Name:

S. No.

Enrolment No:



Semester: I

Max. Marks: 100

Marks

: 03 hrs.

CO

Time

UPES

End Semester Examination, December 2023

Course: Inorganic Chemistry

Program: B.Sc. Physics + Mathematics + Geology

Course Code: CHEM 1007G

Instructions: Read the instructions given below carefully:

1. All questions are compulsory.

2. Internal choice is given in Q 9 and 11.

| SECTION A |
|-----------------|
| (5Qx4M=20Marks) |

| | | Mai KS | 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 |
| | SECTION B | | -1 |
| | (4Qx10M= 40 Marks) | | |
| 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. OR What is variable valency in covalent bonds? Discuss it taking | 10 | CO4 |
| | phosphorous and sulphur as examples. SECTION-C | | |
| | (2Qx20M=40 Marks) | | |

| Q 10 | a) Discuss the hybridization and structure of ClF₃.b) Calculate radius ratio of a crystal with coordination number 8. | 10 10 | CO3 |
|------|--|----------|-----|
| Q 11 | a) Derive Born-Lande equation and explain Madelung constant. OR With the help of a suitable example and diagram, discuss sp³d hybridization. | 10 | |
| | b) Draw MO energy level diagram for O₂ molecule. Work out on its bond order and magnetic property. OR Use the following data to calculate the lattice energy of sodium chloride using Born Haber cycle. You must write all | | CO4 |
| | thermochemical equations for 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 | |