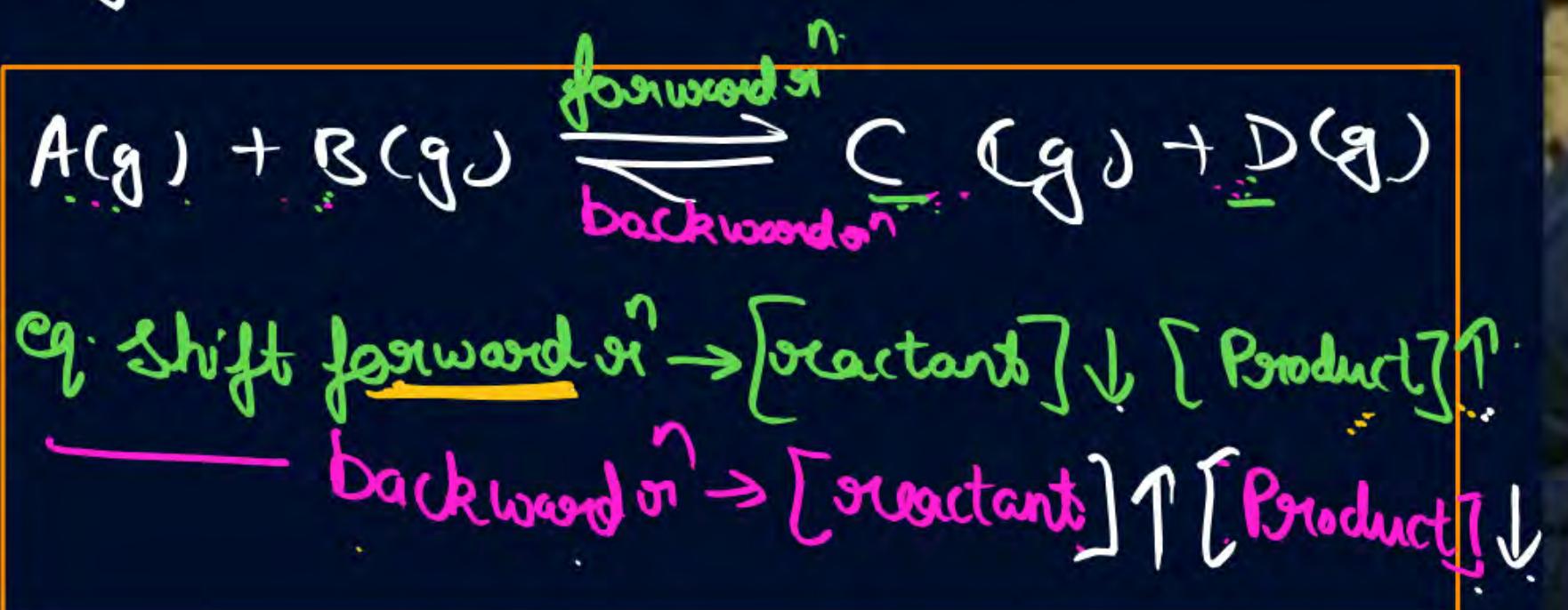
$Z \rightleftharpoons P + Q$ , respectively are in the ratio of 1 : 9. If the degree of dissociation of X and Z be equal, then the ratio of total pressure at these equilibria is

- A** 1 : 36
- B** 1 : 1
- C** 1 : 3
- D** 1 : 9



## Le-Chartilier Principle

when eq. is disturbed it will go in that direction which will nullify the Change.

#  
MIT



## Effect of Concentration of Reactant

#  
MIT

$[R] \uparrow \Rightarrow$  eq. shift forward  $\alpha^n$

$[R] \downarrow \Rightarrow$  " " backward  $\alpha^n$

$[P] \uparrow \Rightarrow$  " " backward  $\alpha^n$

$[P] \downarrow \Rightarrow$  " " forward  $\alpha^n$

@schrodinger.exe

**Concentration of reactants increases**

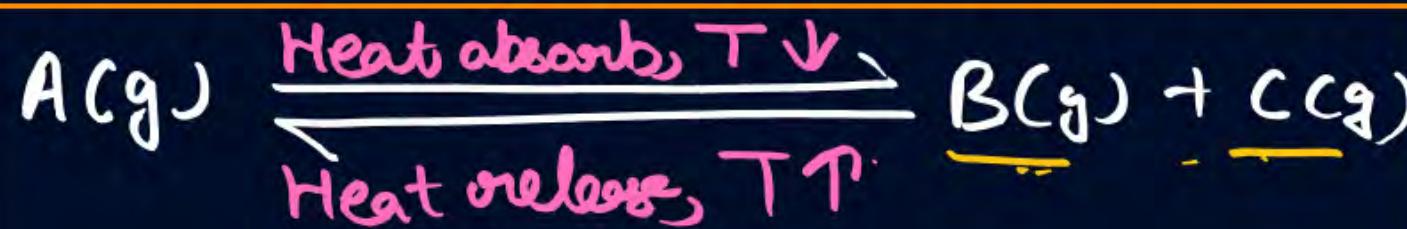




# Effect of Temperature for Endothermic Reaction

#  
MIT

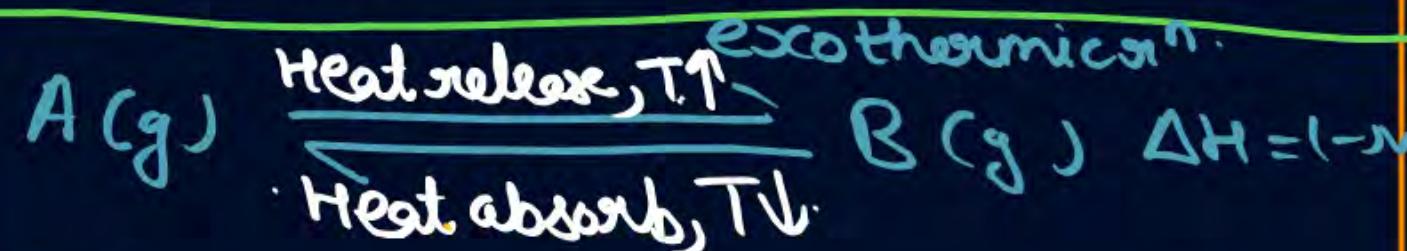
dissociation  $\rightarrow \Delta H = (+) N \epsilon$



endothermic rxn.

$T \uparrow \Rightarrow$  eq. shift forward rxn

$T \downarrow \Rightarrow$  eq. shift backward rxn



$T \uparrow \Rightarrow$  eq. shift backward rxn

$T \downarrow \Rightarrow$  eq. shift forward rxn

@schrodinger.exe

**Temperature increases**



**And vice-versa**

#  
MF

T  
endothermic  $\rightarrow$  max. yield product  $\rightarrow$  High T

exothermic  $\rightarrow$  max. yield product  $\rightarrow$  low T



## Effect of Pressure

$\frac{1}{2}$  Page

@schrodinger.exe

**Pressure increases**



**And vice-versa**



## Effect of Addition of Inert Gases

*½ Page*



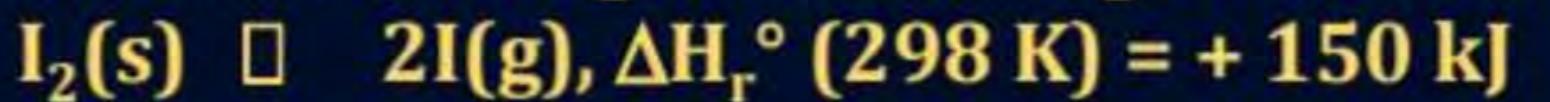
## Effect of Catalyst

- By using positive catalyst equilibrium will be achieved quickly i.e., No effect on equilibrium (+ve) catalyst will increase rate of forward reaction and backward reaction equally.

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**QUESTION – (AIIMS 2004)**

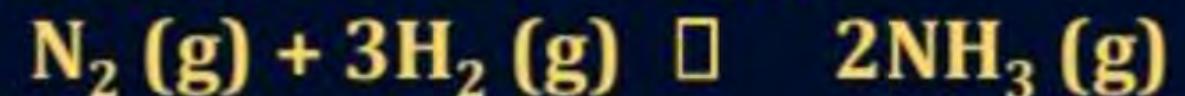
**Of the following which change will shift the reaction towards the product?**



- A** Increase in concentration of  $I_2$
- B** Decrease in concentration of  $I_2$
- C** Increase in temperature
- D** Increase in total pressure

**QUESTION – (NCERT Exemplar)**

On increasing the pressure, in which direction will the gas phase reaction proceed to re-establish equilibrium, is predicted by applying the Le Chatelier's principle. Consider the reaction.

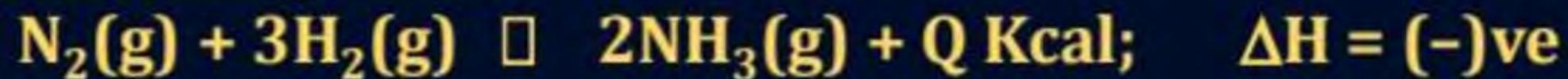


Which of the following is correct, if the total pressure at which the equilibrium is established, is increased without changing the temperature?

- A** K will remain same
- B** K will decrease
- C** K will increase
- D** K will increase initially and decrease when pressure is very high

**QUESTION**

In the manufacture of  $\text{NH}_3$  by Haber's process, the condition which would give maximum yield is:



- A** High temperature, high pressure and high concentrations of the reactants
- B** High temperature, low pressure and low concentrations of the reactants
- C** Low temperature and high pressure
- D** Low temperature, low pressure and low concentration of  $\text{H}_2$

**QUESTION – (NCERT Exemplar)**

In which of the following reactions, the equilibrium remains unaffected on addition of small amount of argon at constant volume?

- A**  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
- B**  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
- C**  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
- D** The equilibrium will remain unaffected in all the three cases.

**QUESTION**

One of the following equilibria is not affected by change in volume of the flask

- A**  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
- B**  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
- C**  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$
- D**  $\text{SO}_2\text{Cl}_2(\text{g}) \rightleftharpoons \text{SO}_2(\text{g}) + \text{Cl}_2(\text{g})$

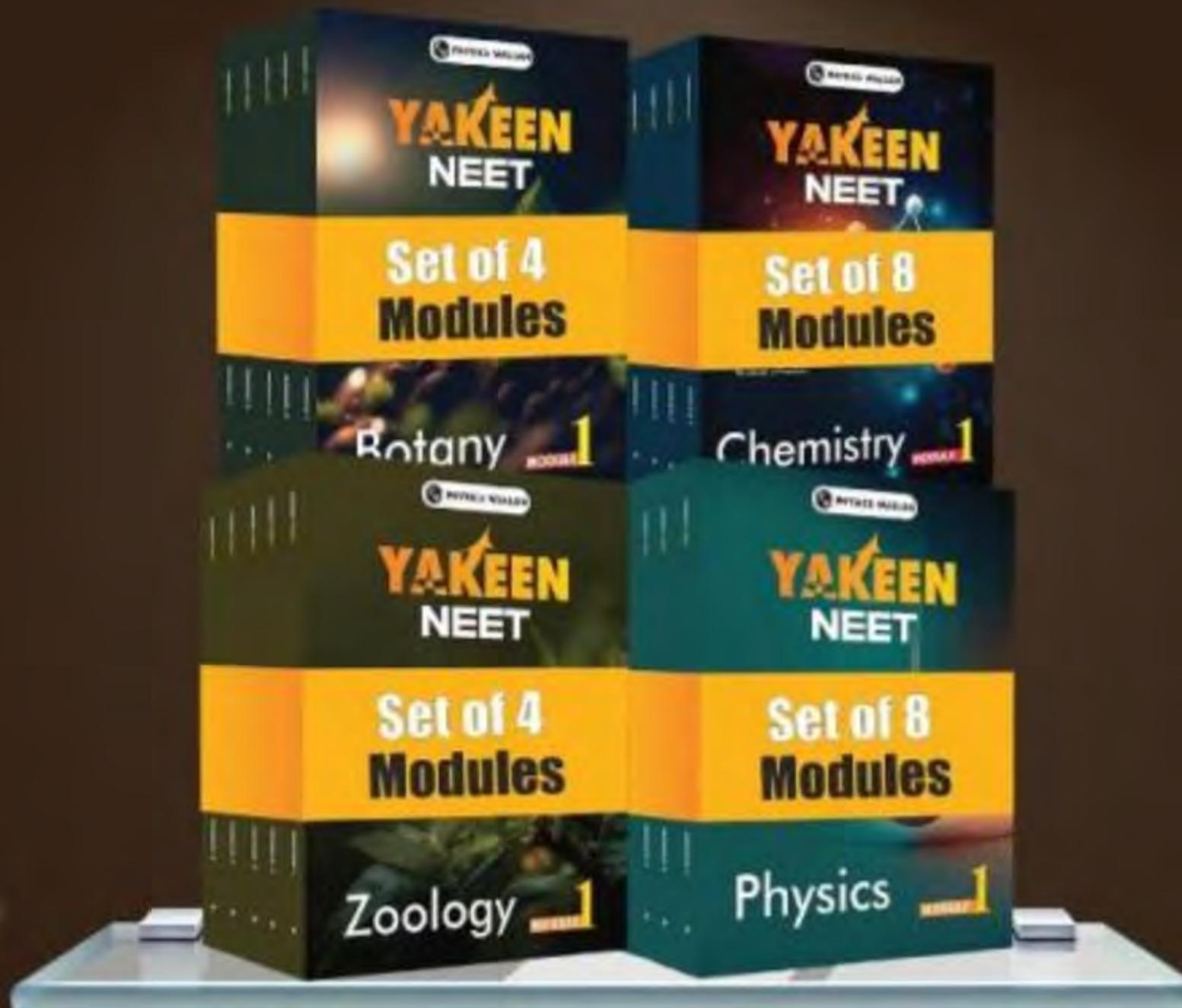


## Home work from modules

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# Magarmach Practice Questions ( MPQ )



## QUESTION – (NEET 2025)

For the reaction  $A(g) \rightleftharpoons 2B(g)$ , the backward reaction rate constant is higher than the forward reaction rate constant by a factor of 2500, at 1000 K.  
[Given:  $R = 0.0831 \text{ L atm mol}^{-1} \text{ K}^{-1}$ ]  $K_p$  for the reaction at 1000 K is:

- A** 83.1
- B**  $2.077 \times 10^5$
- C** 0.033
- D** 0.021

**QUESTION – (NEET 2025)**

**Higher yield of NO in**

**$\text{N}_2(\text{g}) + \text{O}_2 \rightleftharpoons 2\text{NO}(\text{g})$  can be obtained at**

**[ $\Delta H$  of the reaction = + 180.7 kJ mol<sup>-1</sup>]**

- A. higher temperature**
- B. lower temperature**
- C. higher concentration of N<sub>2</sub>**
- D. higher concentration of O<sub>2</sub>**

**Choose the correct answer from the options given below:**

- A** A, D only
- B** B, C only
- C** B, C, D only
- D** A, C, D only

## QUESTION – (NEET 2024)

In which of the following equilibria,  $K_p$  and  $K_c$  are NOT equal?

- A  $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$
- B  $\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2\text{HI}_{(g)}$
- C  $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightleftharpoons \text{CO}_{2(g)} + \text{H}_{2(g)}$
- D  $2\text{BrCl}_{(g)} \rightleftharpoons \text{Br}_{2(g)} + \text{Cl}_{2(g)}$

**QUESTION – (NEET 2024)**

For the reaction  $2A \rightleftharpoons B + C$ ,  $K_c = 4 \times 10^{-3}$ . At a given time, the composition of reaction mixture is:

$$[A] = [B] = [C] = 2 \times 10^{-3} \text{ M}$$

Then, which of the following is correct?

- A** Reaction is at equilibrium.
- B** Reaction has a tendency to go in forward direction.
- C** Reaction has a tendency to go in backward direction.
- D** Reaction has gone to completion in forward direction.

**QUESTION – (NEET 2023)**

The equilibrium concentrations of the species in the reaction  $A + B \rightleftharpoons C + D$  are 2, 3, 10 and 6 mol L<sup>-1</sup> respectively at 300 K.  $\Delta G^\circ$  for the reaction is: (R = 2 cal/mol K)

- A** -13.75 cal
- B** 1372.60 cal
- C** -137.26 cal
- D** -1381.80 cal

**QUESTION – (NEET 2018)**

**Which one of the following conditions will favour maximum formation of the product in the reaction,  $A_2(g) + B_2(g) \rightleftharpoons X_2(g) \Delta_f H = -X \text{ kJ}$**

- A** Low temperature and high pressure
- B** Low temperature and low pressure
- C** High temperature and low pressure
- D** High temperature and high pressure

**QUESTION – (Delhi 2027)**

**Which one of the following statements is not correct?**

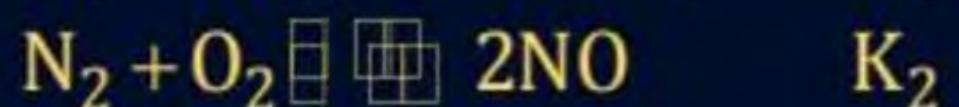
- A** Coenzymes increase the catalytic activity of enzyme.
- B** Catalyst does not initiate any reaction.
- C** The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.
- D** Enzymes catalyze mainly bio-chemical reactions.

A 20 litre container at 400 K contains  $\text{CO}_2(\text{g})$  at pressure 0.4 atm and an excess of  $\text{SrO}$  (neglect the volume of solid  $\text{SrO}$ ). The volume of the containers is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of  $\text{CO}_2$  attains its maximum value, will be: (Given that:  $\text{SrCO}_3(\text{s}) \rightleftharpoons \text{SrO}(\text{s}) + \text{CO}_2(\text{g})$   $K_p = 1.6 \text{ atm}$ )

- A 2 Litre
- B 5 litre
- C 10 litre
- D 4 litre

**QUESTION – (Delhi 2017)**

**The equilibrium constants of the following are:**



**The equilibrium constant (K) of the reaction:**



**A**  $K_2^3 K_3 / K_1$

**C**  $K_2 K_3^3 / K_1$

**B**  $K_1 K_3^3 / K_2$

**D**  $K_2 K_3 / K_1$

**QUESTION – (NEET 2016-I)**

**Consider the nitration of benzene using mixed conc.  $H_2SO_4$  and  $HNO_3$ . If a larger amount of  $KHSO_4$  is added to the mixture, the rate of nitration will be:**

- A** Doubled
- B** Increase
- C** decrease
- D** Unchanged

**QUESTION – (NEET 2015 (Re))**

If the equilibrium constant for  $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$  is K, the equilibrium constant for  $\frac{1}{2}N_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons NO(g)$  will be:

- A**  $K^2$
- B**  $K^{1/2}$
- C**  $\frac{1}{2}K$
- D** K

**QUESTION – (NEET 2015)**

If the value of an equilibrium constant for a particular reaction is  $1.6 \times 10^{12}$ , then at equilibrium the system will contain:

- A** Mostly reactants
- B** Mostly products
- C** Similar amounts of reactants and products
- D** All reactants

**QUESTION – (NEET 2015)**

**Which of the following statements is correct for a reversible process in a state of equilibrium?**

- A**  $\Delta G^\circ = -2.303 RT \log K$
- B**  $\Delta G^\circ = 2.303 RT \log K$
- C**  $\Delta G = -2.303 RT \log K$
- D**  $\Delta G = 2.303 RT \log K$

## QUESTION – (NEET 2014)

For a given exothermic reaction,  $K_p$  and  $K'_p$  are the equilibrium constants at temperature  $T_1$  and  $T_2$ , respectively. Assuming that heat of reaction is constant in temperature range between  $T_1$  and  $T_2$ , it is readily observed that

- A  $K_p > K'_p$
- B  $K_p < K'_p$
- C  $K_p = K'_p$
- D  $K_p = \frac{1}{K'_p}$

**QUESTION – (NEET 2014)**

**For the reversible reaction,  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) + \text{Heat}$ . The equilibrium shifts in forward direction:**

- A** By decreasing the pressure
- B** By decreasing the concentrations of  $\text{N}_2(\text{g})$  and  $\text{H}_2(\text{g})$
- C** By increasing pressure and decreasing temperature
- D** By increasing the concentration of  $\text{NH}_3(\text{g})$

## QUESTION – (NEET 2013)

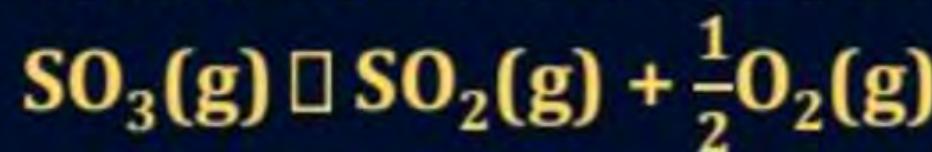
KMnO<sub>4</sub> can be prepared from K<sub>2</sub>MnO<sub>4</sub> as per the reaction:

$3\text{MnO}_4^{2-} + 2\text{H}_2\text{O} \rightleftharpoons 2\text{MnO}_4^- + \text{MnO}_2 + 4\text{OH}^-$ . The reaction can go to completion by removing OH<sup>-</sup> ions by adding:

- A HCl
- B KOH
- C CO<sub>2</sub>
- D SO<sub>2</sub>

**QUESTION – (AIPMT 2012 M)**

Given that the equilibrium constant for the reaction  $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$  has a value of 278 K at a particular temperature. What is the value of the equilibrium constant for the following reaction at the same temperature?



A  $1.8 \times 10^{-3}$

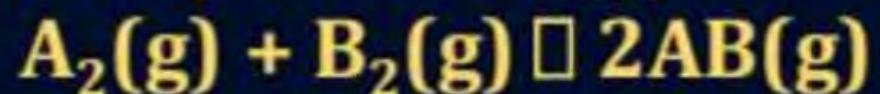
B  $3.6 \times 10^{-3}$

C  $6.0 \times 10^{-2}$

D  $1.3 \times 10^{-5}$

**QUESTION – (AIPMT 2012 M)**

Given the reaction between 2 gases represented by  $A_2$  and  $B_2$  to give the compound  $AB(g)$



At equilibrium, the concentration

of  $A_2 = 3.6 \times 10^{-3} M$

of  $B_2 = 4.2 \times 10^{-3} M$

Of  $AB = 2.8 \times 10^{-3} M$

If the reaction takes place in a scaled vessel at  $527^\circ C$ , then the value of  $K_c$  will be:

**A** 2.0

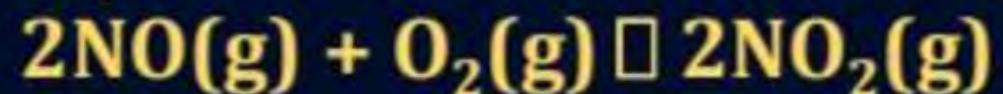
**B** 1.9

**C** 0.62

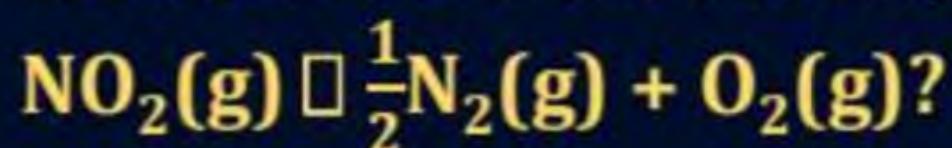
**D** 4.5

**QUESTION – (AIPMT 2011)**

For the reaction  $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ , the equilibrium constant is  $K_1$ . The equilibrium constant is  $K_2$  for the reaction



What is K for the reaction



**A**  $1/(2K_1K_2)$

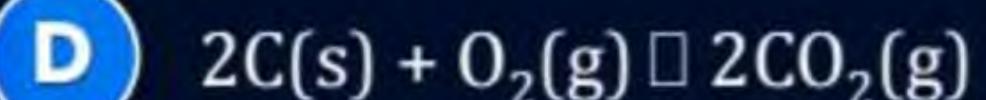
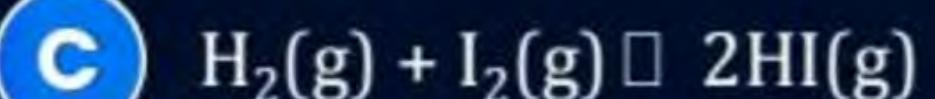
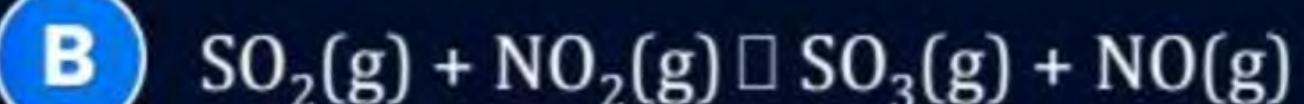
**B**  $1/(4K_1K_2)$

**C**  $[1/K_1K_2]^{1/2}$

**D**  $1/(K_1K_2)$

## QUESTION – (AIPMT 2010)

In which of the following equilibrium  $K_c$  and  $K_p$  are not equal?



**QUESTION – (AIPMT 2010)**

The reaction  $2A(g) + B(g) \rightleftharpoons 3C(g) + D(g)$  is began with the concentrations of A and B both at an initial value of 1.00 M. When equilibrium is reached, the concentration of D is measured and found to be 0.25 M. The value for the equilibrium constant for this reaction is given by expression

- A**  $[(0.75)^3 (0.25)] \div [(0.75)^2(0.25)]$
- B**  $[(0.75)^3 (0.25)] \div [(1.00)^2(1.00)]$
- C**  $[(0.75)^3 (0.25)] \div [(0.50)^2(0.75)]$
- D**  $[(0.75)^3 (0.25)] \div [(0.50)^2(0.25)]$

**QUESTION – (AIPMT 2008)**

The dissociation equilibrium of a gas  $\text{AB}_2$  gas be represented as



The degree of dissociation is 'x' and is small compared to 1. The expression relating the degree of dissociation (x) with equilibrium constant  $K_p$  and total pressure P is:

**A**  $(2K_p/P)$

**B**  $(2K_p/P)^{1/3}$

**C**  $(2K_p/P)^{1/2}$

**D**  $(K_p/P)$

**QUESTION – (AIPMT 2008)**

The values of  $K_p_1$  and  $K_p_2$  for the reaction:



... (a)



... (b)

are in the ratio of 9 : 1. If degree of dissociation of X and A be equal, then total pressure at equilibrium for (a) and (b) are in the ratio

**A** 3 : 1

**B** 1 : 9

**C** 36 : 1

**D** 1 : 1

**QUESTION – (AIPMT 2008)**

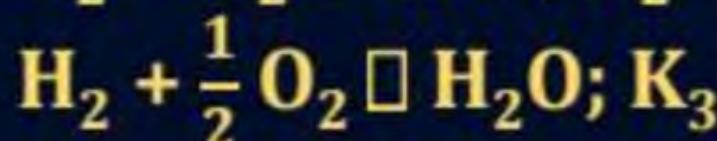
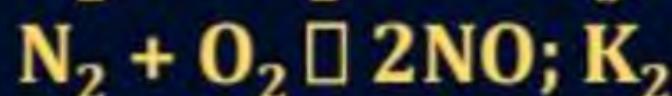
The value of equilibrium constant of the reaction  $\text{HI(g)} \rightleftharpoons \frac{1}{2}\text{H}_2\text{(g)} + \frac{1}{2}\text{I}_2\text{(g)}$  is 8.0.

The equilibrium constant of the reaction  $\text{H}_2\text{(g)} + \text{I}_2\text{(g)} \rightleftharpoons 2\text{HI(g)}$  will be:

- A**  $\frac{1}{16}$
- B**  $\frac{1}{64}$
- C** 16
- D**  $\frac{1}{8}$

**QUESTION – (AIPMT 2003, 2007)**

The following equilibrium constants are given



The equilibrium constant for the oxidation of 2 moles  $\text{NH}_3$  by oxygen to give  $\text{NO}$  is:

**A** 
$$\frac{K_2 K_3^2}{K_1}$$

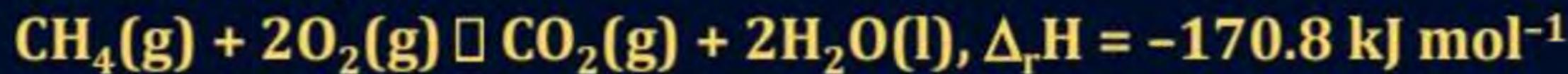
**B** 
$$\frac{K_2^2 K_3}{K_1}$$

**C** 
$$\frac{K_1 K_2}{K_3}$$

**D** 
$$\frac{K_2 K_3^3}{K_1}$$

**QUESTION – (AIPMT 2006)**

**For the reaction**

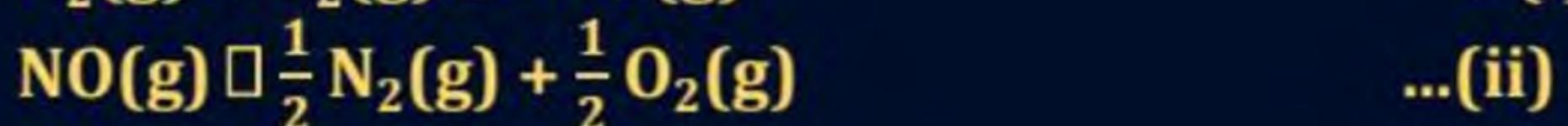


**Which of the following statements is not true?**

- A** The equilibrium constant for the reaction is given by  $K_p = \frac{[\text{CO}_2]}{[\text{CH}_4][\text{O}_2]^2}$
- B** Addition of  $\text{CH}_4(\text{g})$  or  $\text{O}_2(\text{g})$  at equilibrium will cause a shift to the right.
- C** The reaction is exothermic.
- D** At equilibrium, the concentrations of  $\text{CO}_2(\text{g})$  and  $\text{H}_2\text{O}(\text{l})$  are not equal.

**QUESTION – (AIPMT 1989, 94, 2005)**

$K_1$  and  $K_2$  are equilibrium constant for reactions (i) and (ii)



Then,

**A**  $K_1 = \left( \frac{1}{K_2} \right)^2$

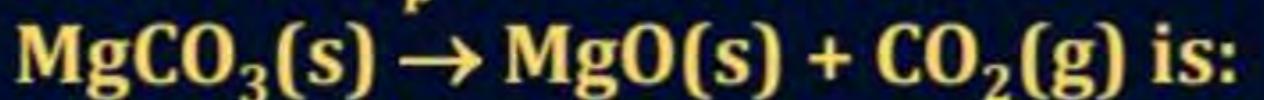
**B**  $K_1 = K_2^2$

**C**  $K_1 = \frac{1}{K_2}$

**D**  $K_1 = (K_2)^0$

**QUESTION – (AIPMT 2000)**

**Value of  $K_p$  in the reaction**



- A**  $K_p = P_{\text{CO}_2}$
- B**  $K_p = P_{\text{CO}_2} \times \frac{P_{\text{CO}_2} \times P_{\text{MgO}}}{P_{\text{MgCO}_3}}$
- C**  $K_p = \frac{P_{\text{CO}_2} \times P_{\text{MgO}}}{P_{\text{MgCO}_3}}$
- D**  $K_p = \frac{P_{\text{MgCO}_3}}{P_{\text{CO}_2} \times P_{\text{MgO}}}$

**QUESTION – (AIPMT 1998)**

If  $K_1$  and  $K_2$  are the respective equilibrium constant for the two reactions



The equilibrium constant of the reaction



Will be

**A**  $K_1/(K_2)^2$

**B**  $K_1 \cdot K_2$

**C**  $K_1/K_2$

**D**  $K_2/K_1$

**QUESTION – (AIPMT 1996)**

If  $\alpha$  is the fraction of HI dissociated at equilibrium in the reaction,  $2\text{HI(g)} \rightleftharpoons \text{H}_2(\text{g}) + \text{I}_2(\text{g})$ , starting with 2 moles of HI, the total number of moles of reactants and products at equilibrium are

- A**  $2 + 2\alpha$
- B** 2
- C**  $1 + \alpha$
- D**  $2 - \alpha$

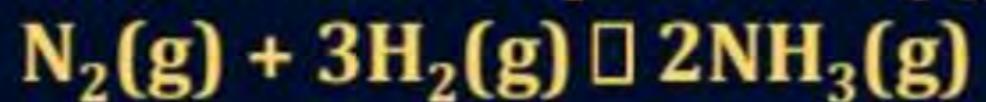
## QUESTION – (AIPMT 1995)

The rate constant for forward and backward reaction of hydrolysis of ester are  $1.1 \times 10^{-2}$  and  $1.5 \times 10^{-3}$  per minute respectively. Equilibrium constant for the reaction  $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}^+ \rightleftharpoons \text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH}$  is:

- A 4.33
- B 5.33
- C 6.33
- D 7.33

**QUESTION – (AIPMT 2003)**

The reaction quotient (Q) for the reaction



Is given by  $Q = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$ . The reaction will proceed from right to left if

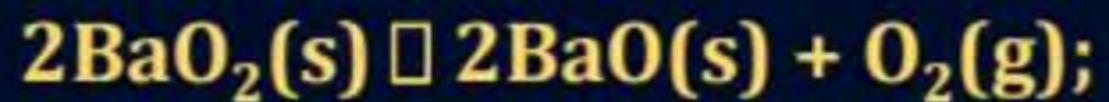
A  $Q = 0$

B  $Q = K_c$

C  $Q < K_c$

D  $Q > K_c$

where  $K_c$  is the equilibrium constant.

**QUESTION – (AIPMT 2002)****For the reaction** **$\Delta H = +\text{ve}$ . In equilibrium condition, pressure of  $\text{O}_2$  is dependent on**

- A** mass of  $\text{BaO}_2$
- B** mass of  $\text{BaO}$
- C** temperature of equilibrium
- D** mass of  $\text{BaO}_2$  and  $\text{BaO}$  both

**QUESTION – (AIPMT 1997)**

**In a two-step exothermic reaction**



**Step 1 and 2 are favoured respectively by**

- A** High pressure, high temperature and low pressure, low temperature
- B** High pressure, low temperature and low pressure, high temperature
- C** Low pressure, high temperature and high pressure, high temperature
- D** Low pressure, low temperature and high pressure, low temperature

**QUESTION – (AIPMT 1996)**

The equilibrium constant for the reaction  $A_2 \rightleftharpoons 2A$  at 500 K and 700 K are  $1 \times 10^{-10}$  and  $1 \times 10^{-5}$  respectively. The given reaction is:

- A** exothermic
- B** slow
- C** endothermic
- D** fast

**QUESTION – (AIPMT 1995)**

**Standard Gibb's free energy change for isomerization reaction**  
**cis-2-pentene  $\rightleftharpoons$  trans-2-pentene**

**Is  $-3.67 \text{ kJ/mol}$  at  $400 \text{ K}$ . If more trans-2-pentene is added to the reaction vessel, then**

- A** More cis-2-pentene is formed.
- B** Equilibrium remains unaffected.
- C** Additional trans-2-pentene is formed.
- D** Equilibrium is shifted in forward direction.

**QUESTION – (AIPMT 1993)**

**According to Le-chatelier's principle, adding heat to a solid ⇔ liquid equilibrium will cause the**

- A** temperature to increase
- B** temperature to decrease
- C** amount of liquid to decrease
- D** amount of solid to decrease

**QUESTION – (AIPMT 1992)**

**Which one of the following information can be obtained on the basis of Le Chatelier principle?**

- A** Dissociation constant of a weak acid
- B** Entropy change in a reaction
- C** Equilibrium constant of a chemical reaction
- D** Shift in equilibrium position on changing value of a constraint

## SINGLE CHOICE QUESTIONS

**QUESTION – (NCERT Exemplar)**

We know that the relationship between  $K_c$  and  $K_p$  is

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

What would be the value of  $\Delta n$  for the reaction



**A** 1

**B** 0.5

**C** 1.5

**D** 2

**QUESTION – (NCERT Exemplar)**

For the reaction  $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ , the standard free energy is  $\Delta G^\Theta > 0$ .  
The equilibrium constant ( $K$ ) would be \_\_\_\_\_.

- A**  $K = 0$
- B**  $K > 1$
- C**  $K = 1$
- D**  $K < 1$

**QUESTION – (NCERT Exemplar)**

**Which of the following is not a general characteristic of equilibria involving physical processes?**

- A** Equilibrium is possible only in a closed system at a given temperature.
- B** All measurable properties of the system remain constant.
- C** All the physical processes stop at equilibrium.
- D** The opposing processes occur at the same rate and there is dynamic but stable condition.

**QUESTION – (NCERT Exemplar)**

$\text{PCl}_5$ ,  $\text{PCl}_3$  and  $\text{Cl}_2$  are at equilibrium at 500K in a closed container and their concentrations are  $0.8 \times 10^{-3} \text{ mol L}^{-1}$ ,  $1.2 \times 10^{-3} \text{ mol L}^{-1}$  and  $1.2 \times 10^{-3} \text{ mol L}^{-1}$  respectively. The value of  $K_c$  for the reaction  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$  will be

- A**  $1.8 \times 10^3 \text{ mol L}^{-1}$
- B**  $1.8 \times 10^{-3}$
- C**  $1.8 \times 10^{-3} \text{ L mol}^{-1}$
- D**  $0.55 \times 10^4$

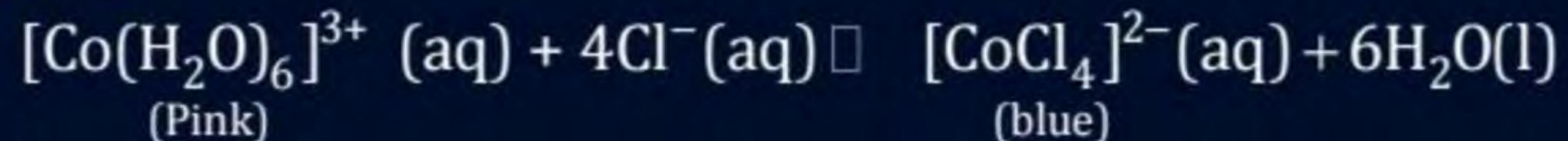
**QUESTION – (NCERT Exemplar)**

**Which of the following statements is incorrect?**

- A** In equilibrium mixture of ice and water kept in perfectly insulated flask mass of ice and water does not change with time.
- B** The intensity of red colour increases when oxalic acid is added to a solution containing iron (III) nitrate and potassium thiocyanate.
- C** On addition of catalyst the equilibrium constant value is not affected.
- D** Equilibrium constant for a reaction with negative  $\Delta H$  value decreases as the temperature increases.

## QUESTION – (NCERT Exemplar)

When hydrochloric acid is added to cobalt nitrate solution at room temperature, the following reaction takes place and the reaction mixture becomes blue. On cooling the mixture it becomes pink. On the basis of this information mark the correct answer.



- A**  $\Delta H > 0$  for the reaction
  - B**  $\Delta H < 0$  for the reaction
  - C**  $\Delta H = 0$  for the reaction
  - D** The sign of  $\Delta H$  cannot be predicted on the basis of this information.

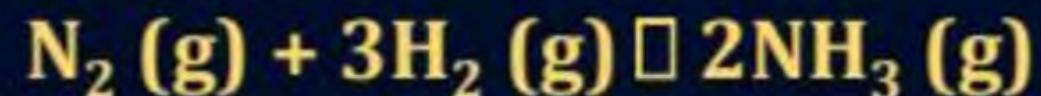
**QUESTION – (NCERT Exemplar)**

**Which of the following options will be correct for the stage of half completion of the reaction A ⇔ B.**

- A**  $\Delta G^\Theta = 0$
- B**  $\Delta G^\Theta > 0$
- C**  $\Delta G^\Theta < 0$
- D**  $\Delta G^\Theta = -RT \ln 2$

**QUESTION – (NCERT Exemplar)**

On increasing the pressure, in which direction will the gas phase reaction proceed to re-establish equilibrium, is predicted by applying the Le Chatelier's principle. Consider the reaction.

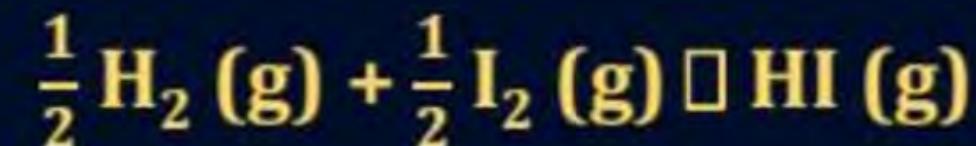


Which of the following is correct, if the total pressure at which the equilibrium is established, is increased without changing the temperature?

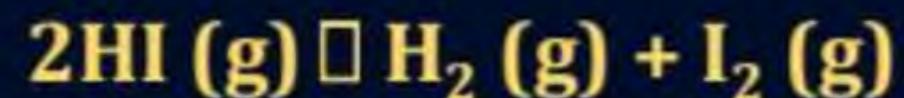
- A** K will remain same
- B** K will decrease
- C** K will increase
- D** K will increase initially and decrease when pressure is very high

**QUESTION – (NCERT Exemplar)**

At 500 K, equilibrium constant,  $K_c$  for the following reaction is 5.



What would be the equilibrium constant  $K_c$  for the reaction



**A** 0.04

**B** 0.4

**C** 25

**D** 2.5

**QUESTION – (NCERT Exemplar)**

In which of the following reactions, the equilibrium remains unaffected on addition of small amount of argon at constant volume?

- A**  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
- B**  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
- C**  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
- D** The equilibrium will remain unaffected in all the three cases.

## MULTIPLE CHOICE QUESTIONS

**QUESTION\* – (NCERT Exemplar)**

For the reaction  $\text{N}_2\text{O}_4 \text{ (g)} \rightleftharpoons 2\text{NO}_2 \text{ (g)}$ , the value of K is 50 at 400 K and 1700 at 500 K. Which of the following options is correct?

- A** The reaction is endothermic.
- B** The reaction is exothermic.
- C** If  $\text{NO}_2 \text{ (g)}$  and  $\text{N}_2\text{O}_4 \text{ (g)}$  are mixed at 400 K at partial pressures 20 bar and 2 bar respectively, more  $\text{N}_2\text{O}_4 \text{ (g)}$  will be formed.
- D** The entropy of the system increases.

**QUESTION\* – (NCERT Exemplar)**

At a particular temperature and atmospheric pressure, the solid and liquid phases of a pure substance can exist in equilibrium. Which of the following term defines this temperature?

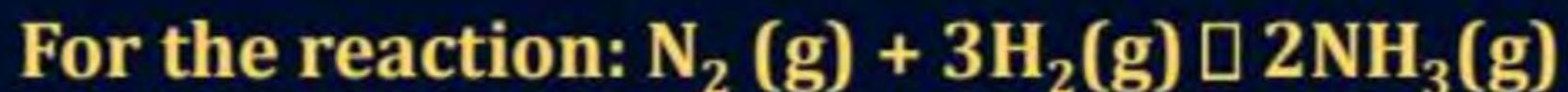
- A** Normal melting point
- B** Equilibrium temperature
- C** Boiling point
- D** Freezing point

## MATRIX MATCH TYPE QUESTIONS

**QUESTION – (NCERT Exemplar)**

**Match the following equilibria with the corresponding condition**

(i)	Liquid $\rightleftharpoons$ Vapour	(a)	Saturated solution
(ii)	Solid $\rightleftharpoons$ Liquid	(b)	Boiling point
(iii)	Solid $\rightleftharpoons$ Vapour	(c)	Sublimation point
(iv)	Solute (s) $\rightleftharpoons$ Solute (solution)	(d)	Melting point
		(e)	Unsaturated solution

**QUESTION – (NCERT Exemplar)**

Equilibrium constant  $K_c = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$

Some reactions are written below in Column I and their equilibrium constants in terms of  $K_c$  are written in Column II. Match the following reactions with the corresponding equilibrium constant

	<b>Column I (Reaction)</b>		<b>Column II (Equilibrium constant)</b>
(i)	$2\text{N}_2(\text{g}) + 6\text{H}_2(\text{g}) \rightleftharpoons 4\text{NH}_3(\text{g})$	(a)	$2 K_c$
(ii)	$2\text{NH}_3(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$	(b)	$K_c^{1/2}$
(iii)	$\frac{1}{2}\text{N}_2(\text{g}) + \frac{3}{2}\text{NH}_2(\text{g}) \rightleftharpoons \text{NH}_3(\text{g})$	(c)	$\frac{1}{K_c}$
		(d)	$K_c^2$

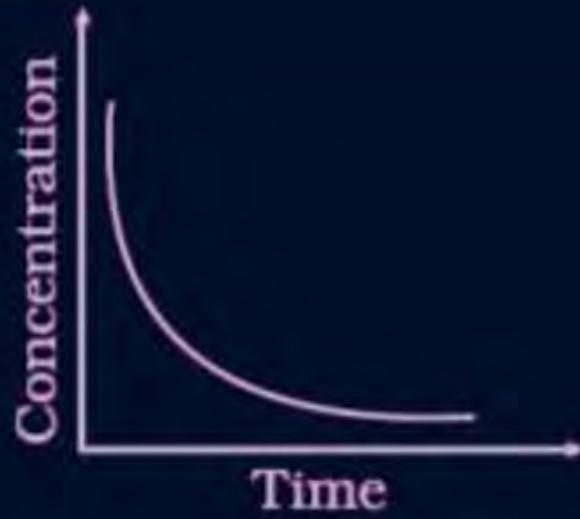
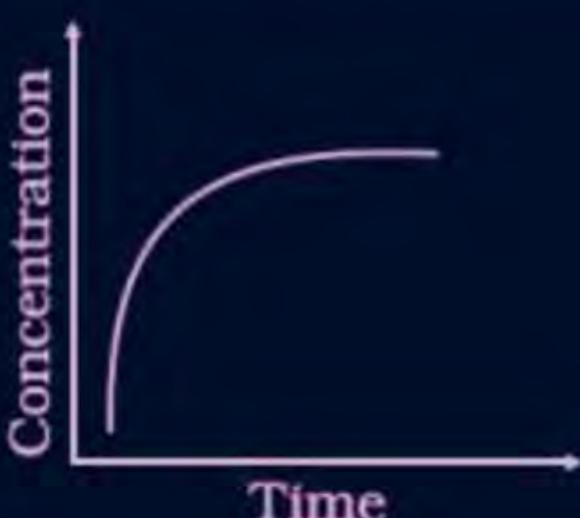
**QUESTION – (NCERT Exemplar)**

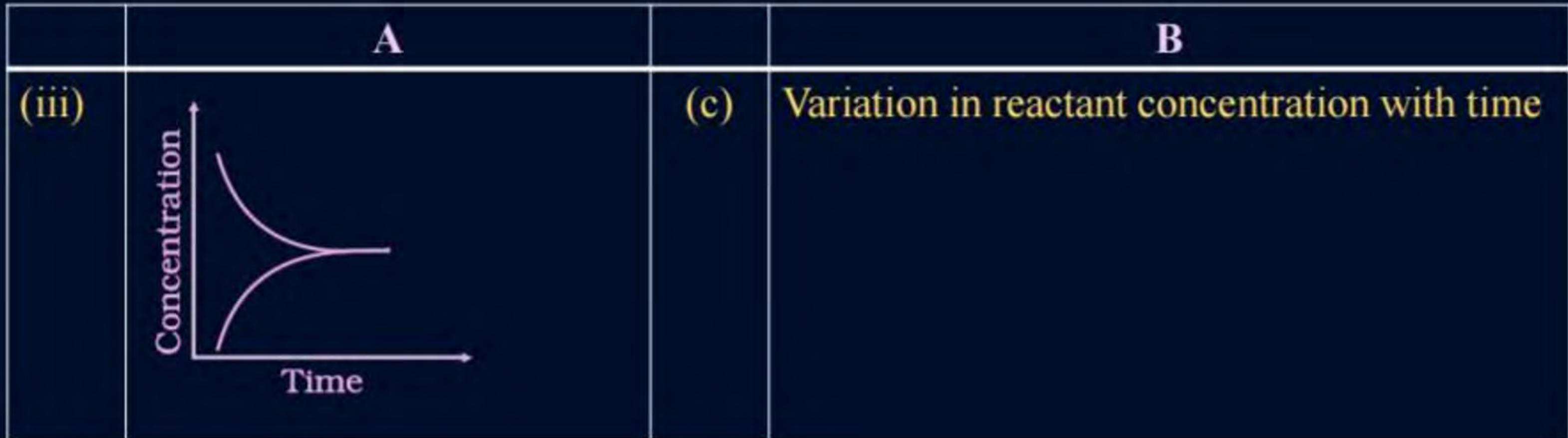
**Match standard free energy of the reaction with the corresponding equilibrium constant**

(i) $\Delta G^\Theta > 0$	(a) $K > 1$
(ii) $\Delta G^\Theta < 0$	(b) $K = 1$
(iii) $\Delta G^\Theta = 0$	(c) $K = 0$
	(d) $K < 1$

**QUESTION – (NCERT Exemplar)**

**Match the following graphical variation with their description**

	<b>A</b>		<b>B</b>
(i)		(a)	Variation in product concentration with time
(ii)		(b)	Reaction at equilibrium



**QUESTION – (NCERT Exemplar)****Match Column (I) with Column (II).**

	<b>Column I</b>		<b>Column II</b>
(i)	Equilibrium	(a)	$\Delta G > 0, K < 1$
(ii)	Spontaneous reaction	(b)	$\Delta G = 0$
(iii)	Non-spontaneous reaction	(c)	$\Delta G^\Theta = 0$
		(d)	$\Delta G < 0, K > 1$

## ASSERTION AND REASON TYPE

**QUESTION – (NCERT Exemplar)**

**Assertion (A):** For any chemical reaction at a particular temperature, the equilibrium constant is fixed and is a characteristic property.

**Reason (R):** Equilibrium constant is independent of temperature.

**A** Both A and R are true and R is correct explanation of A.

**B** Both A and R are true but R is not correct explanation of A.

**C** A is true but R is false.

**D** Both A and R are false.

**QUESTION – (NCERT Exemplar)**

**Assertion (A):** In the dissociation of  $\text{PCl}_5$  at constant pressure and temperature addition of helium at equilibrium increases the dissociation of  $\text{PCl}_5$ .

**Reason (R):** Helium removes  $\text{Cl}_2$  from the field of action.

- A** Both A and R are true and R is correct explanation of A.
- B** Both A and R are true but R is not correct explanation of A.
- C** A is true but R is false.
- D** Both A and R are false.

**THANK  
YOU**