Reg. No ..... Name **21P4005**

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2021

SEMESTER 4 : CHEMISTRY

COURSE : **16P4CHET13EL: ADVANCED INORGANIC CHEMISTRY**

(For Regular - 2019 Admission & Supplementary - 2018/2017/2016 Admissions)

Time : Three Hours Max. Marks: 75

PART A

Answer any 10 (2 marks each)

1. Explain the term quadrupole interaction in Mossbauer spectroscopy using iron complex as an example.
2. What happens to the carbonyl stretching frequency in the IR spectrum of Acetyl acetone on coordination with metal ions?
3. How CO_2 is converted into oxalic acid photochemicaly? Give its mechanism.
4. What are the applications of TEM?
5. Why gold surface is a suitable candidate for forming SAM?
6. Draw the A_2u molecular orbital of ferrocene.
7. Write the difference in the nature of splitting of terms due to weak and strong octahedral fields
8. Give the Drago and Wayland equation for acid base interaction. Illustrate its use in acid- base Chemistry?
9. How the toxicity of Mercury is related to HSAB theory?
10. Discuss the hybridisation and structure of trimethyl boron.
11. What is the hybridisation of Aluminium in aluminium bromide? Explain its Structure.
12. What is super critical fluid chromatography?
13. Discuss the role of Ag_2SO_4 and $HgSO_4$ in the determination of COD.

(2 x 10 = 20)

PART B

Answer any 5 (5 marks each)

14. Discuss on the working of ferrioxalate actinometers with suitable examples.
15. Explain the structure and mechanism of dye sensitized solar cells.
16. What are nano sensors? Discuss its important applications.
17. Discuss the hybridisation scheme for π-bonding in square planar complexes based on Group Theory.
18. Decompose the following RR into IRR combination.

O_h	E	$8C_3$	$6C_2$	$6C_4$	$3C_2$	i	$6S_4$	$8S_6$	$3\sigma_h$	$6\sigma_d$
Γ_F	7	1	-1	-1	-1	7	-1	1	-1	-1

19. Illustrate with examples the effect of solvation in the strength of acids and bases.
20. Discuss on the chromatographic separation of fullerenes.
21. Explain in detail the back titration method for the determination of total nitrate and nitrite present in a given sample of water.

(5 x 5 = 25)

PART C

Answer any 2 (15 marks each)

22. 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 $[Mn(H_2O)_6]^{2+}$.

23. Discuss the important classification, properties and applications of core shell nano particles.
24. 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.
25. Discuss on a) Crownethers, b) cryptands and c) cyclophanes.

(15 x 2 = 30)