

JEE MAIN THERMODYNAMICS — ENTHALPY CHANGE OF A REACTION, ENTHALPY OF FORMATION, COMBUSTION, ATOMISATION AND BOND ENTHALPY — PYQS

Max. Marks: 40

Questions: 10

Section A (MCQ) — 3 questions

- Q.1** The heats of atomisation of methane and ethane are 'x' kJ mol⁻¹ and 'y' kJ mol⁻¹ respectively. The longest wavelength (λ) of light capable of breaking the C–C bond can be expressed in SI unit as :

[JEE Main 2026 (Online) 24th January Evening Shift]

- (1) $\frac{N_A hc}{250(y - 6x)}$ (2) $N_A hc \left(y - \frac{6x}{4}\right)^{-1}$
 (3) $\frac{hc}{1000} \left(\frac{y - 6x}{4}\right)^{-1}$ (4) $\frac{N_A hc}{250(4y - 6x)}$

Scan or tap for the full solution



- Q.2** Consider the following data :
 $\Delta_f H^\circ$ (methane, g) = -X kJ mol⁻¹
 Enthalpy of sublimation of graphite = Y kJ mol⁻¹
 Dissociation enthalpy of H₂ = Z kJ mol⁻¹
 The bond enthalpy of C–H bond is given by :

[JEE Main 2026 (Online) 21st January Evening Shift]

- (1) $\frac{X + Y + 2Z}{4}$ (2) $\frac{X + Y + 4Z}{2}$
 (3) $\frac{-X + Y + Z}{4}$ (4) X + Y + Z

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- Q.3** The correct statement amongst the following is :

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) The standard state of a pure gas is the pure gas at a pressure of 1 bar and temperature 273 K.
 (2) $\Delta_f H^\circ_{500}$ is zero for O₂(g).
 (3) $\Delta_f H^\circ_{298}$ is zero for O(g).
 (4) The term 'standard state' implies that the temperature is 0°C.

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Section B (Numerical) — 7 questions

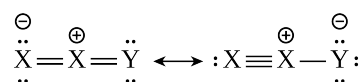
- Q.4** Consider the reaction
 $2\text{H}_2\text{S}(\text{g}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{H}_2\text{O}(\text{l}) + 2\text{SO}_2(\text{g})$
 The magnitude of enthalpy change for the reaction in kJ mol⁻¹ is _____. (Nearest integer)
 Given : $\Delta_f H^\circ(\text{H}_2\text{S}) = -20.1$ kJ mol⁻¹
 $\Delta_f H^\circ(\text{H}_2\text{O}) = -286.0$ kJ mol⁻¹
 $\Delta_f H^\circ(\text{SO}_2) = -297.0$ kJ mol⁻¹

[JEE Main 2026 (Online) 8th April Evening Shift]

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- Q.5** Resonance in X₂Y can be represented as

The enthalpy of formation of X₂Y $\left(\text{X} \equiv \text{X}(\text{g}) + \frac{1}{2}\text{Y} = \text{Y}(\text{g}) \longrightarrow \text{X}_2\text{Y}(\text{g})\right)$ is 80 kJ mol⁻¹.The magnitude of resonance energy of X₂Y is _____ kJ mol⁻¹ (nearest integer value).**Given:** Bond energies of X≡X, X = X, Y = Y and X = Y are 940, 410, 500, and 602 kJ mol⁻¹ respectively.

Valence X: 3, Y: 2

[JEE Main 2025 (Online) 8th April Evening Shift]

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- Q.6** Given :
 $\Delta_{\text{sub}} H^\circ[\text{C}(\text{graphite})] = 710$ kJ mol⁻¹
 $\Delta_{\text{C-H}} H^\circ = 414$ kJ mol⁻¹
 $\Delta_{\text{H-H}} H^\circ = 436$ kJ mol⁻¹
 $\Delta_{\text{C=C}} H^\circ = 611$ kJ mol⁻¹
 The $\Delta_f H^\circ$ for CH₂=CH₂ is _____ kJ mol⁻¹ (nearest integer value)

[JEE Main 2025 (Online) 3rd April Morning Shift]

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- Q.7** The formation enthalpies, $\Delta H_f^\ominus$ for $H_{(g)}$ and $O_{(g)}$ are 220.0 and 250.0 kJ mol^{-1} , respectively, at 298.15 K, and $\Delta H_f^\ominus$ for $H_2O_{(g)}$ is $-242.0 \text{ kJ mol}^{-1}$ at the same temperature. The average bond enthalpy of the O–H bond in water at 298.15 K is _____ kJ mol^{-1} (nearest integer).

[JEE Main 2025 (Online) 28th January Morning Shift]

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- Q.8** Consider the following data:
Heat of formation of $CO_2(g) = -393.5 \text{ kJ mol}^{-1}$
Heat of formation of $H_2O(l) = -286.0 \text{ kJ mol}^{-1}$
Heat of combustion of benzene = $-3267.0 \text{ kJ mol}^{-1}$
The heat of formation of benzene is _____ kJ mol^{-1} . (Nearest integer)

[JEE Main 2025 (Online) 28th January Evening Shift]

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- Q.9** Combustion of 1 mole of benzene is expressed as
 $C_6H_6(l) + \frac{15}{2}O_2(g) \longrightarrow 6CO_2(g) + 3H_2O(l)$.
The standard enthalpy of combustion of 2 mol of benzene is $-x \text{ kJ}$. $x =$ _____.
Given :
1. Standard Enthalpy of formation of 1 mol of $C_6H_6(l)$, for the reaction
 $6C(\text{graphite}) + 3H_2(g) \longrightarrow C_6H_6(l)$ is 48.5 kJ mol^{-1} .
2. Standard Enthalpy of formation of 1 mol of $CO_2(g)$, for the reaction
 $C(\text{graphite}) + O_2(g) \longrightarrow CO_2(g)$ is $-393.5 \text{ kJ mol}^{-1}$.
3. Standard Enthalpy of formation of 1 mol of $H_2O(l)$, for the reaction $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(l)$ is -286 kJ mol^{-1} .

[JEE Main 2024 (Online) 5th April Evening Shift]

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- Q.10** The enthalpy of formation of ethane (C_2H_6) from ethylene by addition of hydrogen where the bond-energies of C–H, C–C, C=C, H–H are 414 kJ, 347 kJ, 615 kJ and 435 kJ respectively is _____ kJ

[JEE Main 2024 (Online) 4th April Morning Shift]

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**ANSWER KEY****Section A (MCQ) — 3 questions**

Ques.	1	2	3								
Ans.	4	1	2								

Section B (Numerical) — 7 questions

Ques.	4	5	6	7	8	9	10
Ans.	1126	98	25	466	48	6535	125