Reg. No ..... Name **26P406**

M.Sc. DEGREE END SEMESTER EXAMINATION- MARCH 2026

SEMESTER 4 : CHEMISTRY

COURSE : **24P4CHET13EL : ADVANCED INORGANIC CHEMISTRY**

(For Regular - 2024 Admission)

Time: Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	What are the irreducible representations corresponds to vibrational modes in octahedral complexes. Predict which among them are IR and Raman active.	(E, CO 1)
2.	What is transition moment integral? Explain.	(U, CO 1)
3.	Calculate the number of microstates for p3 configuration	(A, CO 1)
4.	What are cyclophanes? Give examples.	(U, CO 6)
5.	Discuss the synthesis of potassium fulleride.	(A, CO 6)
6.	What are Heterocrowns? Give examples.	(U, CO 6)
7.	One of the great advantages of PCPs/MOFs is their high surface area. Justify the statement	(A, CO 5)
8.	Represent the autoionization of liquid dinitrogen tetroxide.	(A, CO 5)
9.	Write the transformation matrix obtained due to the rotation of metal ion d orbitals by α degrees in an octahedral field.	(U, CO 1)
10.	Draw the A_2u molecular orbital of ferrocene.	(R, CO 1)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	Explain the recent advances in the development of nanobiotechnology-based drug delivery systems?	(A, CO 4)
12.	Discuss the mechanism and methods by which linear free energy relationship can be determined.	(A, CO 5)
13.	What are some potential environmental applications of MOFs in water purification and carbon capture?	(U, CO 5)
14.	Give five important reactions in liquid BrF_3.	(U, CO 5)
15.	Explain important properties and applications of BioMOFs	(U, CO 5)
16.	Discuss the Group Theoretical concept of hybridisation scheme for σ – bonding in PCl_5 molecule.	(U, CO 1)
17.	Discuss the hybridisation scheme for π-bonding in square planar complexes based on Group Theory.	(An, CO 1)
18.	What are nano shells? How will you synthesise silica-gold nano shell?	(A, CO 4)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19.	Write a note on various types of photo substitution reactions. How the reactivity of complexes changes under photochemical condition? Explain with suitable example.	(U, CO 3)

20. What are quantum dots? How will you characterize them? Discuss the important properties and applications of quantum dots. (U, CO 4)

21. Describe the principle of EPR spectroscopy. Define g value and what are the factors which affect its value? Calculate g value of the methyl radical which shows an EPR peak at 3300 x 10^{-4} T in a spectrometer operating at 9240 MHz. (β = 9.27 x 10^{-24} JT^{-1}) (U, CO 2)

22. Discuss the selection rules for electronic transition. Apply this rule to transition between two non-degenerate states and between states of different degeneracy with suitable examples. Prove the validity of orbital selection rule. (A, CO 1)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	Apply the principles of group theory in co-ordination complexes.	A	1, 2, 3, 9, 10, 16, 17, 22	14
CO 2	Identify the structure of an inorganic solid using IR, Raman, Mossbauer and EPR spectroscopic techniques.	A	21	5
CO 3	Explain the concepts of inorganic photochemistry	U	19	5
CO 4	Describe the structure and properties of nanomaterials.	R	11, 18, 20	9
CO 5	Explain the chemistry of acids, bases, non-aqueous solvents and metal-organic frameworks.	R	7, 8, 12, 13, 14, 15	10
CO 6	Explain the chemistry of fullerenes and metallo-supramolecular structures.	R	4, 5, 6	3

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;