

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

Course Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23MIDSCCHE102**

Type of course : **Minor Elective course MIDSC**  
Name of course : **Fundamentals of chemistry I**  
Total Marks : **50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02	Teaching Hours per Week: 02	Theory	External 25 Marks
	Teaching Hours per Semester: 30		Internal 25 Marks

**Course Objectives:**

1. To understand the core concepts of valence bond theories.
2. To understand organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.

**Course Outcome:**

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
2. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
3. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

Unit	Topic	Credit	Hr
1	<b>CHEMICAL BONDING</b> <b>(A) Valence Bond Theory:</b> Introduction; Hitler-London theory (energy changes taking place during the formation of H <sub>2</sub> Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covalent bond, ionic bond, Coordination covalent bond Coordination bond and Van der Waals force bond. Hybridization and	1	15

	<p>types of hybridization. SP, Sp<sup>2</sup>, Sp<sup>3</sup>, dsp<sup>2</sup>, sp<sup>3</sup>d, sp<sup>3</sup>d<sup>2</sup></p> <p><b>(B) Molecular Orbital Theory:</b> Introduction. M.O. Treatment for H<sub>2</sub> molecules Bonding molecular orbitals and Anti-bonding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A<sub>2</sub> type (H<sub>2</sub>; H<sub>2</sub><sup>+</sup>; N<sub>2</sub>; N<sub>2</sub><sup>+</sup>; O<sub>2</sub>; O<sub>2</sub><sup>+</sup>; O<sub>2</sub><sup>-2</sup>)</p> <p>Formation and configuration of Molecular orbital in a Hetero-nuclear diatomic species of AB type (CO; CN; CN<sup>-</sup>; NO; NO<sup>-</sup>)</p>		
2	<p><b>(A) Structure And Properties</b></p> <p>Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anilinium ion, Acetate ion), Hyper conjugation ( O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals)</p> <p><b>(B) Reaction Mechanism</b></p> <p>Fission of Covalent bond (With at least one example of each intermediates ), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic &amp; Electrophilic), Elimination reactions (E1&amp; E2), Addition reactions (Nucleophilic &amp; Electrophilic)</p>	1	15
<p><b>Books Recommended:</b></p> <p><b>Inorganic Chemistry</b></p> <ol style="list-style-type: none"> <li>1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.</li> <li>2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3<sup>rd</sup> edn, ELPS Oxford University Press, 1999..</li> <li>3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.</li> <li>4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.</li> <li>5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.</li> <li>6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.</li> </ol> <p><b>Organic Chemistry</b></p> <ol style="list-style-type: none"> <li>1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.</li> </ol>			

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.
3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.
4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

**Further Reading:**

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5<sup>th</sup> edn.Oxferd 1994 7thedn-2002.

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Program Name : **B. Sc. Chemistry** Semester : **I**  
**PROGRAM CODE : SCIUG102**  
**COURSE CODE : SC23PMIDSCCHE102**

**Type of Course : Practicals Minor (Elective) Discipline Specific Course PMIDSC**

**Name of Course : Practical's for Fundamentals of chemistry I**

**Total Marks : 50**

**Effective from June 2023 Under NEP 2020**

Total Credits : 02    Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 10	Practicals	External 25 Marks
		Internal 25 Marks

**Course Objectives:**

1. To identify the organic components.
2. Preparation of solutions and their standardization.

**Course Outcomes:**

1. Students will gain a comprehensive knowledge and skills in standardization and preparation of solutions for carrying out reactions.
2. To understand basic methods to identify the compounds on the basis of M. Pt or b. Pt.

Sr.No.	List of Practicals	Credit	Hr
1	<b>Organic Chemistry (Any six)</b> 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative. 2) Candidate should perform the analysis of at least 06 compounds. List of compounds <b>Acids:</b> Benzoic acid. Cinnamic acid, Phthalic acid. Oxalic acid. Succinic acid. <b>Phenols:</b> $\alpha$ -Naphthol. $\beta$ -Naphthol. <b>Bases:</b> <i>p</i> -Toluidine, Diphenylamine. Aniline. Methyl aniline. <b>Neutrals:</b> Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, <i>m</i> -Dinitrobenzene, Urea, Thiourea, Toluene. Acetone,	1	30

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	<p><b>Standardization : (Any Four)</b></p> <ol style="list-style-type: none"> <li>1. Preparation of standard solution of succinic acid and standardization of NaOH / KOH</li> <li>2. Preparation of standard solution of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> and standardization of I<sub>2</sub> solution.</li> <li>3 .Preparation of standard solution of EDTA and estimation of Ca<sup>+2</sup> / Mg<sup>+2</sup> in CaCl<sub>2</sub> / MgCl<sub>2</sub> solution.</li> <li>4. Preparation of standard solution of Oxalic acid and standardization of KMnO<sub>4</sub> solution.</li> <li>5. Preparation of standard solution of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and standardization of FeSO<sub>4</sub> solution.</li> <li>6. Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions.</li> <li>7. Preparation of standard stock solution of HCl by v/v method and their different dilutions.</li> </ol>	1	30
<p><b>Books Recommended:</b></p> <ol style="list-style-type: none"> <li>1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. &amp; et Al. publisher S. Chand's, Paperback December 2010.</li> <li>2.Basic Principles of Practical Chemistry, by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012</li> <li>3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons. By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.</li> </ol> <p><b>Further Reading:</b></p> <ol style="list-style-type: none"> <li>1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.</li> <li>2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal &amp; Company, 2020.</li> </ol>			