

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2023-244)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023
BRANCH IV- CHEMISTRY
FIRST SEMESTER

COURSE : CORE

PAPER : STRUCTURAL INORGANIC CHEMISTRY

SUBJECT CODE : 23CH/PC/SI14

TIME : 3 HOURS

MAX.MARKS :100

Q. No.	SECTION A (10 x 1 = 10 marks) Answer ALL Questions Choose the best answer	CO	KL
1	Which one of the following metal oxide is a normal spinel? a. Fe ₃ O ₄ b. Mn ₃ O ₄ c. NiFe ₂ O ₃ d. MgFe ₂ O ₃	1	1
2	The unit of magnetic susceptibility is a. Tesla b. M/H c. J/m d. dimensionless	1	1
3	XRD analysis is used for a. Phase composition b. residual strain c. crystallite size d. all of these	1	1
4	The presence of light atoms in a solid can be determined by a. XRD b. electron diffraction c. neutron diffraction d. none of these	1	1
5	The EAN for Fe(CO) ₅ is a. 34 b. 35 c. 36 d. 37	1	1
6	The number of Fe-Fe bonds in Fe ₃ (CO) ₁₂ is a. three b. two c. one d. zero	1	1
7	In the reaction [Co(CO) ₂ (L)(H) ₂ (COR)] → [Co(CO) ₂ (L)(H)] + RCHO is called, a. reductive elimination b. oxo process c. reduction d. polymerisation	1	1
8	Complex such as nickel acetylacetonate is used in the a. hydrogenation of olefins b. hydorformylation process c. cyclooligomerisation d. polymerization process	1	1
9	On applying Wade's rule the C ₂ B ₁₀ H ₁₂ belongs to _____ structure. a. nido b. closo c. nido d. arachno	1	1
10	Heteropoly acids were discovered by _____. a. Langmuir b. Berzelius c. G.N. Lewis d. Anderson	1	1

Q. No.	SECTION – B (10 x 1 = 10 marks) Answer ALL Questions Fill in the blanks	CO	KL
11	When a superconductor is cooled below the critical temperature _____ effect occurs.	1	2
12	ReO ₃ type structures can be described as _____ perovskites.	1	2
13	The iron species Fe ²⁺ and Fe ³⁺ in Fe ₃ O ₄ can be distinguished by _____ diffraction.	1	2
14	For X-ray diffraction of monochromatic X-ray radiation such as _____ used.	1	2
15	The formula for cobalt carbonylnitrosyl is _____.	1	2

16	$2\text{NiCN} + 4\text{CO} \longrightarrow \text{Ni}(\text{CO})_4 + \text{Ni}(\text{CN})_2$. This type of reaction is a/an _____.	1	2
17	In Wacker's process _____ salt is used as co-catalyst.	1	2
18	The catalyst used in Monsanto acetic acid process is _____.	1	2
19	In the structure of triphospho nitrilic chloride, the nitrogen and phosphorus atoms in the ring are hybridized _____ respectively.	1	2
20	Dimolybdate systems do not contain _____ ion.	1	2

Q. No.	SECTION C (4 × 6 = 24 marks) ANSWER ANY FOUR QUESTIONS	CO	KL
21	Explain briefly the Pauling's rule for ionic crystals.	3	3
22	Compare electron and neutron diffraction.	3	3
23	How is allyl complexes prepared? Explain the structure and bonding.	3	3
24	Discuss the mechanism of Ziegler-Natta catalysis.	3	3
25	Discuss the properties and structure of i) Phosphazene and ii) zeolites	3	3

Q. No.	SECTION – D (4 × 8 = 32 marks) ANSWER ANY FOUR QUESTIONS	CO	KL
26	a) Discuss Type I and Type II superconductors. b) Give the relation between piezo, pyro and ferroelectric properties.	4	4
27	Discuss the band theory.	4	4
28	How metal carbonyls are prepared? Discuss the nature of bonding in metal carbonyls.	4	4
29	Derive Born-Landé equation and discuss the factors affecting lattice energy.	4	4
30	Outline the preparation, properties and structure of boranes.	4	4

Q. No.	SECTION – E (2 × 12 = 24 marks) ANSWER THE FOLLOWING	CO	KL
31 a	How is the structure of NaCl determined by powder XRD method ? (or)	5	5
31 b	What is the principle involved in electron diffraction? Discuss any two applications.		
32 a	What is oxo-process? Mention its importance? Discuss its mechanism. (or)	5	5
32 b	Discuss the chemistry of <i>iso</i> and <i>heteropolyacids</i> of Mo and W.		
