

KOLHAN UNIVERSITY, CHAIBASA
JHARKHAND



Proposed Syllabus for FYUGP, NEP-2020
(UG – Chemistry 2022, Onward)

UNIVERSITY DEPARTMENT OF CHEMISTRY
KOLHAN UNIVERSITY, CHAIBASA
WEST SINGHBHUM, JHARKHAND – 833202

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20-8-2022
Head
University Department of Chemistry
Kolhan University, Chaibasa

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20/08/2022

Barant Shubhankar
20-08-2022

Semester-I
PAPER Title: Major Paper-1 (MJ-1)
Credits: Theory-04, Practicals-02

Learning objective:

- Atomic theory and its evolution
- Elements in periodic table; physical and chemical characteristics, periodicity
- Characterize bonding between atoms, molecules, interaction and energetic, hybridization and shapes of atomic, molecular orbital's, bond parameters, bond- distances and energies.

Inorganic Chemistry-1

FM-60 Marks		Time 3hrs
Unit	Content	Hours
1	Atomic Structure: Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de' Broglie equation, Heisenberg's Uncertainty Principle and its significance, Quantum numbers and their significance. Shapes of s, p, d and f orbital's. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations, Variation of orbital energy with atomic number.	15h
2	Periodicity of Elements: S, p, d, f block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to s and p-block. (a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. (b) Atomic radii (van 'der Waals) (c) Ionic and crystal radii. (d) Covalent radii (octahedral and tetrahedral) (e) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy. (f) Electron gain enthalpy, trends of electron gain enthalpy (g) Electro negativity, Pauling, Mullikan, electro negativity and bond order, partial charge, hybridization, group electro negativity.	15h
3	Chemical Bonding: Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Expression for lattice energy. Born-Haber cycle and its application, Solvation energy. Covalent bond: Lewis structure, Valence Shell Electron Pair Repulsion Theory (VSEPR), Shapes of simple molecules and ions containing lone-and bond-pairs of electrons multiple bonding, sigma and pi-bond approach, Valence Bond theory, Hybridization containing s, p and s, p, d atomic orbital's, shapes of hybrid orbital's, Molecular orbital theory. Molecular orbital diagrams of simple homonuclear and heteronuclear diatomic molecules, MO diagrams of simple tri and tetra-atomic molecules, e.g., N ₂ , O ₂ , C ₂ , B ₂ , F ₂ , CO, NO, and their ions; HCl, BeF ₂ , CO ₂ , HCHO. Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules, polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Ionic character from dipole moment and electro negativities.	20h
4	Metallic bonding and Weak chemical forces: Metallic Bond: Qualitative idea of free electron model, Semiconductors, Insulators. Weak Chemical Forces: van 'der Waals, ion-dipole, dipole-dipole, induced dipole-dipole	10h

	interactions, hydrogen bond, effects of hydrogen bonding on melting and boiling points, solubility, dissolution.	
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Books Recommended:

- Advanced Inorganic Chemistry by Cotton and Wilkinson
- Principles of Inorganic Chemistry by Puri, Sharma and Kalia
- Inorganic Chemistry, by Moillors
- Pradeep's Inorganic Chemistry, Vol.- I, II and III
- Dinesh Inorganic Chemistry, Vol.- I, II and III
- Text Book of Inorganic Chemistry by P.L. Soni
- Selected Topics in Inorganic by Satyaprakash, Malik, Madan and Tuli
- Advanced Inorganic Chemistry by Gurdeep and Harish

Semester-I

PAPER Title: Chemistry Practical - MJ-1 LAB

FM-25 Marks

Content

- Use of primary and secondary standard solutions.
- Preparation of solutions of different Molarity/Normality.
- Estimation of carbonate and hydroxide present together in mixture.
- Estimation of carbonate and bicarbonate present together in a mixture.
- Estimation of Fe (II) and oxalic acid using standardized KMnO_4 solution.
- Estimation of oxalic acid and sodium oxalate in a given mixture.