

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2023 – 24)

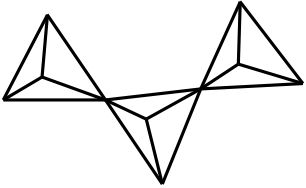
B.Sc. DEGREE EXAMINATION, NOVEMBER 2024
BRANCH IV- CHEMISTRY
THIRD SEMESTER

COURSE : MAJOR CORE
PAPER : INORGANIC CHEMISTRY-I
SUBJECT CODE : 23CH/MC/IC34
TIME : 3 HOURS

MAX.MARKS :100

Q.No.	SECTION-A Answer all questions Choose the right option in the following- (15x1=15 marks)	CO	KL
1.	Solid PCl ₅ exists as a) PCl ₃ b) PCl ₄ ⁺ c) PCl ₆ ⁻ d) both b & c	1	1
2.	Which one of the following is not a Lewis base- a) H ₂ O b) NH ₃ c) CH ₃ NH ₂ d) BF ₃	1	1
3.	The formal charge of O atoms in the ion $\left[\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{O}}}=\text{N}=\overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{O}}} \right]^{\dagger}$ a) -2 b) -1 c) 0 d) +1	1	1
4.	Which one of the following bonds has the least energy? a) Se-Se b) Te-Te c) O-O d) S-S	1	1
5.	Among CH ₄ , NH ₃ and H ₂ O, acidity of H ₂ O is maximum because a) oxygen contains two lone pair of e- b) bond angle is less than 109°28' by VSEPR Theory c) oxygen is more electronegative than C or N. d) H ₂ O is an associative liquid.	1	1
6.	According to VBT a molecule that undergoes sp ² hybridisation will have _____ geometry. a) linear b) planar trigonal c) tetrahedral d) Octahedral	1	1
7.	The best fluorinating agent is? a) XeF ₂ b) XeF ₄ c) XeF ₆ d) XeO ₂ F ₂	1	1
8.	Which one of the following hydroxides is insoluble in water? a) Ca(OH) ₂ b) Ba(OH) ₂ c) Be(OH) ₂ d) Mg(OH) ₂	1	1
9.	Which pair is not correct order of lattice energy? a) KCl > MgO b) AlN > MgO c) BeCO ₃ > MgCO ₃ d) BeCO ₃ = MgCO ₃	1	1
10.	When N ₂ ⁺ is formed from N ₂ , bond order _____ and when O ₂ ⁺ is formed from O ₂ , bond order _____. a) increases, increases b) decreases, decreases c) increases, decreases d) decreases, increases	1	1
11.	For advertisements the coloured discharged tubes contain _____. a) He b) Ne c) Ar d) Kr	1	1
12.	The non-linear molecular among the following is a) SO ₂ b) CO ₂ c) HCN d) NO	1	1

13.	Mg and Li are similar in their properties due to _____ a) same e/m ratio b) same electron affinity c) same group d) same radius	1	1
14.	Light emitting diodes, Laser diodes and memory chips of computer are made of _____ a) Gallium b) Aluminum c) Arsenic d) Gallium arsenide	1	1
15.	The tetrahedral arrangement of perchlorate ion is due to _____ a) presence of lone pair of electrons b) sp^3 hybridisation c) trigonal bipyramidal shape of the ion d) sp^2 hybridisation	1	1

SECTION- B		CO	KL	
Answer all questions Fill in the blanks-				
16.	An example of macrocyclic compound present in biological systems which are responsible for the transportation of Na^+ and K^+ ions through the hydrophobic lipid layers of the cell membrane is _____	2	2	
17.	The formula and charge of the following silicate anion is _____. 	2	2	
18.	Stability of $Ga^+ < In^+ < Tl^+$ is explained by _____.	2	2	
19.	Conversion of BI_3 to B by pyrolysis is called _____.	2	2	
20.	Of the alkaline earth metals only _____ carbide gives methane on reaction with water.	2	2	
Answer in a line or two				
21.	What are pseudohalogens?	2	2	
22.	How many σ and π bonds are present in tetracyanomethane ($C(CN)_4$)?	2	2	
23.	Why sodium oxide solution cannot be stored in Al vessel?	2	2	
24.	Gas X turns lime water milky. It also turns potassium dichromate green. What is gas X?	2	2	
25.	He_2 does not exist- Justify in a line.	2	2	
Match the following				
26.	i) I_3^-	a) Dimer	2	2
27.	ii) Beryllium chloride	b) Benitoite	2	2
28.	iii) Thallium	c) Fertiliser	2	2
29.	iv) Tremolite	d) linear	2	2
30.	v) Monoammonium hydrogen phosphate	e) extremely toxic	2	2
		f) Asbestos		

SECTION- C		CO	KL
Answer any five questions (5 x 6 = 30 Marks)			
31.	Justify the following statements – (3x2=6) i) CO ₂ is a gas, While SiO ₂ is a solid of high melting point. ii) HF is the weakest acid b) NO is a neutral oxide and it turns brown in air.	3	3
32.	i) Compare and contrast VBT and MOT. (3) ii) Explain the extraction of Lithium from Spodumene. (3)	3	3
33.	a) Complete the following reactions- i) $SO_2 + NaOH \rightarrow ? + H_2$ (1) ii) $Ba(OH)_2 + H_2O_2 \rightarrow ? + H_2O$ (1) iii) $BCl_3 + NH_4Cl \xrightarrow{140^\circ C, C_6H_5Cl} ? \xrightarrow{NaBH_4} ?$ (2) iv) $XeF_2 + SbF_5 \rightarrow ?$ (1) v) $Pt + HNO_3 + HCl \rightarrow ? + NO + H_2O$ (1)	3	3
34.	Give any one preparation of diborane. Discuss the structure and bonding in diborane.	3	3
35.	Discuss in detail about chain and sheet of silicates.		
36.	Explain the structure and geometry of the following molecules using VSEPR theory- i. I ₃ ⁻ ii. XeOF ₂ (3 +3)		
37.	i) Explain – Solubility products of hydroxides of Group II increases whereas that of sulphates decreases down the group. (3) ii) Give an account of hydrides of Group 14 elements. (3)		

SECTION- D		CO	KL
Answer any four questions (4x 5 = 20 marks)			
38.	Draw the Lewis structure of N ₂ molecule, explain the bonding in nitrogen molecule using both VBT and MOT. (5)	4	4
39.	i) What happens when phosphoric acid is heated with concentrated nitric acid and ammonium molybdate, (1.5) ii) How is triple phosphate synthesized? (1.5) iii) Identify A, B, C, & D (2) $A (Black) + H_2SO_4 \rightarrow gas B + C?$ $C + (CH_3COO)_2Pb \rightarrow PbS (Black precipitate)$ $C + K_3Fe(CN)_6 \rightarrow D(blue)$	4	4
40.	i) Explain what happens (with relevant chemical equations) when aqueous solution of hydroxyl amine is reacted with nitrous acid (1) ii) a) Draw the structure of Cl ₂ O and I ₂ O ₅ . (2) b) Xenon does not form fluorides like XeF, XeF ₃ and XeF ₅ . (2)	4	4
41.	i) Explain the bonding in phosphonitriles. (3) ii) Discuss the significance of cryptands. (2)	4	4
42.	Give any one preparation and explain the structure of XeF ₆ and IF ₃ . (5)	4	4

	SECTION E	CO	KL
	Answer the following- (2 x 10 = 20 Marks)		
43.	List the salient features of MOT, using MOT explain and compare the bonding, bond order and magnetic properties of O_2 , O_2^- and O_2^{2-} . (10) OR Give an account of i) Structures of oxy acids of sulphur. (5) ii) Basic nature of iodine. (5)	5	5
44.	a) Give a comparative account of oxides and hydrides of nitrogen group elements. (6) b) What are silicones? Discuss any one preparation and properties of silicone. (4) OR a) Give any one preparation and explain structure of BrF_3 and IF_7 (5) b) Explain using MOT the bonding, bond order and magnetic property of NO molecule. (5)	5	5
