

Reg. No. :

Name :

Second Semester M.Sc. Degree Examination, August 2025

**Chemistry/ Analytical Chemistry/ Polymer Chemistry/ Chemistry With
Specialisation In Drug Design And Development**

CH 223/ CL 223/ PC 223/ CHDD 523 : PHYSICAL CHEMISTRY II

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

(Answer any two sub-questions among (a), (b), or (c) from each question.
Each sub-question carries 2 marks)

1. (a) What is the real meaning of wave function?
(b) Why are they called spherical harmonics?
(c) What are symmetric wave functions?
2. (a) What is the significance of Morse curve?
(b) What is Mutual exclusion principle?
(c) What is the importance of fingerprint region in IR spectroscopy?
3. (a) Discuss the basic principle of entropy
(b) What is the application of Maxwell-Boltzmann distribution?
(c) Why is the Sackur-Tetrode equation important?
4. (a) What is meant by thermionic emission?
(b) What is the validity of Dulong-Petit law?
(c) What is meant by thermodynamic probability?

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5. (a) Why is activity coefficient greater than 1?
(b) What is the Debye - Huckel limiting law?
(c) What are the benefits of solid oxide fuel cells?

(10 × 2 = 20 Marks)

SECTION – B

(Answer either (a) or (b) of each question.)
Each question carries 5 marks

6. (a) What are the various types of harmonics?
(b) What is Vector atom model? Discuss its basic concept.
7. (a) Explain the various types of electronic transitions
(b) What is a rotational Raman spectrum? How is it differing from vibrational Raman spectrum?
8. (a) What is meant by canonical ensemble? How is it differing from grand canonical ensemble?
(b) Discuss the concept of equilibrium in statistical thermodynamics?
9. (a) Explain Einstein's theory of heat capacity and its limitations
(b) What is the distribution function of the Bose-Einstein statistics?
10. (a) Explain the Debye-Huckel theory of strong electrolytes.
(b) What is Tafel Equation? How is it differing from Butler-Volmer equation?

(5 × 5 = 25 Marks)

SECTION – C

Answer any **three** questions. Each question carries **10** marks

11. (a) Discuss the wave functions of hydrogen-like systems.
(b) Explain the wave functions for multi electron systems.

12. (a) Describe the instrumentation of rotational spectroscopy.
(b) What is Laser Raman spectroscopy? What are its applications?
13. What are molecular partition functions? Explain translational and vibrational partition functions.
14. (a) Explain Bose-Einstein statistics.
(b) Differentiate between Maxwell-Boltzmann and Fermi-Dirac statistics.
15. (a) Explain the instrumentation and applications of cyclic voltammetry.
(b) What is an electrochemical cell? Discuss the different types of electrochemical cells?

(3 × 10 = 30 Marks)
