



SMRJ Government College, Siwani (Bhiwani)

(Affiliated to Chaudhary Bansi Lal University, Bhiwani)

Session: 2024-25

Lesson Plan

(Department of Chemistry)



Teacher: Dr. Mukesh Rani

Class: B.Sc. 1

Course Type & Title & Course Code: Chemistry-I (24UN-CHE-101)

Semester: 1st Sem

Credits: 3

Maximum Marks: 50

Internal Assessment Marks: 20

End Term Exam Marks: 20

Practical Marks: 30

Course Outcomes: After completing this course, the learner will be able to:

1. Enable to understand the basis of quantum mechanics and structural idea and relevance in describing shapes of s, p and d orbitals.
2. To learn about role of temperature and pressure to establish the state of gases and describe the concept of critical constants of real gases.
3. Get knowledge about the electrophile/nucleophile and its role in mechanism of preparation of organic compounds.
4. To know the physical properties, morphology and crystalline study of liquid and different type of solids.
5. Hand on practice in preparation of solutions, compounds, estimation and determination of physical properties of some compounds

| Sr. No. | Week/Month, 2024 | Unit/ Topic/ Chapter to be covered | Assignment/ Test/ Remarks, if any |
|---------|-------------------------|--|-----------------------------------|
| 1 | 22.07.2024 – 27.07.2024 | Atomic Structure Dual behaviour of matter and radiation, de Broglie's relation, Heisenberg's uncertainty principle, concept of atomic orbitals, significance of quantum numbers, | |
| 2 | 29.07.2024 – 03.08.2024 | radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2 , | |
| 3 | 05.08.2024 – 10.08.2024 | shapes of s, p, d, f orbitals, Rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules | Test |
| 4 | 12.08.2024 – 17.08.2024 | Periodic table and atomic properties Classification of periodic table, definition of atomic and ionic radii, ionisation energy, electron affinity and electronegativity | |
| 5 | 19.08.2024 – 24.08.2024 | 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 | |

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| 6 | 26.08.2024 – 31.08.2024 | Gaseous State Kinetic theory of gases, Maxwell's distribution of velocities and energies (derivation excluded) | Assignment |
| 7 | 02.09.2024 – 07.09.2024 | Calculation of root mean square velocity, average velocity, and most probable velocity. | |
| 8 | 09.09.2024 – 14.09.2024 | Collision diameter, collision number, collision frequency and mean free path (Derivations excluded), | |
| 9 | 16.09.2024 – 21.09.2024 | Deviation of Real gases from ideal behaviour, Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) | Mid Term Exam |
| 10 | 23.09.2024 – 28.09.2024 | Critical Phenomenon Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal's constants (Derivation excluded) | |
| 11 | 30.09.2024 – 05.10.2024 | Structure and Bonding Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation, inductive effect, Electromeric effect and their comparison. | |
| 12 | 07.10.2024 – 12.10.2024 | Mechanism of Organic Reactions Curved arrow notation, homolytic and heterolytic bond fission. Types of reagents: electrophiles and nucleophiles. | Seminar |
| 13 | 14.10.2024 – 19.10.2024 | Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization and Pericyclic reactions. | |
| 14 | 21.10.2024 – 26.10.2024 | Reactive intermediates: Carbocations, carbanions, free radicals, carbenes (structure & stability) | Test |
| 15 | 04.11.2024 – 09.11.2024 | Liquid State Structure of liquids, Properties of liquids – surface tension, refractive index, viscosity, vapour pressure and optical rotation | |
| 16 | 11.11.2024 – 16.11.2024 | Solid State Classification of solids, Law of constancy of interfacial angles, law of rational indices | |
| 17 | 18.11.2024 – 22.11.2024 | Revision | |

Recommended Books/ E resources/ LMS:

1. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India.
2. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 1, 6th Edition, McGraw Hill Education.
3. Clayden, J.; Greeves, N.; Warren, S. (2012), Organic Chemistry, Oxford.
4. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), Senior Practical Physical Chemistry, R. Chand & Co, New Delhi.
6. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons, 1981.

Signature of the Teacher Concerned

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22/11/24



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Session: 2024-25

Lesson Plan

(Department of Chemistry)



Teacher: Dr. Mukesh Rani

Class: B.Sc. II

Course Type & Title & Course Code: Chemical Equilibria & Functional Group Organic (20U CHE 201)

Coordination Chemistry and Chemical Kinetics (20U CHE 202)

Semester: 3rd Sem

Credits: 2+2

Maximum Marks: 50

Internal Assessment Marks: 10

End Term Exam Marks: 40

Practical Marks: 40+10

Course Outcomes: After completing this course, the learner will be able to:


1. Enable to understand the basis of chemical equilibrium, equilibrium constant equilibrium constant equation. Le-Chatelier's principle and its applications
2. Enable to understand the basis of Nernst distribution law Modification of distribution law Applications of distribution law, Nomenclature,
3. Get detailed knowledge about the structure and bonding of Carboxylic acids and its derivatives, physical properties. Preparation, chemical reactions, acidity of carboxylic acids

| Sr. No. | Week/Month, 2024 | Unit/ Topic/ Chapter to be covered | Assignment/ Test/ |
|---------|-------------------------|--|-------------------|
| 1 | 22.07.2024 – 27.07.2024 | Chemical Equilibrium: Equilibrium constant and free energy, concept chemical potential, | |
| 2 | 29.07.2024 – 03.08.2024 | Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van'tHoff reaction isochore, Van'tHoff reaction isotherm. | |
| 3 | 05.08.2024 – 10.08.2024 | Le-Chatelier's principle and its applications, Clapeyron equation and Clausius- Clapeyron equation & its applications. | Test |
| 4 | 12.08.2024 – 17.08.2024 | Nernst distribution law-its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. | |
| 5 | 19.08.2024 – 24.08.2024 | Applications of distribution law: Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride, Determination of equilibrium constant of potassium tri-iodide complex and process of extraction. | |
| 6 | 26.08.2024 – 31.08.2024 | Carboxylic Acids I: Nomenclature, structure and bonding of Carboxylic acids, physical properties, acidity of carboxylic acids, | Assignment |

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| 7 | 02.09.2024 – 07.09.2024 | effects of substituents on acid strength. Methods of preparation of carboxylic acids. | |
| 8 | 09.09.2024 – 14.09.2024 | Reaction and mechanism of Hell-Volhard-Zelinsky reaction, reduction of carboxylic acids, decarboxylation. | |
| 9 | 16.09.2024 – 21.09.2024 | Carboxylic acids II: Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides | Mid Term Exam |
| 10 | 23.09.2024 – 28.09.2024 | Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic). | |
| 11 | 30.09.2024 – 05.10.2024 | Coordination Chemistry-I: Werner's theory of coordination compound nomenclature of coordination compounds, Isomerism in coordination compounds, valence bond theory of transition metal complexes, and its limitations. Crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal field splitting. | |
| 12 | 07.10.2024 – 12.10.2024 | Coordination Chemistry-II: Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, orbital contribution to magnetic moments, application of magnetic moment data for 3d-metal complexes, Types of electronic transitions, | Seminar |
| 13 | 14.10.2025 – 19.10.2024 | selection rules for d-d transitions, spectroscopic ground state, spectrochemical series, Orgel- energy level diagram for d1 and d' state, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion. | |
| 14 | 21.10.2024 – 26.10.2024 | Kinetics-I: Rate of reaction, rate equation, factors influencing the rate of reaction: concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order and second and third order reaction. | Test |
| 15 | 04.11.2024 – 09.11.2024 | Half-life period of a reaction. Methods of determination of order of reaction, Consecutive Reaction, Series reaction, Parallel reactions | |
| 16 | 11.11.2024 – 16.11.2024 | Kinetics-II: Effect of temperature on the rate of reaction - Arrhenius equation. Theories of reaction rate - Simple collision theory for unimolecular reaction, | |
| 17 | 18.11.2024 – 22.11.2024 | Transition state theory,,Enzymatic reaction: Michaelis-Menten treatment, Acid-Base Catalysed reactions | |

Recommended Books/ E resources/ LMS:

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
5. Puri, B. R., Pathania, M. S. & Sharma, L. R., Principles of Physical Chemistry, Vishal Publishing Co.
6. Atkins, P.W.; Paula, J.de. (2014), Atkin's Physical Chemistry Ed., 10th Edition, Oxford University Press.
7. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 1, 6th Edition, McGraw Hill Education.
8. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt.Ltd. (Pearson Education).
9. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt.Ltd. (Pearson Education).


Signature of the teacher concerned



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Lesson Plan

(Department of Chemistry)



Teacher: Dr. Mukesh Rani

Class: B.Sc. II

Course Type & Title & Course Code: Organometallics & Bioinorganic (20U CHE 501)

Chemistry of Polymers (20U CHE 502)

Semester: 3rd Sem

Credits: 2+2

Maximum Marks: 50

Internal Assessment Marks: 10

End Term Exam Marks: 40

Practical Marks: 50

Course Outcomes: After completing this course, the learner will be able to:

1. Enable to understand the basic concept of organometallics compounds, EAN rule, detail concept of metal carbonyl compounds, mononuclear to polynuclear carbonyl 3d series and Catalysis by Organometallic Compounds
2. Get detailed knowledge about the structure and bonding of Metal alkyl, Ferrocene and Zeise's salt
3. Provides important information regarding Molecular Weight, Glass transition temperature & Crystallization of Polymers, Chemistry of polymerization and its techniques.

| Sr. No. | Week/Month, 2024 | Unit/ Topic/ Chapter to be covered | Assignment/ Test/ Remarks, if any |
|---------|-------------------------|---|-----------------------------------|
| 1 | 22.07.2024 – 27.07.2024 | Organometallic Compounds-I: Definition and classification of organometallic compounds on the basis of bond type. Concept of hapticity of organic ligands. Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. | |
| 2 | 29.07.2024 – 03.08.2024 | General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series. | |
| 3 | 05.08.2024 – 10.08.2024 | Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π -acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding | Test |
| 4 | 12.08.2024 – 17.08.2024 | Organometallic Compounds-II: Zeise's salt: Preparation and structure, evidences of synergic effect and comparison of synergic effect with that in carbonyls. | |
| 5 | 19.08.2024 – 24.08.2024 | Metal Alkyls. important structural features of methyl lithium (tetramer) and trialkylaluminium (dimer), | |
| 6 | 26.08.2024 – 31.08.2024 | concept of multicentre bonding in these compounds. Ferrocene: Preparation and reactions (acetylation, alkylation, metallation, Mannich Condensation). Structure and aromaticity. Comparison of | Assignment |

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| | | aromaticity and reactivity with that of benzene. | |
| 7 | 02.09.2024 – 07.09.2024 | Catalysis by Organometallic: Compounds Study of the following industrial processes and their mechanism: Alkene hydrogenation (Wilkinson's Catalyst) | |
| 8 | 09.09.2024 – 14.09.2024 | Synthetic gasoline (Fischer Tropsch reaction) 3. Polymerisation of ethene using Ziegler-Natta catalyst | |
| 9 | 16.09.2024 – 21.09.2024 | Bioinorganic Chemistry: Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals. Sodium / K-pump, carbonic anhydrase and carboxypeptidase. | Mid Term Exam |
| 10 | 23.09.2024 – 28.09.2024 | Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its application in bio-systems, Haemoglobin, Myoglobin; Storage and transfer of iron. | |
| 11 | 30.09.2024 – 05.10.2024 | Introduction and history of polymeric materials: Different schemes of classification of polymers, polymer nomenclature, molecular forces and chemical bonding in polymers, texture of polymers, functionality and its importance: | |
| 12 | 07.10.2024 – 12.10.2024 | criteria for synthetic polymer formation, classification of polymerization processes, relationships between functionality, extent of reaction and degree of polymerization, | Seminar |
| 13 | 14.10.2026 – 19.10.2024 | Kinetics of polymerization: Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and. | |
| 14 | 21.10.2024 – 26.10.2024 | coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques | Test |
| 15 | 04.11.2024 – 09.11.2024 | Conducting polymers: structure, properties and application of the following polymers: polyacetylene, polyaniline, poly(p-phenylene sulphide), polypyrrole, polythiophene. | |
| 16 | 11.11.2024 – 16.11.2024 | Polymers of commercial importance: Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene, poly(vinyl chloride), poly(vinyl acetate), acrylic polymers, fluoro polymers, | |
| 17 | 18.11.2024 – 22.11.2024 | Brief introduction to preparation, structure, properties and application of the following polymers: polyamides, phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers. | |

Recommended Books/ E resources/ LMS:

1. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
2. Application of Spectroscopy of Organic Compounds, J.R. Dyer, Prentice Hall.
3. Spectroscopic Methods in Organic Chemistry, D.H. Williams, I. Fleming, Tata McGraw-Hill.
4. Billmeyer, F.W. Textbook of Polymer Science, 2nd Ed. Wiley Interscience, 1971, Ghosh, P. Polymer Science & Technology, Tata McGraw-Hill Education, 1991.
5. Seymour, R.B. &Carraher, C.E. Polymer Chemistry: An Introduction, Marcel Dekker, Inc. New York, 1981.


Signature of the Teacher Concerned