Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: Inorganic Chemistry (Minor I) **Semester: I**

Program: B.Sc. (Geology/ Mathematics/Physics) **Time: 03 hrs.**

Course Code: CHEM 1020 **Max. Marks: 100**

Instructions:

1. **Mention Roll No. at the top of the question paper.**
2. **ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write down four quantum numbers with their symbols.	**4**	**CO1**
Q 2	Define the photoelectric effect with the help of suitable example.	**4**	**CO1**
Q 3	Sketch out the difference between nuclear charge and effective nuclear charge on an atom?	**4**	**CO2**
Q 4	What are bonding and antibonding molecular orbitals? Explain.	**4**	**CO3**
Q 5	How can we find out the percentage ionic character in a covalent compound?	**4**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Arrange the following in increasing order of ionic bond strength. Give proper justification in support of your answer in each case. (i) LiCl, KCl, RbCl, NaCl (ii) $BeCl_2$, RbCl, $MgCl_2$, LiCl	**10**	**CO3**
Q 7	Derive the de Broglie relation. Calculate the de Broglie wavelength of an electron moving with a velocity of 1.20×10^5 m/s.	**10**	**CO1**
Q 8	Explain Aufbau principle. Why does a 4s orbital is filled before 3d? Give explanation.	**10**	**CO2**
Q 9	What is variable valency in covalent bonds? Discuss it taking phosphorous as an example. **OR** Write the electronic configurations for Sc^{2+}, Mn^{2+}, and Zn^{2+} and determine the number of unpaired electrons?	**10**	**CO4**

SECTION-C (2Qx20M=40 Marks)			
Q 10	(i) By means of a diagram and simple calculations, find out the minimum value of radius ratio for coordination number 3 in an ionic crystal. (ii) What is a hydrogen bond? Explain intramolecular and inter-molecular hydrogen bonding with the help of suitable examples.	**10** **10**	**CO3**
Q 11	(i) Write molecular orbital configuration of the species N_2, N_2^+, N_2^- and N_2^{-2} and calculate their bond order. Also comment on their bond strengths. (ii) Elaborate VSEPR (Valence Shell Electron Pair Repulsion) theory with example. **OR** (i) Discuss the hybridization and structure of SF_4. (ii) Use the following data to calculate the lattice energy of sodium chloride using Born Haber cycle. You must write all the thermochemical equations in all the steps of the cycle. Enthalpy of formation of sodium chloride = -411.3 kJ mol^{-1} Heat of sublimation of Na(s) = 108.7 kJ mol^{-1} Ionization energy of Na(g) = 495 kJ mol^{-1} Dissociation energy of Cl_2(g) = 244 kJ mol^{-1} Electron affinity of Cl(g) = – 349 kJ mol^{-1}	**10 + 10**	**CO4**