DPP SOLUTION

- **Subject – Physical Chemistry**
- **Chapter –** Thermodynamics and Thermochemistry

DPP No.- 07

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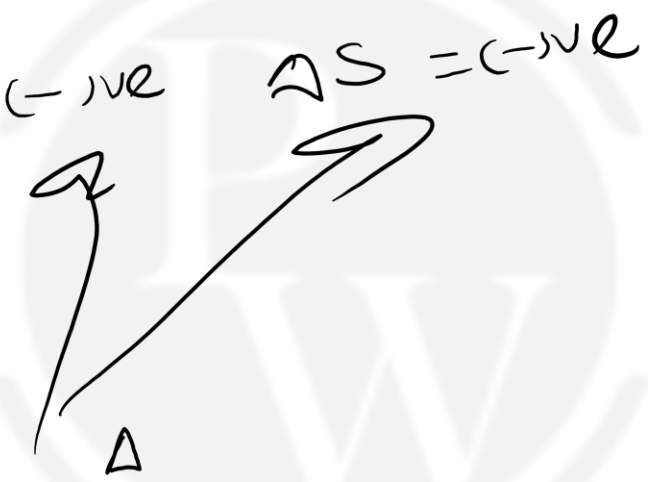
Question-

In which reaction ΔS is positive:

1. $H_2O(\ell) \rightarrow H_2O(s)$
2. $3O_2(g) \rightarrow 2O_3(g)$
3. $H_2O(\ell) \rightarrow H_2O(g)$
4. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

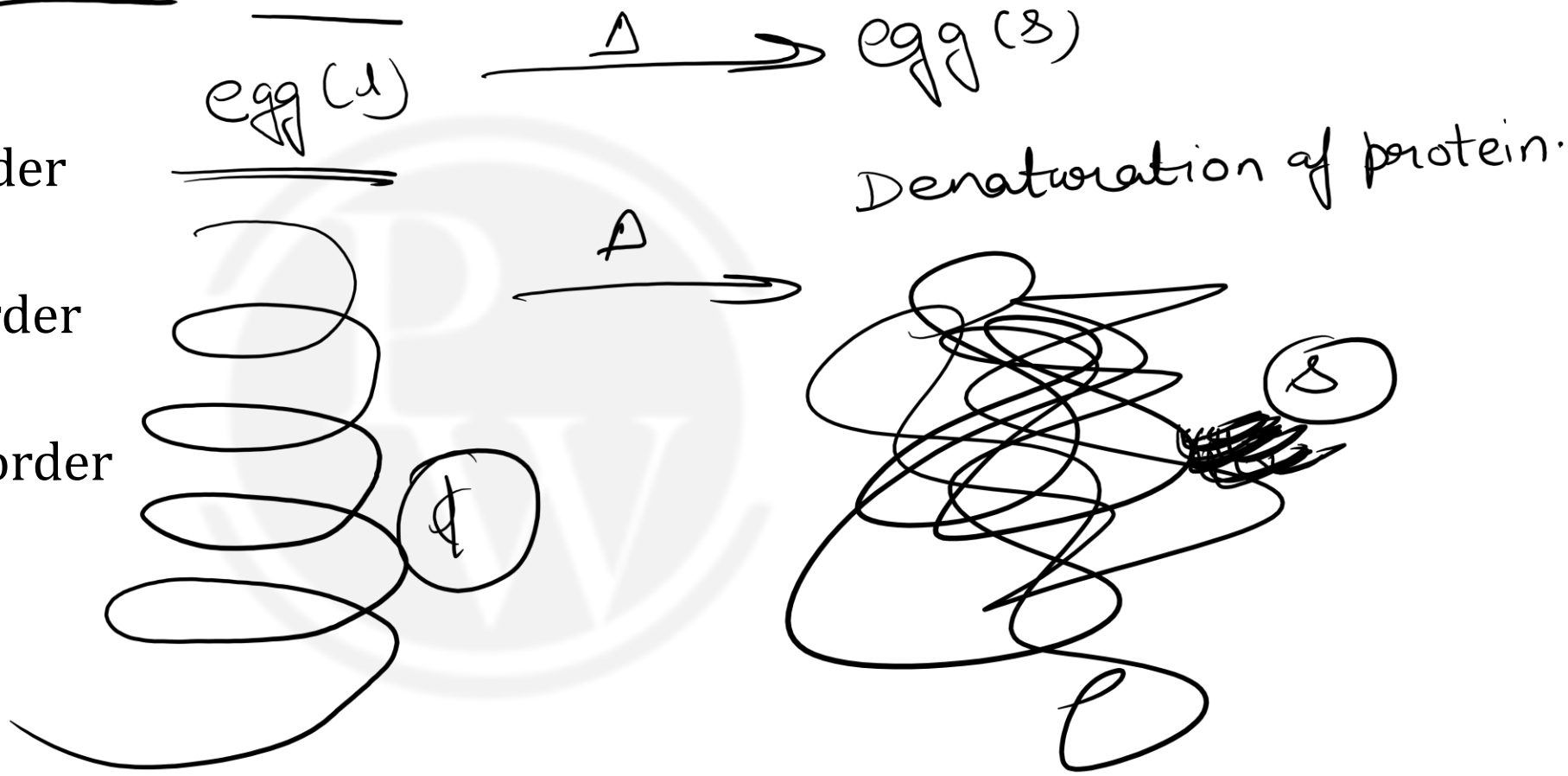


Ans. (3)

Question-

When the egg is hard boiled, there is-

1. Increase in disorder
2. Decrease in disorder
3. No change in disorder
4. ΔG is negative



Ans. (1)

Question-

If S° for H_2, Cl_2 and HCl are 0.13, 0.22 and 0.19 KJ K^{-1} mol^{-1} respectively. The total change in standard entropy for the reaction $H_2 + Cl_2 \rightarrow 2HCl$ is:

1. 30 JK^{-1} mol^{-1}
2. 40 JK^{-1} mol^{-1}
3. 60 JK^{-1} mol^{-1}
4. 20 JK^{-1} mol^{-1}

$\Delta S^\circ = 2 \times 0.19 - (1 \times 0.13 + 1 \times 0.22)$

$= 0.38 - 0.35$

$= 0.03$ KJ/K mol

$= 30$ J/K mol

Ans. (1)

Question-

The enthalpy of vaporization for water is 186.5KJ mol^{-1}, the entropy of its vaporization will be-

$\Delta H_{vap} = 186.5 \text{ KJ/mol}$

$\Delta S_{vap.} = \frac{186.5}{373} = \frac{1}{2} = 0.5 \text{ KJ } K^{-1} \text{ mol}^{-1}$

1. $0.5 \text{ KJ } K^{-1} \text{ mol}^{-1}$
2. $1.0 \text{ KJ } K^{-1} \text{ mol}^{-1}$
3. $1.5 \text{ KJ } K^{-1} \text{ mol}^{-1}$
4. $2.0 \text{ KJ } K^{-1} \text{ mol}^{-1}$

Ans. (1)

Question-

The enthalpy of vaporization of per mole of ethanol (b.p. = 79.5°C and ΔS = 109.8 JK^{-1} mol^{-1}) is:

1. 27.35 KJ/mol
2. 32.19 KJ/mol
3. 38.70 KJ/mol
4. 42.37 KJ/mol

$\Delta H_{vap.} = ?$

$\Delta S_{vap} = 109.8\ J\ K^{-1} mol^{-1}$

B.Pt $= 79.5^{\circ}C$

$= 79.5 + 273$

$T_B = 352.5\ K$

$\Delta S_{vap} = \frac{\Delta H_{vap.}}{T_B}$

$\Delta H_{vap.} = \Delta S_{vap} \times T_B$

$= 109.8 \times 352.5$

$= 38704.5\ J\ K^{-1} mol^{-1}$

$\Delta H_{vap} = 38.704\ KJ\ K^{-1} mol^{-1}$

273
79.5
352.5

Ans. (3)

Question-

Ammonium chloride when dissolved in water leads to cooling sensation. The dissolution of NH_4Cl at constant temperature is accompanied by :

1. Increase in entropy.
2. Decrease in entropy
3. No change in entropy
4. No change in enthalpy

$NH_4Cl(s) + H_2O \rightarrow NH_4Cl(aq.)$

$\Delta H = (+)ve$

$NH_4^+(aq.) + Cl^-(aq.)$

Ans. (1)

Question-

The spontaneous nature of a reaction is impossible if

ΔH = (−ve
ΔS = (+ve
rxn always spontaneous

1. ΔH is +ve, ΔS is also +ve
2. ΔH is –ve, ΔS is also –ve
3. ΔH is –ve, ΔS is +ve
4. ΔH is +ve, ΔS is –ve

Ans. (4)

Question-

Which of the following is true for the reaction $H_2O(\ell) \rightleftharpoons H_2O(g)$ at 100°C and 1 atmosphere

$\Delta n_g = 1 - 0 = 1$

1. $\Delta S = 0$ ✗
2. $\Delta H = 0$ ✗
3. $\Delta H = \Delta E$ ✗
4. $\Delta H = T\Delta S$ ✓

$\Delta H = \Delta U + \Delta n_g RT$

$\Delta G = 0$

$\Delta G = \Delta H - T\Delta S$

$\Delta H = T\Delta S$

Ans. (4)

Question-

Determine the entropy change for the reaction given below:

$2H_2(g) + O_2(g) \rightarrow 2H_2O(\ell)$ at 300 K.

If standard entropies of $H_2(g)$, $O_2(g)$ and $H_2O(\ell)$ are 126.6, 201.20 and 68.0 J K^{-1} mol^{-1} respectively.

$\Delta S^\circ = 2 \times 68 - (2 \times 126.6 + 1 \times 201.2)$

$= 136 - (253.2 + 201.2)$

$= 136 - 454.4$

$= -318.4 \text{ J K}^{-1} \text{ mol}^{-1}$

1. $-218.4 \text{ J K}^{-1} \text{ mol}^{-1}$
2. $-318.4 \text{ J K}^{-1} \text{ mol}^{-1}$
3. $-520.2 \text{ J K}^{-1} \text{ mol}^{-1}$
4. $-128.6 \text{ J K}^{-1} \text{ mol}^{-1}$

Ans. (2)

Question-

Calculate the entropy change in melting of one gm ice at 0°C if latent heat of ice is 80 cal/g-

1. 80 Cal K^{-1}
2. 20 Cal K^{-1}
3. 4.4 Cal K^{-1}
4. 0.3 Cal K^{-1}

ΔS for 1 g of ice

M.P.t. = 273

$l_{fusion} = 80$ cal/g

$\Delta H_{fusion} = 80$ cal/g

$\Delta S_{fusion} = \frac{80}{273} = 0.29$ cal K^{-1}

Ans. (4)

Question-

Standard state means- 298 K & 1 atm

1. 25°C and 70 mmHg
2. 298 K and 760 cmHg
3. 273 K and 1 atm
4. 298 K and one atm

Ans. (4)

Question-

If 900 J/g of heat is exchanged at boiling point of water, then what is increase in entropy?

1. 43.4 J/K mole
2. 87.2 J/K mole
3. 900 J/K mole
4. Zero

$H_2O(l) \longrightarrow H_2O(g)$

$M_{H_2O} = 18\ g/mole$

$\Delta H_{fusion} = 900\ J/g$

$\Delta S_{fusion} = \frac{900}{373}\ J/g$

$= 2.41\ J/g\ K$

$= 2.41 \times 18\ J\ K^{-1}\ mol^{-1}$

$= 43.43\ J\ K^{-1}\ mol^{-1}$

Ans. (1)

Thank You...