YAKEEN NEET 2.0

2026

Thermodynamics & Thermochemistry

Physical Chemistry | Lecture -7

By- Amit Mahajan Sir

Topics to be covered

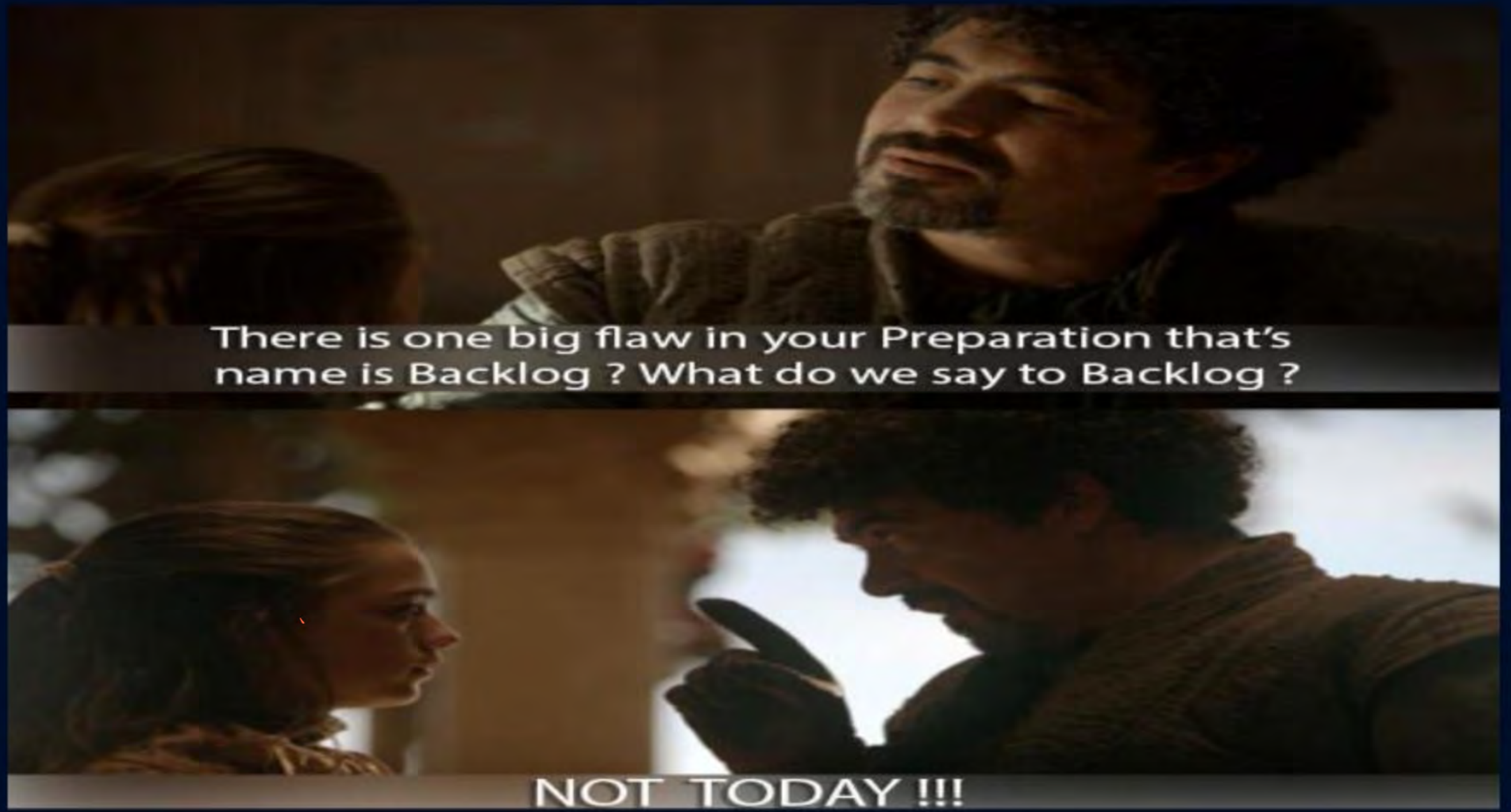
1. ~~Medics Test~~, Revision of Last Class
2. Different Types of Enthalpies
3. Magarmach Practice Questions, Home work from Modules,

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 !!!

Revision of Last Class

Different Types of Enthalpies

Std. Conditions → T = 298 K, P = 1 atm.

Standard Enthalpy of Formation

Elements in elementary state. ⟶ 1 mole Compound. $\Delta H = \Delta H^{0}_{f}$

$1\,H_2(g) + \frac{1}{2}O_2(g) \longrightarrow 1\,H_2O(l)$ $\quad \Delta H = \Delta H^{0}_{f}(H_2O)$

$\frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g) \longrightarrow 1\,HCl(g)$ $\quad \Delta H = \Delta H^{0}_{f}(HCl)$

$\frac{1.5}{2}H_2(g) + \frac{1}{2}N_2(g) \longrightarrow 1\,NH_3(g)$ $\quad \Delta H = \Delta H^{0}_{f}(NH_3)$

#MIT

② all elements in elementary stt. → $\Delta H_f^\circ = 0$

for ex: $H_2(g)$, $He(g)$, $Li(s)$, $F_2(g)$, $Cl_2(g)$, $Br_2(l)$, $I_2(s)$

C(graphite), P_4(white), S_8(Rhombic)

③ $\Delta H_f^\circ (H^+(aq)) = 0$

④ $xA \longrightarrow yB \quad \Delta H^\circ$

$$\Delta H^\circ = \sum y \times \Delta H_{f(P)}^\circ - \sum x \times \Delta H_{f(R)}^\circ$$

$1H_2(g) \rightarrow 1H_2(g)$

① $1C(\text{Diamond}) + 2H_2(g) \rightarrow 1CH_4 \quad \Delta H_1$

② $1C(\text{graphite}) + 2H_2(g) \rightarrow 1CH_4 \quad \Delta H_2$

$\Delta H_1^\circ \neq \Delta H_{f(CH_4)}^\circ$

$\Delta H_2^\circ = \Delta H_{f(CH_4)}^\circ$

$$2A(g) \rightarrow 3B(g)$$

$$\Delta H^\circ = 3 \times \Delta H^\circ_{f(B)} - 2 \times \Delta H^\circ_{f(A)}$$

$$2A(g) + 3C(s) \rightarrow 5B(l) + 4D(g)$$

$$\Delta H^\circ = \left[5 \times \Delta H^\circ_{f(B)} + 4 \times \Delta H^\circ_{f(D)}\right] - \left[2 \times \Delta H^\circ_{f(A)} + 3 \times \Delta H^\circ_{f(C)}\right]$$

Which eqn represents ΔH_f°

(1) $\frac{1}{2}H_2(g) + \frac{1}{2}I_2(g) \rightarrow 1HI(g)$ $\quad \Delta H \neq \Delta H_f(HI)$

(2) $1H_2(g) + 1I_2(s) \rightarrow 2HI(g)$ $\quad \Delta H^\circ \neq \Delta H_f^\circ(HI)$ $\quad \Delta H^\circ = 2 \times \Delta H_f^\circ(HI)$

(3) $\frac{1}{2}H_2(g) + \frac{1}{2}Br_2(l) \rightarrow HBr(g)$ $\quad \Delta H^\circ = \Delta H_f^\circ(HBr)$

(4) $\frac{1}{8}S_8(\text{Monoclinic}) + 1O_2 \rightarrow SO_2(g)$ $\quad \Delta H^\circ \neq \Delta H_f^\circ(SO_2)$

(5) $S(\text{Rhombic}) + 1O_2 \rightarrow SO_2(g)$ $\quad \Delta H^\circ = \Delta H_f^\circ(SO_2)$

QUESTION

The species which by definition has ZERO standard molar enthalpy of formation at 298 K is:

$\Delta H_f^\circ = 0$

(A) $Br_{2(g)}$ ✗

(B) $Cl_{2(g)}$ ✓

(C) $H_2O_{(g)}$ ✗

(D) $CH_{4(g)}$ ✗

QUESTION – (AIIMS 2005)

ΔH°_f (298K) of methanol is given by the chemical equation:

CH_3OH

A $CH_4(g) + 1/2\ O_2(g) \rightarrow CH_3OH(g)$

B $C_{(graphite)} + 1/2\ O_2(g) + 2H_2(g) \rightarrow CH_3OH(l)$

C $C_{(diamond)} + 1/2\ O_2(g) + 2H_2(g) \rightarrow CH_3OH(l)$

D $CO(g) + 2H_2(g) \rightarrow CH_3OH(l)$

$A \rightarrow B \quad +x\,J$ ($x\,J$ of Heat is released)

$\Delta H = -x\,J$

$C \rightarrow D \quad (-x\,J)$ ($x\,J$ of Heat is absorbed)

$\Delta H = +x\,J$

QUESTION

The enthalpy of formation of HCl(g) from the following reaction:

$H_2(g) + Cl_2(g) \longrightarrow 2HCl(g) + 44$ kcal is: $\Delta H = -44$ KCal

(A) –44 kcal/mol

$\frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g) \longrightarrow 1HCl(g)$ $\Delta H = \frac{-44}{2} = -22$ KCal

(B) –22 kcal mol^{-1} ✓

(C) 22 kcal/mol

(D) –88 kcal mol^{-1}

QUESTION – (AIIMS 2017, 2013)

The $\Delta_f H^\circ$ for $CO_2(g)$, $CO(g)$ and $H_2O(g)$ are -393.5, -110.5 and -241.8 kJ/mol respectively, the standard enthalpy change (in kJ) for the reaction

$CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(g)$ is:

$CO_2(g)$ $CO(g)$ $H_2O(g)$

$\Delta H^\circ = [1 \times (-110.5) + 1 \times -241.8] - [1 \times -393.5 + 1 \times 0]$

$= -352.3 + 393.5 = +41.2\ KJ$

$H_2O(l) \rightarrow H_2O(g)$

(A) 524.1

(B) 41.2

(C) –262.5

(D) –41.2

QUESTION

The enthalpy of formation of ammonia gas is –46.0 kJ/mol. The enthalpy change for the reaction $2NH_3(g) \longrightarrow N_2(g) + 3H_2(g)$ is: ①

A. 46.0 kJ

B. 92.0 kJ

C. 23.0 kJ

D. –92.0 kJ

$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \longrightarrow 1NH_3(g)$ $\Delta H = (-46)$ KJ/mol – ②

reverse eq ② X S.C. 2

$2NH_3(g) \longrightarrow 1N_2(g) + 3H_2(g)$

$\Delta H = +46 \times 2 = +92$ KJ

Standard Enthalpy of Combustion

#MIT

① 1 mole Compound (Hydrocarbon) $+ O_2(g) \rightarrow \underline{CO_2(g)} + H_2O(l)$ $\quad \Delta H^\circ = \Delta H^\circ_{Comb}$

②
$$xA \rightarrow yB$$
$$\Delta H^\circ = \sum x \times \Delta H^\circ_{Comb.\ Reactant} - \sum y \times \Delta H^\circ_{Comb.\ (Prod.)}$$

③ jo given → formula usiko

jo pucha → woh matter nahi karta.

$1CH_4(g) + 2O_2(g) \rightarrow 1CO_2(g) + 2H_2O(l)$ $\Delta H^\circ = \Delta H^\circ_{Comb.\ CH_4(g)}$

$\Delta H^\circ = 1 \times \Delta H^\circ_{CH_4} + 2 \times 0 - 1 \times \Delta H^\circ_{f\ Comb.\ CO_2} + 2 \times \Delta H^\circ_{Comb\ H_2O}$

$1S(Rhombic) + 1O_2(g) \rightarrow 1SO_2(g)$ $\Delta H^\circ = \Delta H^\circ_{Comb.\ of\ S}$

$1C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$ $\Delta H^\circ = \Delta H^\circ_{Comb.\ of\ C_3H_8}$

$1C(graphite) + 1O_2(g) \rightarrow 1CO_2(g)$ $\Delta H^\circ = \Delta H^\circ_{Comb.\ of\ C(graphite)} = \Delta H^\circ_{f}\ CO_2(g)$

$$1N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g) \quad \Delta H^\circ$$

$$\Delta H^\circ = \left[1 \times \Delta H^\circ_{C(N_2)} + 3 \times \Delta H^\circ_{C(H_2)}\right] - \left[2 \times \Delta H^\circ_{C\,NH_3}\right]$$

QUESTION

If ΔH°_f of $CH_4^{(g)}$ = -x kJ/mol, and ΔH°_f of CO_2 = -y kJ/mol. Find ΔH for following reaction: ($\Delta^\circ_f H_2O(l)$ = -2kJ/mol)

$$CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l) \quad \Delta H = ?$$

$$\Delta H = [1 \times -y + 2 \times -2] - [1 \times -x + 2 \times 0]$$

$$= [-y - 2z + x] \text{ KJ}$$

QUESTION – (AIIMS 2016)

2364
858
3222

The standard enthalpies of combustion of $C_6H_6(l)$, $C_{(graphite)}$ and $H_2(g)$ are respectively –3270 kJ mol^{-1}, –394 kJ mol^{-1} and – 286 kJ mol^{-1}. What is the standard enthalpy of formation of $C_6H_6(l)$ in kJ mol^{-1}?

A) –48

B) +48

C) –480

D) +480

$6C(graphite) + 3H_2(g) \longrightarrow 1C_6H_6(l)$

$\Delta H^\circ = [6 \times -394 + 3 \times -286] - [1 \times -3270]$

$= -2364 - 858 + 3270$

$= -3222 + 3270$

$= +48$ KJ/mol

QUESTION – (AIIMS 1998)

$n_{C_6H_{12}O_6} = \frac{1.6}{180}$

Combustion of glucose takes place according to the equation: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$, $\Delta H = -72$ kcal. The energy required for production of 1.6 g of glucose is (molecular mass of glucose is 180 g)

(A) 0.064 kcal

(B) 0.64 kcal

(C) 6.4 kcal

(D) 64 kcal

$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2 \quad \Delta H = +72$ KCal

1 mole $\rightarrow$ 72 KCal

$\frac{16}{180}$ " $\rightarrow \frac{72 \times 16}{180 \times 100} = \frac{64}{100} = 0.64$ KCal

QUESTION – (AIIMS 2018, 27 May)

$C_3H_6 + H_2 \rightarrow C_3H_8$ $\quad \Delta H_1 = -124$ kJ

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ $\quad \Delta H_2 = -2027$ kJ

$H_2 + 1/2\ O_2 \rightarrow H_2O$ $\quad \Delta H_3 = -286$ kJ

Calculate enthalpy of combustion of propene?

$C_3H_6 + \frac{9}{2} O_{2(g)} \longrightarrow 3CO_{2(g)} + 3H_2O_{(l)}$

(A) –1020 kJ

(B) –2085 kJ

(C) –2020 kJ

(D) None

THANK YOU