

- (b) What are the possible values of quantum numbers n , l , m , s for an electron in an 4f orbital ? 5
- (c) Name and draw the shapes of various d orbitals. 5
5. (a) What is Aufbau Principle ? What are its limitations ? 5
- (b) Half filled and completely filled orbitals more stable than unfilled orbitals why ? Explain. 5
- (c) What do you understand by an Orbit and Orbital ? 5

Unit III

6. (a) Define Lattice Energy. Discuss the factors on which Lattice Energy of a crystal depends. 5
- (b) Calculate the percentage ionic character of HF. Given Bond distance = $0.92\text{\AA}$ and dipole moment = 1.91D . 5
- (c) Write short notes on the following :
 (i) Polarizability
 (ii) Polarizing power. 5

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Roll No.

Exam Code : S-20

Subject Code—52503

B. Sc. EXAMINATION

(Main/Re-appear)

(Batch 2018 Onwards)

(First Semester)

CHEMISTRY

CCL-104

Inorganic Chemistry-I

(Atomic Structure and Bonding)

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Marks are indicated against each question.

1. (i) What will be the uncertainty in position of an electron if Uncertainty in its velocity is zero ?

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- (ii) How many nodes are present in each of the following $3_{dx^2-y^2}$ and 2_{px} ?
- (iii) Write the physical significance of ψ and ψ^2 .
- (iv) What is $(n + 1)$ rule ? Explain with an example.
- (v) Anhydrous $AlCl_3$ is covalent while hydrated $AlCl_3 \cdot 6H_2O$ is ionic. Explain.
- (vi) What are Bonding and Anti-bonding molecular orbitals ?
- (vii) What do you mean by terms :
 - (i) Polarizing Power
 - (ii) Polarizability
- (viii) What are Fajan's rules ?
- (ix) Draw the shapes of the following hybrid orbital sp^3d and sp^2 .
- (x) What is bond order ? How is it related to stability of a molecule ? **10×2=20**

Unit I

2. (a) What is de-Broglie equation ? Derive this equation. **5**

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- (b) If the position of an electron is measured with an accuracy of 0.002 nm. Calculate the uncertainty in the momentum of the electron. **5**
 - (c) What do you mean by Normal and Orthogonal Wave function ? **5**
3. (a) What is Schrodinger wave equation ? How will you apply this equation to Hydrogen atom ? **5**
- (b) On the basis of Heisenberg uncertainty Principle show that an electron can not exist in the nucleus.
(Radius of nucleus = $10^{-14}m$, $h = 6.6 \times 10^{-34}$, Mass of $e = 9.1 \times 10^{-31}$ kg). **5**
- (c) What are limitations of Bohr's theory ? **5**

Unit II

4. (a) What do you mean by a Node ? How many nodes are present in 2S and 3S orbitals ? **5**

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7. (a) Define Ionic bond and discuss the factors which favours the formation of an ionic bonds. **5**
- (b) Explain the following :
- (i) SO_2 has dipole moment while CO_2 does not.
- (ii) NH_3 has high value of dipole moment. **5**
- (c) How will you correlate electronegativity with percentage Ionic character of a bond in a molecule ? **5**

Unit IV

8. (a) Draw Molecular Orbital energy level diagram for CO. **5**
- (b) Calculate bond order for O_2 molecule. **5**
- (c) Explain on the basis of Molecule Orbital theory the non-existence of He_2 molecule. **5**
9. (a) What are different types of MO ? Draw their shapes. **5**
- (b) Draw Molecular Orbital energy level diagram for NO. **5**
- (c) Write the rules for LCAO method. **5**