ODERN
proach to

Inorganic Chemistry

B.Sc. PART-I
(I & II Semester)
(K.U./M.D.U.)

r. S.P. JAUHAR

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Syllabus

B.Sc. Ist Year (K.U.)

FIRST SEMESTER

Paper I (Theory) Inorganic Chemistry — Max. Marks : [illegible] Time : 3 [illegible]

Note : Eight questions will be set, four questions from each section. The candidate will be required to attempt five questions in all, selecting atleast two questions from each section. As far as possible questions will be short answer type and not essay type.

Section–A (23 Periods)

1. Atomic Structure

Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, orbitals. Aufbau and Pauli exclusion principles. Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater's rules.

2. Periodic Properties

Atomic and ionic radii, ionization energy, electron affinity and electronegativity–definitions, methods of determination or evaluation, trends in periodic table (in s & p block elements).

Section–B (22 Periods)

1. Covalent Bond

Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF SO_4^{2-}, ClO_4^-), Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF, ICl_2^- and H_2O. MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

2. Ionic Solids

Ionic structures (NaCl, CsCl, ZnS (Zinc Blende), CaF_2) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (mathematical derivation excluded) and Born-Haber cycle, solvation energy and its relation with solubility of ionic solids, polarising power and polarisability of ions, Fajan's rule.

SECOND SEMESTER

Paper IV (Theory) Inorganic Chemistry

Max. Marks : 33
Time : 3 Hrs.

Note : Eight questions will be set, four questions from each section. The candidate will be required to attempt five questions in all, selecting atleast two questions from each section. As far as possible questions will be short answer type and not essay type.

Section–A (23 Periods)

1. Hydrogen Bonding and Van der Waals' Forces

Hydrogen Bonding—Definition, Types, effects of hydrogen bonding on properties of substances, application.

Brief discussion of various types of Van der Waals' Forces

2. Metallic Bond and Semiconductors

Metallic Bond—Brief introduction to metallic bond, band theory of metallic bond.

Semiconductors—Introduction, types and applications.

3. s-Block Elements

Comparative study of the elements including diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in biosystems.

4. Chemistry of Noble Gases

Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides and oxyfluorides of xenon.

Section–B (22 Periods)

1. p-Block Elements

Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation).

2. Boron family (13^{th} group)

Diborane properties and structure (as an example of electron, deficient compound and multicentre bonding). Borazene chemical properties and structure : Trihalides of Boron—Trends in Lewis acid character, structure of aluminium (III) chloride.

3. Carbon Family (14^{th} group)

Catenation, $p\pi$-$d\pi$ bonding (an idea), carbides, fluorocarbons, silicates (structural aspects), silicones—general methods of preparations, properties and uses.

4. Nitrogen Family (15^{th} group)

Oxides structures of oxides of N.P. oxyacids—structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus.

5. Oxygen Family (16^{th} group)

Oxyacids of sulphur–structures and acidic strength H_2O_2—structure, properties and uses.

6. Halogen Family (17^{th} group)

Basic properties of halogen, interhalogens types properties, hydro and oxyacids of chlorine–structure and comparison of acid strength.

SYLLABUS

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