[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6005 **D** **Your Roll No.....**

Unique Paper Code : 217101

Name of the Course : **B.Sc. (H) Chemistry**

Name of the Paper : Inorganic Chemistry – I (CHHT-101)

Semester : I

Time : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Six** questions in all.
3. Question No. **1** is compulsory and carries **15** marks.
4. **All** other questions carry **12** marks each.

1. Attempt **any five** questions from the following :

   (a) Which quantum numbers reveal information about the shape, energy, orientation and size of orbitals ?

   (b) Write all the possible Orbitals when n=4. Determine maximum number of electrons which can exist in a completely filled n=4 level.

   (c) Briefly describe particle-wave duality for electron.

   (d) Describe the salient features of Pauling's Electronegativity Scale. How it varies along the group and across the period ?

   (e) Write the electronic configurations of following elements :

   (i) Cu-29; (ii) La-57; (iii) Cr-24

P.T.O.

(f) Arrange the following species in order of increasing size :

O^{-2}, F^{-}, Mg^{+2}, Na+ (5×3)

2. (a) Consider two Hydrogen atoms. In atom A, the electron is in the n = 1 orbit, in atom B, it is in the n = 4 orbit. Answer the following questions :

(i) Which atom has the ground state configuration ?

(ii) In which atom the electron moving faster ?

(iii) Which atom has the larger Ionization Energy ?

(iv) Which atom has the lower potential energy ? (4×2)

(b) Give four possible quantum numbers for a 5f electron of an atom. (4)

3. Write explanatory notes on **any three** of the following :

(a) Aufbau Principle and its limitations

(b) Pauli's Exclusion Principle for filling electrons in orbitals

(c) Electron Affinity

(d) Atomic, Ionic and Covalent radii (4×3)

4. (a) Three successive elements have Z = 17, 18, 19 (Z = atomic number), answer the following :

(i) Write their electronic configurations.

(ii) What types of ions are they expected to form ?

(iii) To which period and group of the Periodic Table they belong to ?

(iv) Arrange them in order of increasing Iionization Energy. (4×2)

(b) The Electronegativity values of noble gases are zero, while those of Halogens are the highest in each period. (4)

5. (a) Derive de Broglie's equation showing electron as a wave.

(b) Write Schrodinger's wave equation and explain all the terms involved in it.

(c) Define Uncertainty Principle. Write its mathematical representation and explain all the terms involved in it. (4×3)

6. (a) Explain effective nuclear charge Z*. Explain Slater's Rules for determining Z*. How is Z* related to (i) Ionization Energy (ii) Electronegativity (iii) Ionic Radius. (8)

(b) Distinguish between "Electron Affinity" and "Electronegativity". (4)

7. (a) Describe Physical significance of ψ and ψ^2 and concept of probability of finding the electron.

(b) Write important features of Normal and Orthogonal wave functions.

(c) The Electronegativity increases as s-character increases in the hybrid orbitals. (4×3)

8. (a) Arrange the following elements in the decreasing order of their Electronegativity

O, F, B, N and Al (4)

(b) Give the sequence in which the energy levels in an atom are filled with electrons (till atomic no. 58). Write the electronic configurations for the elements of atomic number 6, 11, 17 and 25. From this, decide and assign to which group in the Periodic Table each element belongs. (8)