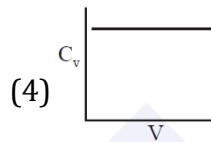
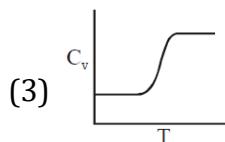
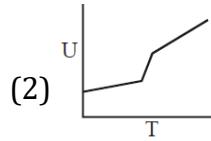
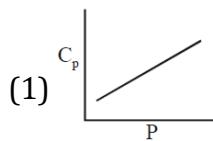


(Physical Chemistry)

Thermodynamics

1. For a diatomic ideal gas in a closed system, which of the following plots does not correctly describe the relation between various thermodynamic quantities? [Thermodynamics]



[Jee Main, Jan 2019]

2. Which one of the following equations does not correctly represent the first law of thermodynamics for the given processes involving an ideal gas? (Assume non-expansion work is zero) [Thermodynamics]

(1) Cyclic process : $\Delta U = -w$ (2) Cyclic process : $q = -w$ (3) Isochoric process : $\Delta U = q$ (4) Isothermal process : $q = -w$

3. The true statement amongst the following is:

[Jee Main, 2020]

(1) S is a function of temperature but ΔS is not a function of temperature.(2) Both S and ΔS are not functions of temperature.(3) Both S and ΔS are functions of temperature.(4) S is not a function of temperature but ΔS is a function of temperature.

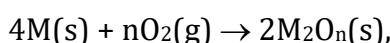
4. A process will be spontaneous at all temperatures if:

[Jee Main, April 2019]

(Thermodynamics)

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

5. For a reaction,



the free energy change is plotted as a function of temperature. The temperature below which the oxide is stable could be inferred from the plot as the point at which :

(1) the slope changes from positive to zero

(2) the free energy change shows a change from negative to positive value

(3) the slope changes from negative to positive

(4) the slope changes from positive to negative

[Jee Main, 2020]

6. For the equilibrium, $2\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$, the value of ΔG° at 298 K is approximately :

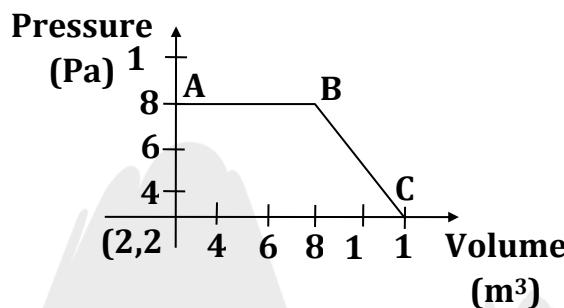
[Thermodynamics]

- (1) -80 kJ mol⁻¹ (2) -100 kJ mol⁻¹ (3) 80 kJ mol⁻¹ (4) 100 kJ mol⁻¹

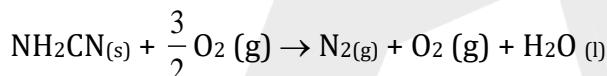
[Jee Main, Jan 2019]

7. The magnitude of work done by a gas that undergoes a reversible expansion along the path ABC shown in the figure is ____.

[Jee Main, 2020]



8. The reaction of cyanamide, $\text{NH}_2\text{CN(s)}$ with oxygen was run in a bomb calorimeter and ΔU was found to be -742.24 kJ mol⁻¹. The magnitude of ΔH_{298} for the reaction.



is ____ kJ. (Rounded off to the nearest integer)

[Assume ideal gases and $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$]

[JEE Main, Feb 2021]

9. When 5 moles of He gas expand isothermally and reversibly at 300 K from 10 litre to 20 litre, the magnitude of the maximum work obtained is ____ J. [nearest integer]

(Given: $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ and $\log 2 = 0.3010$)

[JEE Main, June 2022]

10. For a chemical reaction $A + B \longrightarrow C + D$ ($\Delta_rH^\circ = 80 \text{ kJ mol}^{-1}$) the entropy change Δ_rS° depends on the temperature T (in K) as ($\Delta_rS^\circ = 2T \text{ J K}^{-1} \text{ mol}^{-1}$).

[JEE Main, Feb 2021]

Minimum temperature at which it will become spontaneous is ____ K. (Integer)

11. 40% of HI undergoes decomposition to H_2 and I_2 at 300 K. ΔG° for this decomposition reaction at one atmosphere pressure is ____ J mol⁻¹. [nearest integer]

(Use $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$; $\log 2 = 0.3010$. $\ln 10 = 2.3$, $\log 3 = 0.477$)



ANSWERS KEY

- | | | | | | |
|---------|----------|-----------|--------|-----------|------------|
| 1. (1) | 2. (1) | 3. (3) | 4. (1) | 5. (2) | 6. (3) |
| 7. (68) | 8. (741) | 9. (8630) | | 10. (200) | 11. (2735) |

