



Roll no.....

End Semester Examination, December 2024
B.Sc.Chemistry (H) with Research – Ist Semester
Inorganic Chemistry -I (SCCH101)

Time: 2.5 hrs.

Max Marks:50

Note: **All Questions are compulsory.** However, you have to attempt 5 parts from Q1 and internal choices have been given in Q2-Q5.

Marks are indicated against each question.

PART-A

Q.1 Attempt 5 questions only:

- | | |
|--|----------------|
| (a) Which element has higher value of electron affinity, F or Cl? Why? | [CO-1] [L-2]2 |
| (b) Discuss the structure of XeO_3 . | [CO-1] [L-2]2 |
| (c) The atomic radius decreases gradually on moving left to right in any period. Explain? | [CO-1] [L-1]2 |
| (d) Write down the molecular orbital electronic configuration of C_2 & NO molecules. | [CO-1] [L-3]2 |
| (e) Write a short note on Heisenberg uncertainty principle. | [CO-1] [L-1]2 |
| (f) What are the main limitations of Bohr's theory? | [CO-1] [L-2] 2 |
| (g) Differentiate between a semiconductor and an insulator. | [CO-1] [L-2] 2 |
| | 2x5 |

PART-B

Q.2 Discuss the key features and limitations of Bohr's theory in explaining the atomic spectrum of the hydrogen atom. Derive the equation of radius and velocity of Hydrogen atom. [CO-3] [L-2]10

OR

(a) Explain the concept of effective nuclear charge and how it influences periodic properties, such as ionization enthalpy and atomic size (b) Calculate σ and Z_{eff} for p-electrons of valence shell in Cl-atom ($Z = 17$) [CO-4] [L-3]10

Q.3 Construct the Molecular Orbital (MO) diagram for heteronuclear diatomic molecules such as CO and NO. Explain their bond order, magnetic properties, and stability using the MO theory.

[CO-4][L-3]10

OR

(a) State Pauli's Exclusion Principle, Hund's Rule of maximum multiplicity, and Aufbau's Principle, and explain any one limitation of the Aufbau principle. (b) Explain de Broglie's equation and Heisenberg's Uncertainty Principle, including their significance in wave mechanics.

4]10

[CO-4] [L-

- Q.4 (a) Describe the free electron model for metallic bonding. (b) Describe various types of weak chemical forces (Van der Waals, ion-dipole, dipole-dipole, induced dipole) and analyze their significance in molecular interactions. [CO-3] [L-2]10

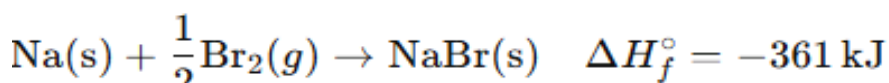
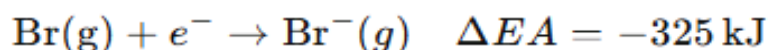
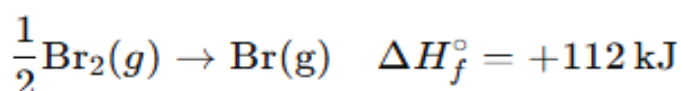
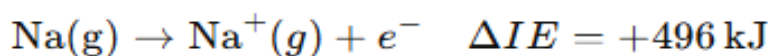
OR

State Fajans' Rule. How does the size and charge of the cation and anion affect the ionic or covalent nature of a bond according to Fajans' Rule? Arrange following compounds in order of their increasing ionic character LiCl, BeCl₂, BCl₃, CCl₄ [CO- 3] [L-2]10

- Q.5 Explain the Valence Shell Electron Pair Repulsion (VSEPR) theory and Determine the no. of bond pair and lone pair electron and molecular geometry of each ion using the VSEPR theory: (a) NH₃, (b) H₂O, (c) CO₂, (d) IF₇ (e) NO₂. [CO-2] [L-4]10

OR

- (a) A hydrogen atom initially at the ground level absorbs a photon, which excites it to the $n = 4^{\text{th}}$ level. Calculate the frequency and wavelength of the photon. (b) Calculate the lattice energy of NaBr(s), given the following thermochemical equations, where ΔIE and ΔEA are ionization energy and electron affinity, respectively.



[CO- 2] [L-4]10