



QP CODE: 25050654



Reg No :

Name :

MSc DEGREE (CSS) EXAMINATION DECEMBER 2025

First Semester

**Core Courses - CH500104 - THERMODYNAMICS, KINETIC THEORY AND
STATISTICAL THERMODYNAMICS**

M Sc CHEMISTRY, MSc POLYMER CHEMISTRY, MSc ANALYTICAL CHEMISTRY, MSc APPLIED
CHEMISTRY, MSc PHARMACEUTICAL CHEMISTRY

2019 Admission Onwards

5ED3FF9B

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

Weight 1 each.

1. Give any four applications of Gibbs- Helmholtz equation.
2. What is the difference between mean molar volume and partial molar volume?
3. Explain the term fugacity.
4. Give Nernst heat theorem. Explain the significance.
5. Briefly describe the experimental verification of Maxwells distribution of molecular velocities.
6. Derive most probable velocity from Maxwell's equation for the distribution of molecular velocities.
7. Explain the drawbacks of Boltzmann distribution statistics.
8. Give few applications of Sackur-Tetrode equation.
9. Determine the heat capacity of carbon dioxide and ammonia based on classical theory.
10. Account for the differences between first order and higher order phase transitions.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

Weight 2 each.

11. Define excess thermodynamic functions and illustrate a method for determining excess enthalpy.
12. Derive vant Hoff's isotherm and explain its significance.
13. Derive an expression for collisions in a mixture of gases.
14. Compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.





15. Compare the postulates of Einstein theory and Debye theory for heat capacities of solids.
16. If ΔG° at 500 K is -520 Jmol^{-1} for the reaction $2A + B = 2C$. Evaluate K_p for the reaction $A + B/2 = C$.
17. The coefficient of viscosity of a gas of molecular weight 32g is $230.0 \mu \text{ poise}$ at 298 K and 1 atm pressure. Estimate its mean path.
18. Calculate the rotational contribution to H° , G° and S° for Oxygen gas at 298 K. The moment of inertia for $O_{2(g)}$, is $1.1937 \times 10^{-46} \text{ kgm}^2$.

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Explain the phase diagram of a three component system of two salts and water where the two salts are capable of forming salt hydrates.
20. Explain in detail the transport properties of gas with reference to viscosity.
21. Write short notes on
(a) Macrostates (b) Microstates (c) Equal-a-priori principle (d) Different types of ensembles (e) thermodynamic probability
22. (a) Derive expressions for Translational partition function and Rotational partition function. (b) Account for the partition function of hydrogen.

(2×5=10 weightage)

