(Pages : 3) **P – 5289**

**Reg. No. : .....**

**Name : .....**

**Second Semester M.Sc. Degree Examination, September 2022**

**Chemistry / Polymer Chemistry / Analytical Chemistry**

**CH/CL/PC 223: PHYSICAL CHEMISTRY - II**

**(Common for Chemistry / Analytical Chemistry (2016 – 2019 Admission) and Polymer Chemistry (2018 – 2019 Admission))**

Time : 3 Hours Max. Marks : 75

SECTION – A

Answer **any two** among (a), (b) & (c) from each question.
Each sub question carries **2** marks.

1. (a) What are associated Legendre polynomials?

   (b) Discuss the wave equation for multi electron systems.

   (c) Describe the Hartree-Fock equation

2. (a) Discuss the classical theory of Raman spectrum.

   (b) Discuss the effect of conjugation on the absorption frequencies.

   (c) Distinguish between fundamentals and overtones.

3. (a) What is electro-kinetic effect?

   (b) What is thermo-osmosis?

   (c) Discuss the entropy production from heat flow.

**P.T.O.**

4. (a) What is Canonical ensemble?

(b) Explain the IR active modes of vibrations of $CO_2$ molecule

(c) What is meant by thermodynamic probability?

5. (a) What is Born equation?

(b) What are the limitations of Onsagar equation?

(c) What is Nernst equation?

**(10 × 2 = 20 Marks)**

SECTION – B

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

6. (a) Briefly explain the orbital real form of spherical harmonics.

(b) Discuss the radial distribution functions.

7. (a) Describe the instrumentation of Microwave spectroscopy.

(b) Briefly explain the various types of vibrational modes

8. (a) Describe the Glansdort – Pregogine equation

(b) Discuss the thermodynamics of solid- liquid system with double salt forms a hydrate.

9. (a) Explain the Fermi-Dirac statistics.

(b) Exlain the Bose – Einstein condenstation

10. (a) Briefly explain the Debye – Huckel limiting law

(b) Explain the various types of overpotentials

**(5 × 5 = 25 Marks)**

## SECTION – C

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

11. (a) Explain the wave equation for multi electron systems.

    (b) Discuss the wave function of hydrogen like systems **(5 + 5)**

12. (a) Discuss the electronic spectra of diatomic molecules

    (b) Discuss the various types of Raman spectra **(5 + 5)**

13. (a) Briefly explain the Onsagar reciprocal relation

    (b) Discuss the thermodynamics of system with three pairs of partially miscible liquids **(4 + 6)**

14. Explain the relation between Maxwell boltzmann and Bose Einstein Statistics.

15. (a) Discuss the different methods for the determination of activity coefficient.

    (b) Explain the theories of overvoltage **(5 + 5)**

**(3 × 10 = 30 Marks)**

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