STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2023-24)

B.Sc. DEGREE EXAMINATION, APRIL 2026
BRANCH IV - CHEMISTRY
SIXTH SEMESTER

COURSE : MAJOR-CORE
PAPER : INORGANIC CHEMISTRY II
SUBJECT CODE : 23CH/MC/IC64
TIME : 3 HOURS MAX. MARKS :100

Q. No.	SECTION A **Answer all the following**	CO	KL
	Choose the correct answer. (15 x 1 = 15 marks)		
1.	The stable oxidation state of Europium is ---------- a) +4 b) +3 c) 0 d) +1	1	1
2.	Which of the following represents the outer electronic configuration of manganese? a) $3p^6\ 3d^5\ 4s^1$ b) $3p^6\ 3d^6\ 4s^2$ c) $3p^6\ 3d^3\ 4s^2$ d) $3p^6\ 3d^5\ 4s^2$	1	1
3.	Which one of the following compounds will exhibit linkage isomerism? a) $[Pt(NH_3)_2Cl_2]$ b) $[Co(NH_3)_4Cl_2]NO_2$ c) $[Co(NH_3)_5NO_2]Cl_2$ d) $[Ag(NH_3)_2]NO$	1	1
4.	The reagent used for the determination of Nickel is a) alizarin b) DMG c) oxine d) ferroin	1	1
5.	An example for an ambidentate ligand is a) thiocyanate b) cyanide c) carbonyl d) nitrosyl	1	1
6.	Ligand used to estimate hardness of water is a) EDTA b) SCN c) DMG d) oxine	1	1
7.	The crystal field stabilization energy CFSE for d^4 ion in high spin octahedral complex is a) 18 Dq b) +6 Dq c) -16 Dq+P d) -6 Dq	1	1
8.	$[Cu(NH_3)_4]^{2+}$ is a) paramagnetic, square planar b) paramagnetic, tetrahedral c) diamagnetic, tetrahedral d) diamagnetic, square planar	1	1
9.	Polydentate ligand that does form a chelate is a) gly b) acac c) trien d) hydrazine.	1	1
10.	The example of sandwich complex is a) benzene b) ferrocene c) NaCl. $[Cu(NH_3)_4]SO_4$. d) ferroin	1	1
11.	Coordination number of Cu in the complex is $[Cu(NH_3)_4]SO_4$. is a) 3 b) 2 c) 5 d) 4	1	1

12.	Which one of the following about the actinides is false? a) The second half of the actinides more closely resembles the lanthanides. b) The atomic spectra of these elements are complex. c) The 5f orbitals in these atoms have a greater spatial extension relative to the 7s and 7p orbitals than the 4f orbitals have relative to the 6s and 6p. d) Unlike for the lanthanide, the +3 state is not the common oxidation state for this	1	1
13.	$[Co(NH_3)_5Br]SO_4$ exhibits _____isomerism. a) hydrate b) linkage c) ligand d) ionization	1	1
14.	Which of the following metal ions possess purple color in aqueous solution? a) Mn^{2+} b) Cr^{3+} c) Fe^{3+} d) Ti^{3+}	1	1
15.	Outer orbital complex is _____. a) $[Ni(CN)_4]^{2-}$ b) $[CoF_6]^{3-}$ c) $[Co(NH_3)_6]^{3+}$ d) $[Mn(CN)_6]^{4-}$	1	1
Q. No.	**SECTION B** **Answer all the following.**	**CO**	**KL**
	Fill in the Blanks. (10 x 1 = 10 marks)		
16.	The effective atomic number of Nickel in $Ni(CO)_4$ is **_____.**		
17.	The relation that links the number of unpaired electrons and magnetic moment is _____.	2	2
18.	Structure of Ziegler-Natta catalyst is_____.	2	2
19.	Lanthanides can be isolated by _____ chromatography.	2	2
20.	Ti^{4+} compounds exhibit an intense colour due to _____transition.	2	2
21.	The number of donor atoms in gly is _____	2	2
22.	The geometry of $[Fe(H_2O)_6]$ is _____.		
23.	The IUPAC name of $[Co\ H_2O\ (NH_3)_2CNClBr]$ is	2	2
24.	Hapticity of Cp ligand is _____.	2	2
25.	CFSE for a d^5 ion in a weak octahedral field is _____.	2	2
	Answer in a line or two. (5x1=5 marks)		
26.	Draw the structure of CH_3Li.	2	2
27.	What is synergic effect in alkenyl complexes?	2	2

28.	Which is more likely to form a high-spin complex F^- or CN^- ?	2	2
29.	Name the transition element present in Vitamin B_{12} and Cytochrome.	2	2
30.	Draw the structure of $Fe_2(CO)_9$..	2	2
Q. No.	**SECTION C** **Answer any SIX of the following. (6 x 5= 30 marks)**	**CO**	**KL**
31.	Compare the elements of cobalt group with respect to their oxides and oxidation states.	3	3
32.	Discuss the biological significance of iron and Manganese.	3	3
33.	Compare the magnetic behaviour of $[NiCl_4]^{2-}$ (tetrahedral) and $[Ni(CN_4)]^{2-}$ (square planar).	3	3
34.	Draw the CFT diagram and calculate CFSE for the octahedral complexes. a) $[Fe(H_2O)_6]^{2+}$ b) $[Cr(NH_3)_6]^{3+}$	3	3
35.	Apply 18 electron rule to i) $Cr(\eta^6\text{-}C_6H_6)(CO)_3$ ii) $Fe(CO)_4X_2$.	3	3
36.	Discuss the extraction of Thorium from monazite.	3	3
37.	Explain the applications of the following i. Alizarin ii. DMG iii. $K_4[Fe(CN)_6]$ in qualitative analysis.	3	3
Q. No.	**SECTION D** **Answer any FOUR of the following. (4 x 5 = 20 marks)**	**CO**	**KL**
38.	Outline the following reactions of Ferrocene. i) acetylation ii) alkylation iii) metalation	4	4
39.	Construct the Latimer diagram for manganese in both acidic and basic solution.		4
40.	Discuss the properties of the first transition series with respect to their oxidation state and colour.	4	4
41.	Explain optical isomerism in four coordinate complexes.	4	4
42.	How lanthanides are separated using ion exchange chromatography?	4	4
Q. No.	**SECTION E** **Answer the following. (2 x 10 = 20 marks)**	**CO**	**KL**
43.	Outline any one method of preparation, any two properties and structure of the following organometallic compounds. a) Nickel carbonyl b) Zeise's salt. (5+5) **OR** Evaluate crystal field splitting in octahedral and tetrahedral complexes with a suitable example. Why is Δ_o greater than Δ_t? (7+3)	5 5	5 5
44.	State Jahn-Teller's theorem and explain the tetragonal distortion in octahedral complexes. **OR** a) Elucidate the causes and consequences of lanthanide contraction. b) Describe chelate effect with a suitable example . (5+5)	5 5	5 5

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