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M – 5461

Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, November 2021

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

- (a) What are the differences between Cartesian and polar coordinates?

(b) What are Legendre polynomials?

(c) Discuss the radial functions of orbitals.
- (a) What is Morse curve? What is its significance?

(b) Discuss the classical theory of Raman Spectrum.

(c) What is the effect of conjugation in electronic spectra vibrational values?
- (a) What is Onsager reciprocal relation?

(b) What is thermo-osmosis?

(c) What is meant by principle of minimum entropy production?

P.T.O.



4. (a) Discuss the concept of ensembles.  
(b) What is the theory of paramagnetism?  
(c) What is Bose-Einstein condensation? What is its significance?
5. (a) What is wein effect?  
(b) What is the theory of multi-layer capacity?  
(c) What are the various types of over-voltages? Discuss.

**(10 × 2 = 20 Marks)**

### SECTION – B

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

6. (a) Discuss the theta equation of particle on a sphere.  
(b) Discuss the wave functions of hydrogen like systems.
7. (a) Distinguish between parallel and perpendicular vibrations.  
(b) Briefly explain the instrumentation of Raman spectrometer.
8. (a) Discuss Le-Chatelier Brauhn principle.  
(b) Derive a generalized equation of entropy production from heat flow.
9. (a) Explain the classical distribution of particles.  
(b) Briefly explain Bose-Einstein statistics.
10. (a) What is activity coefficient? How is it determined?  
(b) Briefly explain the Debye-Huckel limiting law.

**(5 × 5 = 25 Marks)**



## SECTION – C

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

11. (a) Explain the wave equation of a non-planar rigid rotor.  
(b) Explain the Hartree-Fock Self Consistent Field method for atoms. (5+5)
12. (a) Explain the rotational spectra of polyatomic molecules.  
(b) Explain the instrumentation and applications of microwave spectroscopy.
13. (a) Discuss the applications of irreversible thermodynamics.  
(b) Construct the phase diagram of a three component system with two metal salts with water.
14. Explain the relation between Maxwell-Boltzmann and Fermi-Dirac statistics.
15. (a) Explain the various types of electrochemical cells.  
(b) Explain the Nernst equations.

**(3 × 10 = 30 Marks)**

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