LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

SECOND SEMESTER – **APRIL 2025**

UCH2MC02 – CHEMICAL BONDING AND MAIN GROUP ELEMENTS

Date: 29-04-2025 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

SECTION A - K1 & K2 (CO1)			
Q.No	Levels	**Answer ALL the Questions**	**(10 x 2 = 20)**
1	K1	What are the factors favouring an ionic bond formation?	
2		Alkali metals form stable complexes with polydentate ligands. Give an example.	
3		Draw the unit cell of CsCl.	
4		What is carborundum? Mention any one of its application.	
5		Why CO_2 is a gas and SiO_2 is a solid?	
6	K2	Outline the preparation of XeF_6.	
7		Write the Born–Lande equation and mention the terms involved in it.	
8		Name the carbonates and bicarbonates of sodium.	
9		Why are Tl(I) compounds more stable than Tl(III) compounds?	
10		Find the oxidation state of P in H_3PO_2 and H_3PO_3.	
SECTION B – K3 & K4 (CO2)			
		Answer ALL the Questions	**(4 x 10 = 40)**
11	K3	Explain the following a) Ionic compounds are soluble in polar solvents and having high dielectric constant. b) Ionic compounds have higher melting point than covalent compounds. (5+5)	
		[OR]	
12		Calculate the lattice energy of KCl from the following data. Construct the Born Haber's Cycle for the formation of KCl. Heat of formation of KCl = - 438 kJ mol^{-1} Heat of sublimation of KCl = + 86 kJ mol^{-1} Heat of dissociation of Cl_2 = + 244 kJ mol^{-1} Ionization energy of K = + 425 kJ mol^{-1} Electron affinity of Cl(g) = - 355 kJ mol^{-1}	
13		a) Differentiate between the cubic close packing and hexagonal close packing of spheres. b) Discuss the wurtzite crystal structure of ZnS. (5+5)	
		[OR]	
14		a) Explain nonstoichiometric defects in crystals and their consequences. b) Discuss the biological importance of alkali metals. (5+5)	
15	K4	Describe the chemistry of the oxides of nitrogen.	
		[OR]	
16		Using VBT, examine the structure of XeF_2 and XeF_6.	
17		Discuss the extraction of beryllium.	
		[OR]	
18		a) List the two and three-dimensional silicates providing an example each. Draw the structure of sheet silicates. b) Explain the oxidation state and strength of H_3PO_2, H_3PO_3 and H_3PO_4. (6+4)	

SECTION C – K5 & K6 (CO3)			
	Answer ALL the Questions		**(2 x 20 = 40)**
19	K5	a) Deduce the characteristics of ionic compounds.	(10+10)
		b) Explain the following giving reasons. i) LiF has higher lattice energy than LiI. ii) degree of hydration of alkali metals decreases from Li^+ to Cs^+.	
		[OR]	
20		State Fajans' rule. Explain the covalent character in ionic compounds using Fajan's rule.	
21	K6	a) Discuss the structure and bonding of diborane.	(10+10)
		b) Give a comparative account of salt-like, interstitial and covalent carbides.	
		[OR]	
22		a) Review the position of noble gases in the periodic table and explain the properties.	(10+10)
		b) Evaluate the anomalous behaviour of Li and Be from the other group I and II elements.	
