GOVERNMENT DEGREE COLLEGE, NANDIKOTKUR

DEPARTMENT OF CHEMISTRY

GENERAL AND INORGANIC CHEMISTRY

SEM II PAPER -1

Unit I: Atomic Structure and Periodic Table

Short Questions:

1.State Bohr's theory of the hydrogen atom and its limitations.

2.Explain the dual nature of electrons.

3.What is Heisenberg's uncertainty principle?

4.Write the Schrödinger equation and explain its significance.

5.Define Pauli's exclusion principle.

6.State Hund's rule.

7.What is the Aufbau principle and how does it determine the electronic configuration of atoms?

8.What are radial and angular wave functions?

9.Explain periodic law and its significance in the periodic table.

10.What are the horizontal, vertical, and diagonal relationships in the periodic table?

Long Questions:

1.Discuss the electronic configuration of elements using Bohr's theory, and the significance of wave functions.

2.Explain the periodic trends in atomic radii, ionization potential, electron affinity, and electronegativity.

3.Describe the IUPAC nomenclature and group number classification in the periodic table.

4.Discuss the concept of isoelectronic species and the inert-pair effect.

5.Compare the Pauling, Mulliken-Jaffe, and Allred-Rochow definitions of electronegativity.

Unit 2: Ionic Bond

Short Questions:

1.What are the general properties of ionic compounds?

2.Define lattice energy and state the factors affecting it.

3.Explain the Born-Haber cycle with respect to ionic compounds.

4.What factors affect the thermal stability and solubility of ionic compounds?

5.Define covalent character in ionic compounds and explain Fajan's rules.

6.What is the significance of ionization potential, electron affinity, and electronegativity in ionic bond formation?

Long Questions:

1.Explain the formation of ionic compounds with the help of ionization potential, electron affinity, and electronegativity.

2.Discuss the Born-Haber cycle in detail and its application in determining the enthalpy of formation of ionic compounds.

3.Describe the polarization of ions and its effects on the physical properties (such as melting point and solubility) of ionic compounds.

4.Explain the stability of ionic compounds in terms of lattice energy and Born-Haber cycle.

Unit 3: The Covalent Bond

Short Questions:

1.What is Valence Bond theory and how does it explain the formation of covalent bonds?

2.Describe hybridization and its application to molecules like $BeCl_2$, BF_3, CH_4, and PCl_5.

3.What is the VSEPR model and how does it predict the geometry of molecules?

4.Explain the effect of electronegativity on bond formation.

5.What is Molecular Orbital theory? How does LCAO help in constructing M.O. diagrams?

6.Illustrate the M.O. diagram for diatomic molecules like N2, O2, CO, and NO.

Long Questions:

1.Discuss the Valence Bond theory and explain the hybridization in molecules such as BeCl2, BF3, and CH4.

2.Explain the VSEPR theory and predict the shapes of molecules like NH3, H2O, SF6, XeF4, and XeF6.

3.Discuss the molecular orbital theory and construct the M.O. diagram for N2, O2, CO, and NO molecules, including bond order and magnetic properties.

Unit 4: Metallic and Weak Bonds

Short Questions:

1.What is a metallic bond and how does it explain the properties of metals?

2.Describe the free electron theory and its limitations.

3.What is the band theory of metals and how does it classify conductors, semiconductors, and insulators?

4.What is hydrogen bonding? Differentiate between intra- and intermolecular hydrogen bonds.

5.What are van der Waals forces? How do they influence the properties of molecules?

Long Questions:

1.Explain the formation of metallic bonds and discuss their properties such as electrical conductivity, malleability, and ductility.

2.Describe the band theory of metals and explain how it accounts for the electrical properties of metals, semiconductors, and insulators.

3.Discuss hydrogen bonding and its effects on the physical properties of substances like water, alcohol, and acetic acid.

4.Explain van der Waals forces and their importance in the physical properties of molecular compounds.

Unit 5: Acids and Bases

Short Questions:

1.Explain the Arrhenius theory of acids and bases.

2.State Bronsted-Lowry theory of acids and bases.

3.What is the Lewis theory of acids and bases?

4.What are non-aqueous solvents? Give examples of protonic and aprotic solvents.

5.What is pH and how is it related to pKa and pKs?

6.What is salt hydrolysis? Provide an example.

7.What is Pearson's concept of acids and bases?

Long Questions:

1 Compare the Arrhenius, Bronsted-Lowry, and Lewis theories of acids and bases.

2.Discuss the role of non-aqueous solvents in acid-base reactions, particularly liquid ammonia.

3.Define the concept of pH, pKa, and pKs, and explain how they are calculated and used in acid-base equilibria.

4.Discuss the HSAB (Hard and Soft Acids and Bases) principle and its significance in chemical bonding, particularly in hard-hard and soft-soft interactions.

5.Explain the process of salt hydrolysis with examples, and discuss the types of salts formed during neutralization reactions.