



Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET UNIVERSITY)

M.Sc. (Second Semester – Regular/Supplementary) Examinations, May – 2026

24MCYPC12004 – Physical Chemistry-II

(Chemistry)

Time: 3 hrs

Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

- | | CO # | Blooms Level |
|---|------|--------------|
| a. Differentiate the intensive and extensive properties. | CO1 | K1 |
| b. Write the Maxwell equation using thermodynamic square. | CO2 | K2 |
| c. Write the relationship between pressure and partition function. | CO3 | K2 |
| d. What are forces and fluxes? | CO4 | K1 |
| e. Calculate the rate constant of a first order reaction having half-life period of 10 min. | CO5 | K2 |

PART – B

(10 x 5 = 50 Marks)

Answer **ALL** the questions

- | | Marks | CO # | Blooms Level |
|--|-------|------|--------------|
| 2. a. Explain the state and path functions with examples. | 5 | CO1 | K3 |
| b. Calculate the internal pressure for one mole of an ideal gas. | 5 | CO1 | K4 |
| (OR) | | | |
| c. The heat capacity of 10 mol of an ideal gas at a certain temperature is 300JK^{-1} at constant pressure. The heat capacity of the same gas at the same temperature and at constant volume would be how much? | 8 | CO1 | K4 |
| d. What do you mean by system and surrounding? | 2 | CO1 | K2 |
| 3.a. Calculate the fugacity of a gas governed by the equation $P(V_m - b) = RT$. | 8 | CO2 | K4 |
| b. What is Trouton's rule? | 2 | CO2 | K2 |
| (OR) | | | |
| c. Derive the entropy for third law of thermodynamics. | 8 | CO2 | K3 |
| d. What do you mean by residual entropy? | 2 | CO2 | K2 |
| 4.a. Distribute three distinguishable particles among various energy level such that total energy is $4E$. | 6 | CO3 | K4 |
| b. Derive the value of partition function at low and high temperature. | 4 | CO3 | K3 |
| (OR) | | | |
| c. Derive the relationship between U and Z . | 7 | CO3 | K3 |
| d. Calculate the Z_{el} of F atom. | 3 | CO3 | K2 |
| 5.a. Derive the general entropy balance equation for an open system. | 5 | CO4 | K3 |
| b. State and explain Onsager's Reciprocity Relation. | 5 | CO4 | K3 |
| (OR) | | | |
| c. Explain the criteria for a Non-equilibrium Stationary State (NESS). | 5 | CO4 | K3 |
| d. Define Phenomenological Equations. | 5 | CO4 | K3 |
| 6.a. Derive the Arrhenius equation. | 8 | CO5 | K3 |
| b. Draw the Maxwell Distribution curve. | 2 | CO5 | K2 |
| (OR) | | | |
| c. Derive the expression of rate constant for the first order reaction. | 5 | CO5 | K3 |
| d. Calculate the time required for 99.9% completion of a first order reaction, if the required time is 32 min for 90% completion. | 5 | CO5 | K4 |

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