

Lesson Plan

Name of the Faculty : **Dr. Jasbir**
Class : **B. Sc- I**
Semester : **First Semester (2023-24)**
Subject : **Inorganic Chemistry, Physical Chemistry & Chemistry Practical.**
Paper Code : **CHE 101 A, CHE 101 B, CHP 101**

Lectures	Topic (including assignment and test)
July & August 2023	<p>Inorganic Chemistry: 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, d orbitals.</p> <p>Physical Chemistry: Liquid States: Structure of liquids. Properties of liquids, surface tension, viscosity vapour pressure and optical rotations and their determination.</p> <p>Chemistry Practical: Redox titrations: Determination of Fe²⁺, C₂O₄²⁻ (using KMnO₄, K₂Cr₂O₇), Iodometric titrations: Determination of Cu²⁺ using standard hypo.</p>
September 2023	<p>Inorganic Chemistry: Periodic Properties: General principles of periodic table: Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater's rules. Atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, methods of determination or evaluation, trends in periodic table (in s & p block).</p> <p>Physical Chemistry: Solid State: Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of crystals. Definition of unit cell & space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl. Liquid crystals: Difference between solids, liquids and liquid crystals, types of liquid crystals. Applications of liquid crystals.</p> <p>Chemistry Practical: Complexometric titrations: Determination of Mg²⁺, Zn²⁺ by</p>

	EDTA. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
October 2023	Inorganic Chemistry: 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. Valence shell electron pair repulsion (VSEPR) theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- and H_2O . MO theory of heteronuclear diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.
November & December 2023	Inorganic Chemistry: Ionic Solids: Ionic structures radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

Signature
Dr. Jasbir

Lesson Plan

Name of the Faculty : Dr. Jasbir
Class : B.Sc- II
Semester : Third Semester (2023-24)
Paper Code : CHE 201A, CHP 201

Lectures	Topic (including assignment and test)
July & August 2023	<p>Inorganic Chemistry: Chemistry of Elements of Ist transition series: Definition of transition elements, position in the periodic table, General characteristics & properties of Ist transition elements, Structures & properties of some compounds of transition elements – TiO₂, VOCl₂, FeCl₃, CuCl₂ and Ni (CO)₄.</p> <p>Physical Chemistry Chemical Equilibrium Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and its applications Clapeyron equation and Clausius – Clapeyron equation its applications.</p>
September 2023	<p>Inorganic Chemistry : Chemistry of Elements of IInd & IIIrd transition series: General characteristics and properties of the IInd and IIIrd transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry.</p>
October 2023	<p>Inorganic Chemistry: Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature & isomerism in coordination compounds, valence bond theory of transition metal complexes Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂.</p>
November & December 2023	<p>Distribution Law Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium</p>

	<p>constant of potassium tri-iodide complex and process of extraction.</p> <p>Revision & Semester Exams</p>
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Lesson Plan

Name of the Faculty : Dr. Jasbir
Class : B.Sc- III
Semester : Fifth Semester (2023-24)
Paper Code : CHE 301A, CHE 301C, & CHP 301

Lectures	Topic (including assignment and test)
July & August 2023	<p>Inorganic Chemistry : Metal-ligand Bonding in Transition Metal Complexes: Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.</p> <p>Chemistry Practical: Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insoluble): Pb^{2+}, Hg^{2+}, Hg^{22+}, Ag^+, Bi^{3+}, Cu^{2+}, Cd^{2+}, As^{3+}, Sb^{3+}, Sn^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}, Thin Layer Chromatography: Determination of R_f values and identification of organic compounds (a) Separation of green leaf pigments (spinach leaves may be used) (b) Separation of a mixture of colored organic compounds using common organic solvents.</p>
September 2023	<p>Inorganic Chemistry : Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt(II).</p> <p>Chemistry Practical: Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insoluble): Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, NH_4^+, CO_3^{2-}, S^{2-}, SO_3^{2-}, $S_2O_3^{2-}$, NO_2^-, CH_3COO^-, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-}, $C_2O_4^{2-}$, PO_4^{3-}, BO_3^{3-}</p>
October 2023	<p>Physical Chemistry: Spectroscopy-I Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Bornoppenheimer approximation, Degrees of freedom.</p> <p>Rotational Spectrum Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using</p>

	<p>population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.</p> <p>Inorganic Chemistry : Magnetic Properties of Transition Metal Complexes Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of s and g_{eff} values, orbital contribution to magnetic moments. Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d_1 and d_9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.</p> <p>Chemistry Practical: Steam distillation: Naphthalene from its suspension in water Separation of <i>o</i>- and <i>p</i>-nitrophenols, Column chromatography: Separation of fluorescein & methylene blue Separation of leaf pigments of spinach leaves.</p>
November & December 2023	<p>Physical Chemistry Spectroscopy-II Vibrational spectrum Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups.</p> <p>Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.</p> <p>Revision & Semester Exams</p>

Tau Devi Lal Govt. College for Women, Murthal

Lesson Plan

Name of the Faculty : Dr. Jasbir
Class & Sem. : B.Sc- I, 2nd Semester
Session : 2023-24
Subject : CHE 102A, CHE 102C, CHP-102.

Lectures	Topic (Including Assignment and Test)
Jan. 2024	<p>Inorganic Chemistry: Hydrogen Bonding & Vander Waals Forces Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces Metallic Bond and Semiconductors Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond Semiconductors- Introduction, types and applications.</p> <p>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. Chemistry of Noble Gases: Chemical properties, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon</p>
Feb. 2024	<p>Inorganic Chemistry: p-Block Elements: Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation). Boron family: Diborane – properties and structure (as an example of electron – deficient compound and multicenter bonding), Borazine – chemical properties and structure Trihalides of Boron – Trends in Lewis acid character structure of Aluminium (III) chloride. Carbon Family: Catenation, $p\pi-d\pi$ bonding (an idea), carbides, fluorocarbons, silicates structural aspects), silicones – general methods of preparations, properties and uses.</p> <p>Physical Chemistry: Electrochemistry: Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Arrhenius theory of ionization, Ostwald’s Dilution Law. Debye- Huckel – Onsager’s equation for strong electrolytes, Transport number, definition and determination by Hittorf’s methods.</p>

<p>March 2024</p>	<p>Nitrogen Family: 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. Oxygen Family: Oxyacids of Sulphur-structures and acidic strength H₂O₂ –structure, properties and uses. Halogen Family: Basic properties of halogen, interhalogens types properties, hydro and oxyacids of Chlorine-structure and comparison of acid strength.</p> <p>Practicals: Iodometric titrations: Determination of Cu²⁺ (using standard hypo Solution j.</p> <ol style="list-style-type: none"> 1. Paper Chromatography 2. Qualitative Analysis of the any one of the followin Inorganic cations and anions by paper chromatography (Pb'+ Cu'+, Ca²⁺+ Ni + , Cl- Bf, I" and P04³and NOö).
<p>April 2024</p>	<p>Physical Chemistry <u>Electrochemistry-II:</u> Kohlarusch's Law, calculation of molar ionic conductance and effect of viscosity te mperature & pressure on it. Application of Kohlarusch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Definition of. pH and pKa, Buffer solution, Buffer action , Henderson Hazel equation, Buffer mechanism of buffer aqtion .</p> <p>Revision & Semester Exams</p>

Lesson Plan

Name of the Faculty : Dr. Jasbir
Class & Sem. : B.Sc- II, 4th Semester
Session : 2023-24
Subject : CHE 202A, CHE 202B.

Lectures	Topic (Including Assignment and Test)
Jan. 2024	<p>Inorganic Chemistry: Lanthanides: Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. Chemistry of analysis of various groups of basic radicals, Theory of precipitation, coprecipitation, post-precipitation, purification of precipitates.</p> <p>Physical Chemistry Electrochemistry-III electrolytic and Galvanic cells – reversible & Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement, Weston standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction (G, H & K). Types of reversible electrodes – metal metal ion gas electrode, metal –insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications.</p>
Feb. 2024	<p>Inorganic Chemistry: Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.</p> <p>Physical Chemistry: Electrochemistry: Concentration cells with and without transference, LJP, application of EMF measurement, potentiometric titration, Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.</p>

March 2024	Inorganic Chemistry: Theory of Qualitative and Quantitative Inorganic Analysis: Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.
April 2024	Inorganic Chemistry: Theory of Qualitative and Quantitative Inorganic Analysis-II Chemistry of analysis of various groups of basic radicals, Theory of precipitation, coprecipitation, Post-precipitation, purification of precipitates. Revision and Test

Lesson Plan

Name of the Faculty : **Dr. Jasbir**
Class : **B.Sc- III, 6th Semester**
Session : **2023-24**
Subject : **CHE 302A, CHE 302B, CHP 302**

Lectures	Topic (Including Assignment and Test)
Jan. 2024	<p>Inorganic Chemistry: Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal-ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls. Silicones and phosphazenes, preparation, properties, structure and uses.</p> <p>Physical Chemistry: Solutions: Dilute Solutions and Colligative Properties Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.</p>
Feb. 2024	<p>Inorganic Chemistry: Acids and Bases, HSAB Concept: Arrhenius, Bronsted Lowry, the Lux Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of HSAB. Symbiosis, electronegativity, hardness and softness.</p> <p>Physical Chemistry: Phase Equilibrium Statement and meaning of the terms – phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system – Example – water and Sulphur systems. Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilverisation of lead</p>

	<p>Chemistry Practical: To determine the molecular weight of a non-volatile solute by Rast Method, To standardize the given acid solution (mono, dibasic acid) Ph metrically.</p>
<p>March 2024</p>	<p>Inorganic Chemistry: Bioinorganic Chemistry: Essential and trace elements in biological processes, metalloporphyrin with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca²⁺. Nitrogen fixation.</p> <p>Chemistry Practical: To prepare o-chlorobenzoic acid from anthranilic acid, To prepare p-bromoaniline from p-Bromo acetanilide. To prepare m-nitroaniline from m-dinitrobenzene, To prepare S-Benzyl-iso-tiotropium chloride from thiourea.</p>
<p>April 2024</p>	<p>Chemistry Practical: To determine the strength of the given acid solution (mono and dibasic acid) conductometrically, To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically, To determine the strength of given acid solution (mono and dibasic acid) potentiometrically.</p> <p>Revision and Test</p>