Reg. No ..... Name **25P4005**

MSc DEGREE END SEMESTER EXAMINATION- MARCH 2025

SEMESTER 4 : CHEMISTRY

COURSE : **21P4CHET13EL : ADVANCED INORGANIC CHEMISTRY**

(For Regular - 2023 Admission and Supplementary 2022/2021 Admissions)

Duration : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	What are the advantages of using polymer nanocomposites in various applications?	(U, CO 4)
2.	SbF_5 acts as an acid in liquid BrF_3. Why?	(A, CO 5)
3.	Find out the number of microstates for p^2 configuration.	(A, CO 1)
4.	write the transformation matrix obtained due to the rotation of metal ion d orbitals by α degrees in an octahedral field.	(U, CO 1)
5.	Where does the binding of fullerenes with metals takes place?	(A, CO 6)
6.	Draw the E_1u molecular orbitals of ferrocene.	(R, CO 1)
7.	Explain excited state electron transfer reactions with an example.	(A, CO 3)
8.	What are the uses of core shell partcles?	(U, CO 4)
9.	The mixture of KCl and $AlCl_3$ in liquid $POCl_3$ is amphoteric. Why?	(An, CO 5)
10.	Show that the angular wave function $3\cos^2\theta$ -1 is corresponding to the function $_Z^2$	(E, CO 1)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	Find out the normal modes of vibration of Ammonia molecule and classify them into stretching and bending modes.	(E, CO 1)
12.	Write a note on various types of photo substitution reactions.	(U, CO 3)
13.	Explain in detail about the molecular receptors which are cation binding hosts with suitable examples	(U, CO 6)
14.	Explain why crystal engineering and molecular recognition are considered as the main principles of supramolecular chemistry.	(A, CO 6)
15.	Discuss the significance of the Hammett equation.	(A, CO 5)
16.	Exaplain the conversion of water into oxygen in presence of manganese based photosystems.	(A, CO 3)
17.	Explain the Vibrational analysis of Water molecule and find out the normal modes of vibration.	(E, CO 1)
18.	Discuss the chemical and biological sensing applications of porous silicon.	(U, CO 4)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19.	Describe the principle of EPR spectroscopy. Define g value and what are the factors which affect its value? Sketch and explain the ESR spectrum of $[Mn(H_2O)_6]^{3+}$ and $[Mn(H_2O)_6]^{2+}$.	(A, CO 2)

20. Using Group theory explain MO theory of sigma bond formation in the complex $[Mn(H_2O)_6]^{3+}$. Expand the discussion to Crystal Field Splitting and nature of electron spin in the complex. (U, CO 1)

21. Explain the role of Nanotechnology for the manipulation of biomolecules. (U, CO 4)

22. Explain (a) Solvo - thermal method (b) Microwave-assisted method (c) Electrochemical method for the synthesis of MOFs (U, CO 5)

(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	3, 4, 6, 10, 11, 17, 20	13
CO 2	Identify the structure of an inorganic solid using IR, Raman, Mossbauer and EPR spectroscopic techniques.	A	19	5
CO 3	Explain the concepts of inorganic photochemistry.	U	7, 12, 16	5
CO 4	Describe the structure and properties of nanomaterials.	R	1, 8, 18, 21	9
CO 5	Explain the chemistry of acids, bases, non-aqueous solvents and metal-organic frameworks.	R	2, 9, 15, 22	9
CO 6	Explain the chemistry of fullerenes and metallo-supramolecular structures.	R	5, 13, 14	5

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