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Total No. of Questions: [09]

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**B.Sc. (Hons) Chemistry (Semester –1st)**  
**INORGANIC CHEMISTRY-I**  
**Subject Code: BCHMS1-101**  
**Paper ID: [19131601]**

**Time: 03 Hours**

**Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**SECTION-A**

**[2 Marks each]**

Q1. Short answer type questions.

- a. Briefly explain the limitations of Bohr's model.
- b. What does it mean for a wave function to be normalized?
- c. What is the significance of orthogonal wave functions?
- d. Write the conditions for acceptable wave functions?
- e. Write the applications of lithium aluminium hydride.
- f. Why does the chemical reactivity of the alkali metals increase from Li to Cs?
- g. How does hybridization affect electronegativity?
- h. Briefly explain Fajan's rules.
- i. Which has larger dipole moment  $\text{NH}_3$  or  $\text{NF}_3$  and why?
- j. What is the band theory of metals?

**SECTION-B**

**[5 marks each]**

- Q2. How do you arrive at Schrodinger wave equation for H-atom starting with simple sine wave equation?
- Q3. Draw the radial distribution function curves for 2s, 2p and 3s orbitals of H-atom.
- Q4. List the two different scales of electronegativity and briefly describe the theoretical basis behind each.
- Q5. Define hydrogen bonding and explain the main theories for hydrogen bonding.
- Q6. Draw MO diagram of NO and compare the bond orders of  $\text{NO}$ ,  $\text{NO}^+$ ,  $\text{NO}^-$ .

**SECTION-C**

**[10 marks each]**

- Q7. Write down the Born-Landé equation and define the terms used in it. Use the equation to show why some crystals, which according to the radius ratio concept should adopt a coordination number of 8, in fact have a coordination number of 6.
- Q8. What are Slater's rules? Using Slater's rules, determine  $Z^*$  for-
  - a. A 3p electron in P, S, Cl, and Ar. Is the calculated value of  $Z^*$  consistent with the relative sizes of these atoms?
  - b. A 2p electron in  $\text{O}^{2-}$ ,  $\text{F}^-$ ,  $\text{Na}^+$  and  $\text{Mg}^{2+}$ . Is the calculated value of  $Z^*$  consistent with the relative sizes of these ions?
- Q9. Explain VSEPR theory. Taking few examples analyze how VSEPR theory helps to visualize the three-dimensional structure of molecules.