

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2023-2024 & thereafter)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024
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 Answer all Questions (10 x 1=10)	CO	KL
1.	The HOMO of CO and NO are respectively a) σ and π b) σ^* and π^* c) σ and π^* d) π and π^*	CO1	K1
2.	Half sandwich compounds are organometallic compounds which a) Have only one Cp ring b) Have parallel Cp rings c) Have even number of Cp rings d) Contains four membered rings	CO1	K1
3.	The miller indices of the diagonal plane of a cube are a) 110 b) 101 c) 100 d) 111	CO1	K1
4.	Lattice energy of ionic solids does not reveal information about their a) volatility b) magnetic property c) solubility d) hardness	CO1	K1
5.	The most commonly used spectroscopic method for analysis of metal carbonyls is a) Mass b) IR c) UV-Vis d) ESR	CO1	K1
6.	The function of Cu (II) salt in Wacker's process is a) catalyst b) co-catalyst c) reducing agent d) 'a' and 'b'	CO1	K1
7.	The hybridization and coordination number of rhodium metal in Wilkinson's catalyst is a) dsp^2 , 4 b) sp^3 , 4 c) sp^3d^2 , 6 d) d^2sp^3 , 6	CO1	K1
8	The catalyst used in Wacker process is a combination of a) Zinc chloride and Iron Chloride b) Palladium chloride and copper chloride c) Zinc chloride and Copper chloride d) palladium chloride and zinc chloride	CO1	K1
9.	Ziegler Natta catalyst is an important reaction for a) Polymerisation b) Nanosynthetic reaction c) Oxidation d) Organosynthetic reaction	CO1	K1
10.	The Madelung constants, interionic distance and the Born exponents for both LiF and MgO are the same. The lattice energies of the two compounds are in the ratio a) 1:2 b) 1:4 c) 2:3 d) 1:3	CO1	K1
Q No	SECTION B Answer all Questions (10 x 1=10)	CO	KL
11.	The formation of pi complex in Zeise's salt is due to the presence of _____	CO2	K2
12.	When a superconductor's Meisner effect is activated, it _____ a nearby magnet.	CO2	K2
13.	Indicate the compound with the highest lattice energy among LiF, MgO and KBr.	CO2	K2
14.	Interpret the nonstoichiometric nature of interstitial compounds.	CO2	K2

15	Estimate what happens on the treatment of $\text{Fe}(\text{CO})_5$ with NaOH ?	CO2	K2
16.	At a pH of about 10, what is the ion present in a molybdate solution?	CO2	K2
17.	Point out an application of dielectric materials.	CO2	K2
18.	Associate any one property of X-Rays with its application in XRD.	CO2	K2
19.	The radius ratio of an ionic compound is 0.765. Its coordination number is _____	CO2	K2
20.	Provide one example of covalent and ionic carbide.	CO2	K2

Q No	SECTION C Answer any four questions (4 x 6=24)	CO	KL
21.	Apply band theory to explain the conducting behaviour of metals, n-type and p-type semiconductors?	CO3	K3
22.	Identify the compound with highest C-O stretching frequency among $[\text{V}(\text{CO})_6]$, $\text{Cr}(\text{CO})_6$, $[\text{Mn}(\text{CO})_6]^+$ and CO . and give reasons	CO3	K3
23.	Demonstrate the role of catalyst in Monsanto acetic acid process.	CO3	K3
24.	Illustrate EAN and 18 electron rules with examples.	CO3	K3
25.	Distinguish between tetrahedral and octahedral heteropolyacids with a specific example each	CO3	K3

	SECTION D Answer any four questions (4 x 8=32)	CO	KL
26.	Examine the formation of supra molecular assemblies. Explain reason for their stability and give their applications	CO4	K4
27.	Analyse Paulings rules for ionic crystals using examples.	CO4	K4
28.	Investigate the chemistry of phosphazenes and their applications.	CO	K4
29.	Probe into the study of crystal structure using Debye Scherrer method and give the selection rules.	CO4	K4
30.	Outline the BCS theory to understand the phenomenon of superconductivity.	CO4	K4

	SECTION E Answer any two questions (2x12=24)		
31.	(a) Apply Wade's rule to interpret the structure of (i) B_4H_{10} (ii) $\text{B}_{10}\text{C}_2\text{H}_{12}$ (4x2=8) (b) Evaluate Curie Weiss Law. (4) (OR) (a) Judge the relationship between piezo, pyro and ferro electric substances. (6) (b) Analyse Metal hydride complexes and give their applications. (6)	CO5	K5
32.	(a) Distinguish Electron and Neutron Diffractions. (6) (b) Recommend a mechanism of Oxo process (6) (OR) (a) Discuss the instrumentation of a powder diffractometer. How it is used to characterize the samples? (8) (b) Support the classification of boranes with an example. (4)	CO5	K5