Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

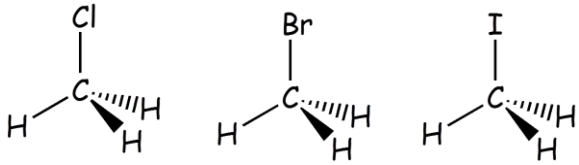
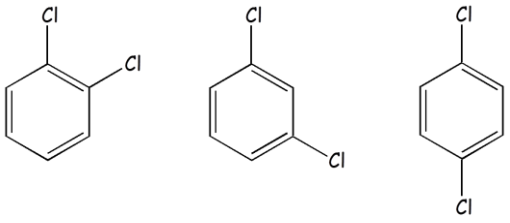
Course: Atomic Structure and Bonding **Semester: Ist**

Program: B.Sc (H) Chemistry **Time : 03 hrs.**

Course Code: CHEM1028 **Max. Marks: 100**

Instructions: *Attempt all the questions: Question nos. 9 & 10 have internal choice*

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define the term electron affinity. Explain with reason why the electron affinity of fluorine (F) atom is less than that of chlorine (Cl) atom?	**4**	**CO2**
Q 2	How does the effective nuclear charge vary down a group in the periodic table, and why? Calculate the effective nuclear charge experienced by the valence electron in sodium (Na) atom using Slater's rule.	**4**	**CO2**
Q 3	Illustrate Heisenberg Uncertainty Principle. Why can't we measure both the exact position and momentum of an electron at the same time? Provide a physical interpretation.	**4**	**CO1**
Q 4	Arrange the following molecules in increasing order of their dipole moments: (i)  (ii) 	**2+2**	**CO3**

Q 5	Discuss the structure of the following molecules using VSEPR theory: (i) XeF_2 (ii) $XeOF_2$	**2+2**	**CO3**
SECTION B (4Qx10M= 40 Marks)			
Q 6	Write a short note on (i) solvation energy and (ii) the factors effecting lattice energy in ionic compounds.	**10**	**CO3**
Q 7	Explain the following: (a) Oxygen molecule is paramagnetic while nitrogen molecule is diamagnetic. (b) The bond order in O_2^- is less than that in O_2 which in turn is less than that in O_2^+.	**5+5**	**CO4**
Q8	The ground state electronic configuration of chlorine (Cl) atom is $1s^2 2s^2 2p^6 3s^2 3p^5$. Account for the geometry of the following molecules/ions formed by chlorine: (i) ClF_3 and (ii) ClO_3^-.	**10**	**CO3**
Q 9	State and explain four important postulates of Bohr's theory of the hydrogen atom. OR In a hydrogen atom, an electron jumps from 3rd orbit to the 1st orbit. Find out the frequency and wavenumber of the observed spectral line.	**10**	**CO1**
SECTION-C (2Qx20M=40 Marks)			
Q 10	(a) What is meant by a metallic bond? Illustrate the nature of metallic bond on the basis of: (i) Electron sea model. (ii) Valence bond model. OR Use the molecular orbital theory to predict the bond order and the number of unpaired electrons in CO and NO molecules.	**20**	**CO4**

Q 11	Explain ionic character in covalent compounds with at least two suitable examples. Which compound from each of the following pairs is more ionic and why? (i) AgCl or NaCl (ii) Al_2O_3 and CaO. (iii) $BeCl_2$ or NaCl. (iv) $AlCl_3$ or $MgCl_2$.	**10+10**	**CO4**