LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SECOND SEMESTER – **APRIL 2023**

UCH 2502 – CHEMICAL BONDING AND MAIN GROUP ELEMENTS

Date: 03-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	SECTION A - K1 (CO1)
	Answer ALL the Questions **(10 x 1 = 10)**
1.	**Define the following**
a)	Lattice energy
b)	Amorphous compounds
c)	Clathrates
d)	Crown ethers
e)	Catenation
2.	**Fill in the blanks**
a)	Crystalline solids are ____tropic in nature.
b)	The radius-ratio of ZnS is 0.52 and the coordination number of Zn is ____.
c)	The cage forming molecule in methane clathrate is _____.
d)	_____ metal combines with nitrogen and form its nitride while other alkali metals do not.
e)	B_nH_{n+4} is the formula for _____boranes.
	SECTION A - K2 (CO1)
	Answer ALL the Questions **(10 x 1 = 10)**
3.	**True or False**
a)	Among the silver halides, AgF is least soluble.
b)	All possible 3D-space lattice are of fourteen distinct types.
c)	When two atoms come within 5 nanometres of each other, there will be a slight interaction between them, thus causing polarity and slight attraction.
d)	LiCl is not deliquescent.
e)	Feldspar is not a silicate mineral.
4.	**Match the following**
a)	Born-Landé equation- Zinc
b)	Wurtzite - Electrostatic force of attaction
c)	Hydrogen bond - Lattice energy
d)	18-Crown-6 - Borazine
e)	Inorganic benzene - Potassium ion
	SECTION B - K3 (CO2)
	Answer any TWO of the following in 100 words **(2 x 10 = 20)**
5.	a) Explain the covalency in ionic compounds using Fajans' rule. (5) b) Construct Born-Haber cycle for the formation of a salt, MX, and calculate the lattice energy of MX from the data given below. Heat of formation of MX = –550 kJ mol^{-1} Heat of sublimation of M = +80 kJ mol^{-1}

	Heat of dissociation of X_2 = +155 kJ mol^{-1} Ionization energy of M = +374 kJ mol^{-1} Electron affinity of X = –343 kJ mol^{-1} (5)
6.	a) Draw the *ccp* and *hcp* arrangement of crystal lattice. (4) b) Comment on the impact of hydrogen bonding on the boiling point of hydrides of group-15, 16, and 17 elements. (6)
7.	a) Explain the chemical reactions of alkali metals with water and ammonia. (5) b) Cite the uses of alkali metals and their compounds. (5)
8.	Illustrate the different types of carbides with examples. (10)
	SECTION C – K4 (CO3)
	Answer any TWO of the following in 100 words (2 x 10 = 20)
9.	a) Describe the properties of ionic compounds. (5) b) How is radius ratio useful in determining the coordination number and geometry of a compound? (5)
10.	a) Write a note on London dispersive forces and liquefaction of gases. (5) b) Outline the synthesis and properties of crystalline clathrates and hydrates. (5)
11.	a) Discuss the biological importance of alkali metals. (5) b) Illustrate the process of extraction of beryllium from its ore. (5)
12.	a) How is boron extracted from borax? (5) b) List out the various types of oxoacids of phosphorus and mention the oxidation state of phosphorus in each. (5)
	SECTION D – K5 (CO4)
	Answer any ONE of the following in 250 words (1 x 20 = 20)
13.	a) Explain the following: i) NaCl is soluble in water but $BaSO_4$ is not. ii) Melting point of $PbCl_2$ is higher than $PbCl_4$. (5) b) Illustrate the structure of NaCl and CsCl. (10) c) HF is a liquid whereas HCl, HBr and HI are gases at 298 K. Explain. (5)
14.	a) How do the properties of lithium and beryllium differ from their respective group elements? (12) b) Write the preparation, properties and uses of sodium nitroprusside. (8)
	SECTION E – K6 (CO5)
	Answer any ONE of the following in 250 words (1 x 20 =

	20)
15.	a) Outline the factors influencing the formation of an ionic compound. (5) b) Explain the stoichiometric and non-stoichiometric defects in solids. (12) c) Why is solid ice less dense than liquid water? (3)
16.	a) Outline the magnetic and oxidising properties of peroxides and superoxides of alkali metals. (6) b) Comment on the alkali metal complexes of crown ethers. (4) c) Illustrate the preparation, properties, and structure elucidation of diborane. (10)

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