


Name:			
Enrolment No:			
<b>UPES</b> <b>End Semester Examination, December 2023</b>			
<b>Course: Inorganic Chemistry</b> <b>Program: B.Sc. Physics + Mathematics + Geology</b> <b>Course Code: CHEM 1007G</b>		<b>Semester: I</b> <b>Time : 03 hrs.</b> <b>Max. Marks: 100</b>	
<b>Instructions: Read the instructions given below carefully:</b> <ol style="list-style-type: none"> <li>All questions are compulsory.</li> <li>Internal choice is given in Q 9 and 11.</li> </ol>			
<b>SECTION A</b> <b>(5Qx4M=20Marks)</b>			
S. No.		Marks	CO
Q 1	Which is larger in size: C or F? Give suitable reason.	4	CO2
Q 2	Which quantum numbers reveals the information about the energy and orientation of orbitals?	4	CO1
Q 3	What are bonding and antibonding molecular orbitals?	4	CO3
Q 4	How can we find out the % ionic character in a covalent compound?	4	CO3
Q 5	What is the speed of an electron whose de Broglie wavelength is 0.1 nm? Given $h = 6.626 \times 10^{-34}$ J.s and $m = 9.1 \times 10^{-31}$ kg.	4	CO1
<b>SECTION B</b> <b>(4Qx10M= 40 Marks)</b>			
Q 6	Derive the Schrodinger wave equation.	10	CO1
Q 7	Explain the following giving appropriate reasons: (a) The ionization potential of N is greater than that of O. (b) Second ionization potential is always greater than the first.	10	CO2
Q 8	Define electron affinity. Explain why electron affinity I has negative value whereas electron affinity II is positive? Give its trend across the period and down the group of periodic table.	10	CO2
Q 9	Discuss the various properties of ionic compounds. <b>OR</b> What is variable valency in covalent bonds? Discuss it taking phosphorous and sulphur as examples.	10	CO4
<b>SECTION-C</b> <b>(2Qx20M=40 Marks)</b>			

Q 10	<p>a) Discuss the hybridization and structure of <math>\text{ClF}_3</math>.</p> <p>b) Calculate radius ratio of a crystal with coordination number 8.</p>	<p><b>10</b> <b>10</b></p>	<b>CO3</b>
Q 11	<p>a) Derive Born-Landé equation and explain Madelung constant.</p> <p style="text-align: center;"><b>OR</b></p> <p>With the help of a suitable example and diagram, discuss <math>sp^3d</math> hybridization.</p> <p>b) Draw MO energy level diagram for <math>\text{O}_2</math> molecule. Work out on its bond order and magnetic property.</p> <p style="text-align: center;"><b>OR</b></p> <p>Use the following data to calculate the lattice energy of sodium chloride using Born Haber cycle. You must write all thermochemical equations for the steps of the cycle.</p> <p>Enthalpy of formation of sodium chloride = <math>-411.3 \text{ kJ mol}^{-1}</math></p> <p>Heat of sublimation of <math>\text{Na(s)}</math> = <math>108.7 \text{ kJ mol}^{-1}</math></p> <p>Ionization energy of <math>\text{Na(g)}</math> = <math>495 \text{ kJ mol}^{-1}</math></p> <p>Dissociation energy of <math>\text{Cl}_2(\text{g})</math> = <math>244 \text{ kJ mol}^{-1}</math></p> <p>Electron affinity of <math>\text{Cl(g)}</math> = <math>-349 \text{ kJ mol}^{-1}</math></p>	<p><b>10</b></p> <p><b>10</b></p>	<b>CO4</b>