

Chemical Thermodynamics

NEET previous year questions · Chemistry

7 questions from the official papers: NEET 2026 (2), Re-NEET 2026 (3), NEET 2020 (2). Each is followed by its answer and a worked solution written by BrainIt. Generated on 23 October 2026.



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1. NEET 2026 · Q48

Consider the following reaction: $2A(g) + B(g) \rightarrow 2D(g)$. $\Delta U^\ominus = -10 \text{ kJ mol}^{-1}$ and $\Delta S^\ominus = -44 \text{ JK}^{-1}$ at 298 K. Identify the correct option with $\Delta G^\ominus$ for the reaction and the spontaneity of the reaction at 298 K. (Given: $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$)

- (1) $-1.635 \text{ kJ mol}^{-1}$, spontaneous
- (2) $-0.63568 \text{ kJ mol}^{-1}$, spontaneous
- (3) $+0.63568 \text{ kJ mol}^{-1}$, non-spontaneous
- (4) $+1.635 \text{ kJ mol}^{-1}$, non-spontaneous

Answer (3)

Sol. With $\Delta n_g = 2 - 3 = -1$, $\Delta H^\ominus = \Delta U^\ominus + \Delta n_g RT = -10 - \frac{298 \times 8.31}{1000} = -12.48 \text{ kJ}$. Then $\Delta G^\ominus = \Delta H^\ominus - T\Delta S^\ominus = -12.48 - \frac{298 \times (-44)}{1000} = -12.48 + 13.112 \approx +0.636 \text{ kJ mol}^{-1}$. A positive $\Delta G^\ominus$ means the reaction is non-spontaneous.

2. NEET 2026 · Q74

At a certain temperature, T (K), during a process, 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is:

- (1) 400 J (2) 300 J (3) 700 J (4) 500 J

Answer (2)

Sol. By the first law of thermodynamics, $\Delta U = q + w$. Heat absorbed by the system gives $q = +500 \text{ J}$, and work done by the system gives $w = -200 \text{ J}$. Therefore $\Delta U = 500 - 200 = 300 \text{ J}$.

3. Re-NEET 2026 · Q59

Two moles of an ideal gas undergo free expansion from 10 L to 100 L at 300 K. The values of ΔS_{system} and $\Delta S_{\text{surroundings}}$ are (R is universal gas constant)

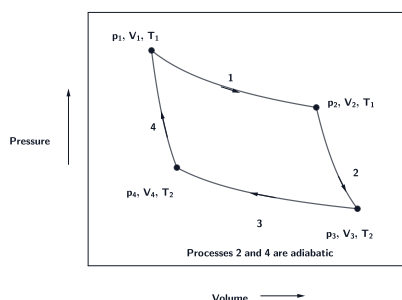
- (1) $\Delta S_{\text{system}} = 0$; $\Delta S_{\text{surroundings}} = 0$
- (2) $\Delta S_{\text{system}} = 4.606 R$; $\Delta S_{\text{surroundings}} = -4.606 R$
- (3) $\Delta S_{\text{system}} = 0$; $\Delta S_{\text{surroundings}} = 4.606 R$
- (4) $\Delta S_{\text{system}} = 4.606 R$; $\Delta S_{\text{surroundings}} = 0$

Answer (4)

Sol. Free expansion is into vacuum, so no work is done and no heat is exchanged: $w = 0$, $q = 0$. The surroundings are therefore completely untouched and $\Delta S_{\text{surroundings}} = 0$. Entropy is a STATE function, so the system's change is computed along any reversible path with the same endpoints: $\Delta S = nR \ln \frac{V_2}{V_1} = 2R \ln 10 = 4.606 R$. The net positive total confirms the irreversibility. NCERT Class 11, Thermodynamics (entropy and spontaneity).

4. Re-NEET 2026 · Q69

Consider the reversible processes for 1.0 mol of an ideal gas as shown in the figure.



w_1 , w_2 , w_3 and w_4 represent work done (in calories) in the processes 1, 2, 3 and 4, respectively; ΔU_2 and ΔU_4 are changes in the internal energy for the processes 2 and 4, respectively. [use $R = 2 \text{ cal K}^{-1} \text{ mol}^{-1}$] The correct option is

- (1) $w_1 + w_3 = -2T_1 \ln \frac{V_2}{V_1} - 2T_2 \ln \frac{V_4}{V_3}$
- (2) $w_2 + w_4 = \Delta U_2 - \Delta U_4$
- (3) $w_1 + w_2 = 2T_1 \ln \frac{V_2}{V_1}$
- (4) $w_1 + w_2 + w_3 + w_4 = 0$

Answer (1)

Sol. The cycle is a Carnot-type sequence: steps 1 and 3 are isothermal (at T_1 and T_2) and steps 2 and 4 are adiabatic. For a reversible isothermal change $w = -nRT \ln \frac{V_f}{V_i}$, so with $n = 1$ and $R = 2$ the two isothermal contributions add to exactly the expression in option (1). NCERT Class 11, Thermodynamics (work in reversible isothermal and adiabatic processes).

Why the other options are wrong:

- (2) for an adiabatic step $q = 0$ so $w = \Delta U$ for EACH, giving $w_2 + w_4 = \Delta U_2 + \Delta U_4$; the minus sign is the error
- (3) gets the sign of the isothermal work backwards and wrongly treats the adiabatic w_2 as zero
- (4) confuses $\Delta U = 0$ over a cycle with $w = 0$; the net work equals the enclosed area and is non-zero

5. Re-NEET 2026 · Q74

A protein undergoes reversible thermal denaturation from its initial state **N** to denatured state **D** according to $N \rightleftharpoons D$. At 60 °C, the concentrations of both **N** and **D** are equal at equilibrium, and the standard enthalpy change of denaturation is 666 kJ mol⁻¹. The standard entropy change (ΔS° in kJ K⁻¹mol⁻¹) of the protein upon denaturation at 60 °C is closest to

- (1) 2.0 (2) 2000.0 (3) 333.0 (4) 11.1

Answer (1)

Sol. Equal equilibrium concentrations mean $K = 1$, and since $\Delta G^\circ = -RT \ln K$, the standard free energy

change is zero. Setting $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ = 0$ gives $\Delta S^\circ = \frac{\Delta H^\circ}{T} = \frac{666}{333} = 2.0 \text{ kJ K}^{-1} \text{ mol}^{-1}$, using $T = 60 + 273 = 333 \text{ K}$. NCERT Class 11, Thermodynamics (Gibbs energy and equilibrium).

6. NEET 2020 · Q97

For the reaction $2\text{Cl(g)} \rightarrow \text{Cl}_2(\text{g})$, the correct option is

- (1) $\Delta_r H > 0$ and $\Delta_r S < 0$
- (2) $\Delta_r H < 0$ and $\Delta_r S > 0$
- (3) $\Delta_r H < 0$ and $\Delta_r S < 0$
- (4) $\Delta_r H > 0$ and $\Delta_r S > 0$

Answer (3)

Sol. The reaction $2\text{Cl(g)} \rightarrow \text{Cl}_2(\text{g})$ involves the formation of a bond, which releases energy, making $\Delta_r H < 0$. Additionally, the reaction decreases the number of gas molecules, reducing entropy, so $\Delta_r S < 0$. Chapter: Chemical Thermodynamics.

7. NEET 2020 · Q107

The correct option for free expansion of an ideal gas under adiabatic condition is

- (1) $q = 0$, $\Delta T < 0$ and $w > 0$
- (2) $q < 0$, $\Delta T = 0$ and $w = 0$
- (3) $q > 0$, $\Delta T > 0$ and $w > 0$
- (4) $q = 0$, $\Delta T = 0$ and $w = 0$

Answer (4)

Sol. In a free expansion of an ideal gas under adiabatic conditions, no work is done ($w = 0$) and no heat is exchanged ($q = 0$). Since the internal energy of an ideal gas depends only on temperature, $\Delta T = 0$. Chapter: Chemical Thermodynamics.

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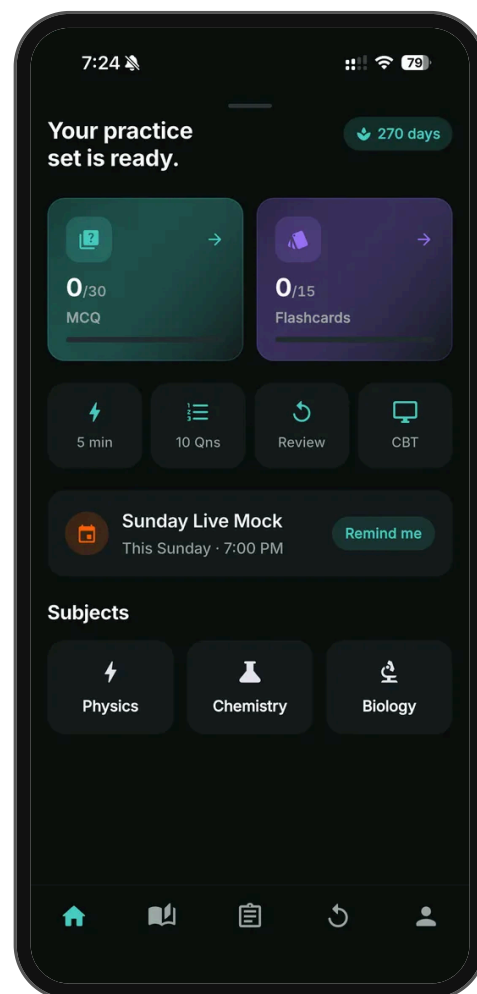
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