

## Lesson Plan [Academic Session 2022-2023]

**Class: B. ScFirst Year [Isemester]**

**Subject: (CH-101) Inorganic Chemistry**

**Dr. Amit Kumar, Assistant Professor of Chemistry**

Month	Topic	Academic Activities
September, 2022	<b>Atomic Structure:</b> Idea of de Broglie matter waves, Heisenberg's uncertainty principle, Atomic orbitals, Quantum numbers, Radial and angular wave functions, normal and orthogonal wave functions, significance of $\Psi$ and $\Psi^2$ , probability distribution curves, shapes of s, p, d, f orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rules, Electronic configuration of elements, effective nuclear charge, Slater's rules.	Introduction of Syllabus and Course outcomes  Doubt solving sessions  Discussion of Previous Years Questions
October, 2022	<b>Periodic table and Atomic properties:</b> Classification of periodic table into s, p, d, f blocks, atomic and ionic radii, ionisation energy, electron affinity and electronegativity definition, methods of determination or evaluation, trend in periodic table (in s and p-block elements), Pauling, Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio. <b>Covalent Bond:</b> Valence bond theory (Heitler-London and Pauling approach) and its limitation, directional characteristics of covalent bond, various type of hybridisation and shapes of simple inorganic molecules and ions ( $\text{BeF}_2$ , $\text{BF}_3$ , $\text{CH}_4$ , $\text{PF}_5$ , $\text{SF}_6$ , $\text{IF}_7$ , $\text{SO}_4^{2-}$ , $\text{ClO}_4^-$ , $\text{NO}_3^-$ )	Assignment on various topics of Atomic Structure  Discussion on Assignment  Doubt solving sessions  Discussion of Previous Years Questions
November, 2022	<b>Covalent Bond:</b> Valence shell electron pair repulsion (VSEPR) theory to $\text{NH}_3$ , $\text{H}_3\text{O}^+$ , $\text{SF}_4$ , $\text{ClF}_3$ , $\text{H}_2\text{O}$ , $\text{SnCl}_2$ , $\text{ClO}_3^-$ and $\text{ICl}_2^-$ . Molecular orbital theory of homonuclear ( $\text{N}_2$ , $\text{O}_2$ ) heteronuclear (CO and NO) diatomic molecules and ions, bond energy, bond angle, bond length and dipole moments, percentage ionic character from dipole moment and electronegativity difference. <b>Ionic Solids:</b> Ionic structures ( $\text{NaCl}$ , $\text{CsCl}$ , $\text{ZnS}$ (Zinc blende), $\text{CaF}_2$ ) size effects, radius ratio rule and its limitations, Madelung constant, Stoichiometric and Non stoichiometric defects in crystals	Class Test of Periodic Table and Atomic properties Discussion on Test Presentation of Students Doubt solving sessions Discussion of Previous Years Questions
December, 2022	<b>Ionic Solids:</b> Lattice energy (mathematical derivation excluded) and Born-Haber cycle, Solvation energy and its relation with solubility of Ionic solids, Polarizing power and Polarisability of ions, Fajan's rule. <b>Revision of syllabus</b>	Doubt solving sessions  Discussion of Previous Years Questions

## Lesson Plan [Academic Session 2022-2023]

Class: B. Sc Second Year [III semester]

Subject: (CH-201) Inorganic Chemistry

**Dr. Amit Kumar, Assistant Professor of Chemistry**

Month	Topic	Academic Activities
September, 2022	<b>Chemistry of d-Block elements</b> Definition of transition elements, position in the periodic table, General characteristic properties of d-Block elements, Comparison of properties of 3d elements with 4d and 5d elements with reference only to ionic radii, oxidation state, magnetic and spectral properties and stereo chemistry.	Introduction of Syllabus and Course outcomes Doubt solving sessions Discussion of Previous Years Questions
October, 2022	<b>Chemistry of d-Block elements</b> Stability of various oxidation states and e.m.f (Latimer and Frost diagrams), Structure and properties of some compounds of transition elements- $\text{TiO}_2$ , $\text{VOCl}_2$ , $\text{FeCl}_3$ , $\text{CuCl}_2$ and $\text{Ni}(\text{CO})_4$ , <b>Coordination Compounds:</b> Werner's theory of coordination compounds, effective atomic number, chelates, nomenclature of coordination compounds, Isomerism in coordination compounds,	Sessional Test of Chemistry of d-block elements Discussion on Test Doubt solving sessions Discussion of Previous Years Questions
November, 2022	<b>Coordination Compounds:</b> Valence bond theory of transition metal complexes. <b>Non-aqueous solvents:</b> Physical properties of solvents, types of solvents and their general characteristics	Class Test of Coordination compds Discussion on Test Doubt solving sessions Discussion of Previous Years Questions

<b>December, 2022</b>	<b>Non-aqueous solvents:</b> Reactions in non-aqueous solvents with reference to liquid NH <sub>3</sub> and liquid SO <sub>2</sub> . <b>Revision of syllabus</b>	Doubt solving sessions Discussion of Previous Years Questions
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**Lesson Plan [Academic session 2022-2023]**

**Class: B. Sc Third Year [Vsemester]**

**Subject: (CH-301) Inorganic Chemistry**

**Dr. Amit Kumar, Assistant Professor of Chemistry**

<b>Month</b>	<b>Topic</b>	<b>Academic Activities</b>
<b>September, 2022</b>	<b>Metal-Ligand Bonding in Transition Metal complexes:</b> Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planer complexes, factors affecting the crystal field parameters.	Introduction of Syllabus and Course outcomes Test to identify Slow and Advanced Learners Doubt solving sessions Discussion of Previous Years Questions
<b>October, 2022</b>	<b>Thermodynamics and Kinetic Aspects of metal complexes:</b> A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, Irving William Series, substitution reactions of square planer complexes of Pt [II], Trans effect.	Assignment on M-L Bonding in Transition Metal complexes Discussion on Assignment Doubt solving sessions Discussion of Previous Years Questions
<b>November, 2022</b>	<b>Magnetic properties of Transition metal complexes:</b> Types of magnetic materials, magnetic susceptibility, method of determining magnetic susceptibility, spin only formula, L-S coupling, correlation of $\mu_s$ and $\mu_{eff}$ values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes. <b>Electronic spectra of Transition metal</b>	Class Test of Magnetic properties of Transition metal complexes Discussion on Test Presentation of Students Doubt solving sessions

	<b>complexes:</b> Selection rules for d-d transition, spectroscopic ground states, spectrochemical series,	Discussion of Previous Years Questions
<b>December, 2022</b>	<b>Electronic spectra of Transition metal complexes:</b> Orgel energy level diagram for $d^1$ and $d^9$ states, discussion of electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{+3}$ complex ion. <b>Revision of syllabus</b>	Doubt solving sessions Discussion of Previous Years Questions

### Lesson Plan [Academic session 2022-2023]

**Class: B. Sc Third Year [Vsemester]**

**Subject: (CH-302) Physical Chemistry**

**Dr. Amit Kumar, Assistant Professor of Chemistry**

Month	Topic	Academic Activities
<b>September, 2022</b>	<b>Physical Properties and Molecular Structure:</b> Optical activity, polarization-(Clausius-Mossotti equation derivation excluded). Orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetism	Introduction of Syllabus and Course outcomes  Doubt solving sessions  Discussion of Previous Years Questions
<b>October, 2022</b>	<b>Spectroscopy:</b> Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born-oppenheimer approximation, Degrees of freedom. <b>Rotational Spectrum:</b> Selection rules, Energy levels of rigid rotator (semi-classical principles), rotational spectra of diatomic molecules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length and isotopic effect.	Sessional Test of Physical Properties and Molecular Structure  Discussion on Test  Doubt solving sessions  Discussion of Previous Years Questions
<b>November, 2022</b>	<b>Vibrational spectrum:</b> Selection rules, Energy levels of simple harmonic oscillator, pure vibrational spectrum of diatomic molecules, determination of force constant and qualitative relation of force constant and bond energy, idea of vibrational frequencies of different functional groups. <b>Raman Spectrum:</b> Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra <b>Quantum Mechanics-I:</b> Black-body radiation, Plank's radiation law, photoelectric effect, postulates of quantum	Doubt solving sessions  Discussion of Previous Years Questions

	mechanics, quantum mechanical operators, commutation relations, Hamiltonian operator,	
<b>December, 2022</b>	<b>Quantum Mechanics-I:</b> Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box. <b>Revision of syllabus</b>	Doubt solving sessions Discussion of Previous Years Questions