Re-Acoredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: પરિપત્ર :–

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન અનુસ્નાતક અભ્યાસક્રમ ચલાવતી તમામ કોલેજોનાં આચાર્યશ્રીઓ તથા વિભાગીય વડાશ્રીને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc.Sem. 4 ના Pharmaceutical Chemistry, Organic Chemistry, Physical Chemistry, Enviornmental Chemistry અને Analytical Chemistry ના અભ્યાસક્રમ સંદર્ભે રસાયણશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૦૪/૧૨/૨૦૨૩ની સભાના ઠરાવ ક્રમાંક :૦૫ અન્વયે નીચે મુજબ કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાના અધ્યક્ષશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિદ્યાશાખાવતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૦૬/૧૨/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૪૬ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

રસાયણશાસ્ત્ર વિષયનીઅભ્યાસ સમિતિની તા.૦૪/૧૨/૨૦૨૩ ની સભાનાં ઠરાવ ક્રમાંકઃ૦૫

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc.Chemistry Sem.-4 નો Pharmaceutical Chemistry, Organic Chemistry, Physical Chemistry, Enviornmental Chemistry અને Analytical Chemistry નો અભ્યાસક્રમ સર્વાનુમતે મંજૂર કરી વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૬/૧૨/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૪૬

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪થી અમલમાં આવનાર M.Sc. Chemistry Sem.-4 ના Pharmaceutical Chemistry, Organic Chemistry, Physical Chemistry, Enviornmental Chemistry અને Analytical Chemistry ના અભ્યાસક્રમ સંદર્ભે રસાયણશાસ્ત્ર વિષયની અભ્યાસ સમિતિની તા.૦૪/૧૨/૨૦૨૩ ની સભાના ઠરાવ ક્રમાંક :૦૫ અન્વયે કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાના અધ્યક્ષશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ સ્વીકારી મંજૂર કરવામાં આવે છે.

બિડાણઃ ઉપર મુજબ

ક્રમાંક : એસ./સાયન્સ/પરિપત્ર/૩૦૫૧૯/૨૦૨૩
તા.૦૭–૧૨–૨૦૨૩

કુલસચિવ

પ્રતિ,
૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓ તથા વિભાગીય વડાશ્રી.
..... આપશ્રીની કોલેજ/વિભાગના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

Veer Narmad South Gujarat University, Surat

Syllabus

M.Sc. Organic Chemistry

Semester-IV

To be effective from June-2023

NEP-2020

Name of Program	**Master of Science(Chemistry) and M.Sc. Organic Chemistry (Evening)**
Abbreviation	**M.Sc.**
Duration	**2 Years**
Eligibility Criteria	**M.Sc. (Organic Chemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc. (Inorganic Chemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc. (Physical Chemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc. (Analytical Chemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M. Sc . Environmental Chemistry** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc. (Pharmaceutical Chemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc. Organic Chemistry (Evening)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry.
Objective of Program	The core objective of the M.Sc. programme is to prepare the students for dynamic career in industry and academia by providing an excellent environment of teaching and research in the core and emerging areas of the discipline.

Program Outcome	PO1: To enhance the knowledge of chemistry domains and become master in respective branch of chemistry. To be able to communicate clearly and effectively with in and across disciplinary lines. PO2: Built up entrepreneurship ability by taking advantage of industrial hub in periphery of our university. PO3: Establishment of research center with the aid of interdisciplinary subject being run in university. PO4: Persuasion of doctoral degree in the concern subject and further study. PO5 : Development of related short term courses related to demanded subject in anticipation of strengthening knowledge and application PO6: Training/internship of students for employment in public sector, private sector and national laboratories. PO7: Participation in scientific discussions showing respect and lead interdisciplinary work with experts from other fields. PO8: To understand and adopt the best safety practices in chemical research. PO9: Participation in scientific discussions showing respect and lead Interdisciplinary work with experts from other fields. PO10: To understand and adopt the best safety practices in research.

M. B. Mahida

Program Specific Outcomes	Students need to build up foundation in the fundamentals & application of current chemical and scientific theories in the concerned branches of Inorganic, Organic, Analytical, Physical, Environmental and Pharmaceutical Chemistry. PSO1 : Develop scientific temper, communicate scientific information in a clear, concise and precise manner. PSO2 : Find job opportunities at all level of chemical industries(dyes & pharmaceutical), national laboratories & research centers. PSO3 : Apply the knowledge in sustainable and eco friendly technologies. PSO4 : Inculcate logical thinking to addressess the problem and become result oriented. PSO5 : Development of research culture in persuasion of Ph.D. program at national & international institute/university. PSO6 : Participate in specific competitive examination conducted by various public service commission and other public sector. PSO7 : Develop and apply the fundamental knowledge to build small scale industry in context to Atma Nirbhar Bharat. PSO8 : Scale up the synthetic product to a pilot level plant and gradually to bulk. PSO9 : Enhance the scientific temperament among the students in anticipation of developing research culture and implementation of policies at global & local level. PSO10 : Communicate scientific information clear in both writing and orally. PSO11 : Students shall start to become better readers, thinkers and learners in their discipline by processing their ideas through writing. PSO12 : Will build new scientific understanding as it provides students the opportunity to articulate their thinking as they engage in the science practicesduring an investigation.

M. B. Mahida.

Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
	PO1												
	PO2												
	PO3												
	PO4												
	PO5												
	PO6												
	PO7												
	PO8												
	PO9												
	PO10												
Medium of Instruction	English												

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library, IT tools, encourages students to participate in seminars/ workshops, presentations by students, assignments etc.

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Structure of M.Sc. Syllabus
M.Sc. Semester-IV
Organic Chemistry

Sr. No.	CourseTitle	L	Credit
1	AdvanceOrganic Chemistry	4	4
2	SelectedTopicsIn OrganicChemistry-II	4	4
3	AdvanceOrganic Synthesis	4	4
4	MedicinalChemistry-II OR DyeandIntermediates-II	4	4
5	Skill Enhancement: Green Chemistry	2	2
6	Practicals	12	6
		30	24

ExternalExaminationTimeDuration:03hrs

Nameof Exam	Semester	Paper No	Course group	Credit	Internal Marks	External Marks	Total Marks
M.Sc.	III	I	Core	04	30	70	100
		II	Core	04	30	70	100
		III	Core	04	30	70	100
		IV	Elective-1 OR Elective-II	04	30	70	100
		V	Skill Enhancement	02	15	35	50
			Practical	06	60	140	200
			Total	24	195	455	650

M.B. Mahida

Master of Science, M.Sc. Organic Chemistry,
Semester-IV
To be effective from June-2023
(NEP-2020)
Paper-I: Advance Organic Chemistry

Total Periods: 60

Course Code	OCC-401	Title of the Course	**Advance Organic Chemistry**
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To learn multicomponent reaction, alkene formation, asymmetric synthesis, amide formation, role of intermediate in synthesis, transformation and study their mechanism. • Role of various oxidizing agents in organic synthesis,chemoselectivity, factors affecting oxidation reaction, study their working mechanism and various applications. • Role of various reducing agents in organic synthesis, chemoselectivity, factors affecting reduction reaction, study their working mechanism and various application. • Study of cationotropic, aniontropic migration, involvement of reactive intermediate in various rearrangement, migrating aptitude of various groups.

Unit	Description
1.	**NAME REACTIONS** **(15 Periods)** General nature, method, mechanism and synthetic applications ofthe following reactions; (1)Ugi reaction (2) Noyori reaction (3) Wittig reaction (4) Peterson olefination reaction (5) Mannich reaction (6) Stille reaction (7) Ene recation (8) Staudinger reaction (9) Corey-Fuchs reaction (10) Ritter reaction (11) Mcmurry reaction (12) Michael addition

M.B. Mahida

2.	**OXIDATION** **(15 Periods)** Introduction, Oxidation with Cr(VI), Mn(VII), Mn(IV), OsO_4, Periodic acid. Peroxy acid, $Tl(NO_3)_2$, Iodobenzene diacetate. Oxidation of hydrocarbons-alkenes, aromatic rings, saturated C-H group (activated and unactivated),aldehyde and ketones
3.	**REDUCTION** **(15 Periods)** Introduction, different reductive processes, hydrocarbons- alkenes, alkynes and aromatic rings, Carbonyl compounds- aldehydes, ketones, ($LiAlH_4$, $NaBH_4$ only for aldehyde and ketone, Aluminium isopropoxide, Sn/HCl and Zn/ HCl) acids and their derivatives, epoxides, nitro, nitroso, azo and oxime groups, Birch reduction, Shapiro reduction.
4.	**MOLECULAR REARRANGEMENTS** **(15 Periods)** Rearrangement involving migration to electron deficient carbon: (i) Expansion and contraction of rings/Demajnov rearrangement (ii) Benzil-benzilic acid rearrangement Rearrangement involving migration to electron rich carbon: (i) Favorskii rearrangement (ii) Sommelet-Hauser rearrangement (iii) Neber rearrangement Rearrangement involving migration to electron deficientnitrogen: (i) Schmidt rearrangement (ii) Curtius rearrangement Aromatic rearrangements: (i) Migration around the aromatic nucleus: Jacobsenrearrangement (ii) Migration of group from the side chain to the nucleus: Ortonrearrangement, Hoffmann-Martius rearrangement, Rearrangementof N-nitrosoanilines (Fischer-Hepp rearrangement). Rearrangement involving migration from oxygen to ring: (i) Fries rearrangement (ii) Claisen rearrangement

M. B. Mahida

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library, IT tools, encourages students to participate in seminars/ workshops, presentations by students, assignments etc.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	To learn type of transformation, intermediate step. Types of multicomponent reaction, insitu reaction, role of reactive intermediate in transformation, types of asymmetric synthesis, alkene formation reaction, base catalyzed reaction, mechanism of reaction and their synthetic applications.
2.	To learn the role of various oxidizing agents, study chemoselectivity, mechanism of reaction, transformation of group, name reactions based on various oxidizing agents and their synthetic applications.
3.	To learn about role of various reducing agents, chemoselectivity, mechanism of reaction, transformation of group, name reactions based on various reducing agents and their synthetic applications.
4.	To learn about type of rearrangement, migrating aptitude, ring expansion, contraction, strain theory, isotopic effect, effect of other groups with reference to functional group and their application.

M. B. Mahida.

Suggested References:

Reference Books Recommended:

1. Organic synthesis using transition metals-Roderick Bates (Wiley)
2. Organic chemistry – J. Clayden, N. Greeves, S. Warren and P. Wothers (Oxford Press)
3. Some modern methods of organic synthesis – W. Carruthers (Cambridge)
4. Organic synthesis – Michael B. Smith
5. Advanced organic chemistry, Part B – F. A Carey and R. J. Sundberg, 5th edition (2007)
6. Guidebook to organic synthesis-R K Meckie, D M Smith and R A Atken
7. Organic synthesis- Robert E Ireland
8. Strategic Applications of named reactions in organic synthesis-Laszlo Kurti and Barbara Czako
9. Organic Synthesis, Jagdamba Singh & L.D.S. Yadav, 6th edition, Pragati Prakashan (2010).
10. Reaction Mechanism in Organic Chemistry by S. M. Mukherji and S. P. Singh (McMillan India Ltd., 1976)
11. Advance Organic Chemistry, Reaction Mechanism and Structure by Jerry March, 4th ed. John Wiley & Sons, 1992

On-line resources to be used if available as reference material
On-line Resources

M. B. Mahida.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Organic Chemistry,

Semester-IV

To be effective from June-2023

(NEP-2020)

Paper-II: Selected Topics in Organic Chemistry-II

Total Periods: 60

Course Code	OCC-402	Title of the Course	**Selected Topics in Organic Chemistry-II**
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To understand and familiarize the basic principles, theory and instrumentation of mass spectroscopy, low and high resolutionmass spectra, to impart knowledge in theory and principles of spectroscopy, spectroscopic technique for characterization and differentiation of various nucleus. • To understand kinetically and thermodynamically controlledreactions, effect of substituent on structure on reactivity, terms involved in linear free energy relationship. • To provide basic theoretical understanding of heterocyclic chemistry, improving general methodology for different kind of ring synthesis which implies the new heterocyclic systems by changing the functionality with respective positions in skeleton. • To understand natural and synthetic polymers, structural variations, classification properties and applications.

M. B. Mahida

Unit	Description
1.	**MASS SPECTROMETRY** **(15 Periods)** Theory and principles of mass spectroscopy; Instrumentation; low and high resolution mass spectra; Ionization techniques – Electron Impact (EI) ionization, Chemical Ionization (CI), Field Desorption (FD), Fast Atom Bombardment (FAB), Electronspray Ionization (ESI); Determination of molecular weight and molecular formula, nitrogen rule, detection of molecular ion peak, base peak, metastable ion peak, isotopic peak; Fragmentations – rules governing the fragmentations, McLafferty rearrangement; Fragmentation of compounds: saturated and unsaturated hydrocarbons, aromatic hydrocarbons, alcohols, ethers, ketones, aldehydes, carboxylic acids, amines, amides, compounds containing halogens, nitriles, esters and nitro compounds.
2.	**STRUCTURE-REACTIVITY PRINCIPLES** **(15 Periods)** Types of mechanisms, thermodynamic and kinetic requirements,kinetic and thermodynamic control, Hammonds postulate, Curtian-Hammet principle, potential energy diagrams, transitionstate and intermediates, methods of determining mechanisms- isotope effect. The Hammet equation andlinear free energy relationships, substituent and reaction constants, positive and negative deviation from Hammet equation, Taft equation.
3.	**HETEROCYCLIC CHEMISTRY-II** **(15 Periods)** (A) Five and six membered heterocycles with more than twohetero atoms: Synthesis, reactivity, aromatic character and importance of following heterocycles:1,2,3- triazole, 1,2,4- triazole, 1,2,4-oxadiazole, 1,3,4-oxadiazole, 1,2,5-oxadiazole (B) Condensed six membered heterocycles: Synthesis, reactivity, aromatic character and importance of following heterocyclic Rings: Quinoline, Isoquinoline, Cinnoline,Quinoxaline, Phthalazine, Naphthyridine, Phenoxazine

M.B. Mahida.

4.	**SYNTHETIC AND BIO-POLYMERS**	**(15 Periods)**
	Bio-polymers: General introduction, types, properties and usesofpolysaccharides – starch and cellulose **Synthetic polymers:** General introduction, method of preparation, properties and uses of Polyester, poly- tetrafluoroethylene, polyamino acids, polycyanoacrylates, polyurethanes, silicone rubbers, polyphosphazenes, divinylether -maleic anhydride cyclopolymer (DIVEMA) polymeric antioxidants	

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library, IT tools, encourages students to participate in seminars/ workshops, presentations by students, assignments etc.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

M. B. Mahida.

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	Understand the theory, instrumentation and important terms of mass spectrometry, fragmentation pattern, to set valuable insight into the types of molecular interaction and interpreting from obtained data.
2.	To learn about basic concept, synthesis and application of heterocyclic chemistry, aware about heterocyclic systems, types of heterocyclic rings, application of heterocycles in medicinal chemistry.
3.	To learn about type of reactions in context to kinetically and thermodynamically control concept, derivatization of various equation and their significance, different terminology and their application in designing various bioactive scaffolds.
4.	To learn about natural and synthetic polymers, their classification, properties and synthetic applications.
Suggested References:	

Reference Books Recommended:

1. Spectroscopic Identification of Organic Compounds, R. M. Silverstein and F. X. Webster, 6th edition (John Wiley & Sons)
2. Introduction to Spectroscopy, D. L. Pavia, G. M. Lampman and G. S. Kriz, 3rdedition (Thomson Brooks/Cole)
3. Spectroscopic Methods in Organic Chemistry, D. H. Williams and I. Fleming, 4thedition (Mcgraw – Hill Book Company)
4. Organic Spectroscopy, William Kemp, 3rd edition (Palgrave)
5. Organic Spectroscopy – Principles and Applications, Jag Mohan, 2nd edition (Narosa Publishing House)
6. Spectroscopy of Organic Compounds, P. S. Kalsi, 5th edition (New Age International Publishers)
7. Elementary Organic Spectroscopy: Principles and Chemical applications (revised edition), Y. R. Sharma (S. Chand Publishing)
8. Organic Chemistry by Francis A. Carey (McGraw-Hill Book Co., 1987).
9..Structure and Mechanism in Organic Chemistry, C. K. Ingold, Cornell Uni.Press.
10. Principles of Organic Synthesis, R.O.C. Norman and J. M. Coxon, Blackie Academic and Professional.
11 .Reaction Mechanism in Organic Chemistry, S. M. Mukherji and S. P. Singh, Macmillan.
12. Organic Chemistry – J. Clayden, N. Greeves, S. Warren and P. Wothers
13. An introduction to the chemistry of heterocyclic compounds-R M Acheso Heterocyclic Chemistry- J A Joule and Smith
14. Heterocyclic Chemistry-II- R R Gupta, M Kumar, V Gupta, Springer (India) pvt
15. Heterocyclic Chemistry, 4th Edition by J. A. Joule & K. Mills, Published by Chapman & Hall (1995)

M.B. Mahida.

16. Principles of modern heterocyclic chemistry, Edited by Leo A. Paquette, Published by Pearson Benjamin Cummings (1968)
17. Heterocyclic Chemistry, 3rd Edition by Thomas L. Gilchrist, Published by Prentice Hall (1997)
18. The Structure & Reactions of Heterocyclic Compounds, Edited by Michael Henry
19. Palmer, Published by Edward Arnold (1967)
20. Heterocyclic chemistry by V. K. Ahluwalia, Narosa publishing house.
21. Harry R. Allcock, Frederick W. Lampe and James E. Mark, Contemporary Polymer Chemistry, 3rd edition, Pearson Prentice Hall, 2005.
22. Organic Polymer Chemistry by K. J. Saunders.

On-line resources to be used if available as reference material
On-line Resources

M. B. Mahida

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Organic Chemistry,
Semester-IV
To be effective from June-2023
(NEP-2020)
Paper-III: Advance Organic Synthesis

Total Periods: 60

Course Code	OCC-403	Title of the Course	**Advance Organic Synthesis**
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To understand the reaction mechanism of a chemical reaction, the path and the feasibility of a reaction, reactivity of a group and needto understand preferential group, suitable reagent and appropriate condition. • To understand the synthetic pathway, breaking and assembling molecules, suitable reagent, to suggest synthetic route for complex organic compounds with stereochemistry. • To learn ring synthesis based on retrosynthetic pathway, application of various name reactions, generation of intermediates and their involvement in the construction of ring and generation of aromatic compounds from heterocycles. • To learn about organometallic chemistry, synthesis of hydrocarbon, olefin, transformation of various functional group, name reactions based on organometallic compound, their mechanism and synthetic applications.

Unit	Description
1.	**PROTECTION-DEPROTECTION AND UMPOLUNG CHEMISTRY** **(15 Periods)** Need of protecting groups – Protection of alcohols, Carbonyl,Carboxylic acid and amino groups, Synthetic equivalent groups and examples on transformations, Concept of umpolung, generation of acyl anion, equivalent using 1,3-dithianes, epoxides, ter. butyl hydrazone, cyanide ions, cyanohydrine ether, nitro compounds and alkynes.

M. B. Mahida.

2.	**DISCONNECTION APPROACH** **(15 Periods)** Introduction to disconnection, Concept of synthon, Syntheticequivalent, Functional group interconversion (i) One group disconnection: Disconnection and synthesis of alcohols, olefins, simple ketones,acids and its derivatives (ii) Two groups disconnection: Disconnections in 1,3-dioxygenated skeletons, preparation of β- hydroxy carbonyl compounds, α,β-unsaturated carbonyl compounds, 1,3-dicarbonyls, 1,5- dicarbonyls and use of Mannichreaction (iii) Pericyclic reactions: Disconnections based on Diels-Alder reaction and electrocyclicreaction: Its use in organic synthesis
3.	**RING SYNTHESIS** **(15 Periods)** Introduction to ring synthesis (i) Synthesis of saturated heterocycles: Synthesis of 3 and 4 membered rings (N, O, S) (ii) heterocycles in organic synthesis: Synthesis of alkanes and cycloalkanes from thiophene, Synthesisof alkenes and cycloalkenes from pyridines, Synthesis of Aromatic compounds from pyrilium salts, pyridazine, thiophenes and furan
4.	**ORGANOMETALLIC COMPOUNDS AND THEIRAPPLICATIONS** **(15 Periods)** (i) Carbon-metal bonds in organometallic compounds, Synthesisand applications of Organolithium, Organozincand Lithium diorganocuprate. (ii) Basic concept of organoboranes, Preparation of organoboranes, Stereochemistry of hydroboration, Mechanism of hydroboration – oxidation, Synthetic applications.

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library, IT tools encourages students to participate in seminars/ workshops, presentations by students, assignments etc.

M.B. Mahider.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	eightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Focus on the protecting and deprotecting groups with various organic scaffolds, choose of reagents, solvents and synthetic pathway, the reactions of group and their synthetic applications.
2.	Understand deep aspects of retrosynthesis and oxidation-reduction reaction, assumption of synthetic equipment and design the novel route for the synthesis target.
3.	Understand synthesis of various rings based on retrosynthetic pathway, application of reactive intermediate in the synthesis of ring, can be able to design new molecules of interest and generation of aromatic hydrocarbons from various heterocycles.
4.	Learn the Role of organometallic compounds in organic synthesis, reduction, oxidation, transformation of a group, application in pharmaceutical industries for thesynthesis of pharmaceutically active agents.

M. B. Mahida

Suggested References:

Reference Books Recommended:

1. Organic synthesis using transition metals-Roderick Bates (Wiley).
2. Organic chemistry – J. Clayden, N. Greeves, S. Warren and P. Wothers (Oxford Press).
3. Some modern methods of organic synthesis – W. Carruthers (Cambridge)
4. Organic synthesis – Michael B. Smith.
5. Advanced organic chemistry, Part B – F. A Carey and R. J. Sundberg, 5th edition (2007).
6. Guidebook to organic synthesis-R K Meckie, D M Smith and R A Atken.
7. Organic synthesis- Robert E Ireland.
8. Strategic Applications of named reactions in organic synthesis-Laszlo Kurti and Barbara Czako.
9. Organic Synthesis, Jagdamba Singh & L.D.S. Yadav, 6th edition, Pragati Prakashan (2010).
10. Reaction Mechanism in Organic Chemistry by S. M. Mukherji and S. P. Singh (McMillan India Ltd., 1976).
11. Advance Organic Chemistry, Reaction Mechanism and Structure by Jerry March, 4th ed.
    John Wiley & Sons, 1992.
12. Designing Organic Synthesis – A Programmed Introduction to the Synthon Approach, Stuart Warren, John Wiley & Sons (1994).
13. Organic Synthesis: The disconnection approach, Stuart Warren, John Wiley & Sons (1994).
14. Selected Organic Synthesis, Ian Fleming, John Wiley & Sons (1977).
15. Principles of Organic Chemistry by R.O.C. Norman (Chapman and Hall, 1986).
16. Organometallic Chemistry by P. L. Pauson (Edward Arnold, 1968).
17. Principles of Organometallic Chemistry by Coats, Green, Powell & Wade (Chapman and Hall, 1977).

On-line resources to be used if available as reference material
On-line Resources

M. B. Mahida.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Organic Chemistry,
Semester-IV
To be effective from June-2023
(NEP-2020)
Paper-IV: Medicinal Chemistry-II (Elective-I)

Total Periods: 60

Course Code	**OEC-401**	Title of the Course	**Medicinal Chemistry-II**
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To understand antibiotics, classification and drug belong to that class, structural variation, synthesis and uses of antibiotics. • To learn about types of anti allergic and anti infective drugs, their classification, general structures, effect of substituent, SAR, synthesis and uses. • To understand anti malarial drug, life cycle of plasmodium, general classification, their structural variation, synthesis and uses. • To understand life cycle of virus. Various classes of enzymes, general structure of anti viral and anti-HIV agents, structural variation, synthesis and uses.

Unit	Description
1.	**ANTIBIOTICS** **(15 Periods)** General introduction and classification of antibiotics Broad spectrum antibiotics, Macrolide antibiotics, Aminoglycoside antibiotics and Non-classifiable antibiotics (i) β-lactam antibiotics: Penicillins (Structural variations and SAR), Cephalosporins(Structural variations) (ii) Non-lactam antibiotics: Tetracyclin (Structural variations and SAR) Structures and medicinal importance/ clinical uses/ pharmacological applications of the following: Bacitracin, Vancomycin, Erythromycin, Lincomycin, Chloramphenicol, Nalidixic acid, Norfloxacin, Ciprofloxacin

M. B. Mahida.

2.	**ANTIALLERGIC AND LOCAL ANTI INFECTIVEDRUGS** **(15 Periods)** **(A) Antihistamines and related Antiallergic Drugs:** General introduction and mode of action, Structure variation inAminoalkylethers, Ethylenediamines, Propylamine, Phenothiazine and Piperazine derivatives. Synthesis and therapeutic uses of only the following: Diphenhydramine (Benadryl), Antazoline, Chlorpheniramine, Primethazine, Doxylamine, Pyrilamine and Promethazine **(B) Anti – mycobacterial agents:** General Introduction of Tuberculosis & Leprosy-disease, Classification of anti TB agents,Treatment, Mode of action, Adverse effect of Anti TB agents &Anti–leprotic agents, Synthesis and therapeutic uses of only the following: Ethionamide, Ethambutol, DDS (Dapsone), Pyrazinamide and Isoniazid **(C) Sulfonamides:** General classification, mode of action and SAR Synthesis andtherapeutic uses of only the following: Sulfamethoxine (Sufadoxine), Sulfamethoxy-Pyrazine(Sulfalene), Succinyl sulfathiazole (Sulfasuxidine)
3.	**ANTIMALERIALS AND ANTINEOPLASTIC AGENTS** **(15 Periods)** **(A) Antimalarials:** Introduction, Types, Life cycle of plasmodium, drug resistance,General classification, SAR of 4- and 8-aminoquinolines and Structure variation in Sesquiterpene Lactones, mode of action, Synthesis and therapeutic uses of only the following: Mefloquine, Chloroquine, Primaquine, Pyrimethamine(Daraprim), Quinacrine **(B) Antineoplastic Agents (Cancer Chemotherapy)** Introduction to cancer, types, Causes & Treatment of cancer, Metastasis, Drug Resistance, Targets of anticancer agents, adverse effects of cancer therapy (in brief) General classification of antineoplastic agents, Mode of action, Synthesis and therapeutic uses of only the following:Mechlorethamine, Cyclophosphamide, Melphalan, 6- Mercaptopyrine,Trimetrexate, Cytarabine

M. B. Mahida

4.	**ANTI-VIRAL AND ANTI-HIV AGENTS**	**(15 Periods)**

(A) Antiviral agents:

Introduction, Types & classes of viruses, Classification of antiviral agents, mechanism of action, Antiviral Compounds forDNA Viruses & Selected RNA Virus Infections other than HIV(Influenza A and B Viruses, Hepatitis C Virus)

(B) Anti-HIV Drugs:

Introduction, HIV Infection and its Pathological Effects, HIV Structure and life cycle, Targets for Drug Design of Anti-HIVAgents, HIV drugs in clinical use, Development of Drug Resistance, the need for new Anti-HIV Drugs, Introduction ofAIDS

Synthesis and therapeutic uses of only the following: Amantadine, Acyclovir, Zidovudine, Indinavir

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library, IT tools, encourages students to participate in seminars/ workshops, presentations by students, assignment etc.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

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Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand antibiotics, their classification, general structure, lactum and non- lactum antibiotics, next generation antibiotics, SAR, synthesis and uses of selected drug molecules.
2.	Learn general classification of anti histamines, anti-mycobacterial and sulphonamides, their structural variations, mode of action and synthesis of selected drug molecules.
3.	Learn life cycle of malaria, types of plasmodia, general structure of anti malarial agents, structural variation among them, mode of action, synthesis and uses of selected drug molecules.
4.	Understand life cycle of virus. Identification of enzymes responsible for replicationof virus, mechanism of drug action. Synthesis and uses of selected drug molecules.

Suggested References:

Reference Books Recommended

1. Burger's Medicinal Chemistry and Drug Discovery (5/e), 1997, Vol. 1, 2, 3, 4,5, Edited by ManFred E. Wolff (John Wiley & Sons, inc., New York).
2. Principles of Medicinal Chemistry, Vol. I & II (5/e), by S. S. Kadam, K. R. Mahadik, K. G. Bothra (Nirali Prakashan).
3. Principles of Medicinal Chemistry by William O. Foye (ed.), Lea and Febiyer, Philadelphia.
4. Wilson and Gisvold's Text-book of Organic Medicinal and Pharmaceutical Chemistry (5/e, 1982) by Robert F. Doerge (J. B. Lippincott Company, Philadelphia/Toppan Co. Ltd., Tokyo).
5. Essential of Medicinal Chemistry (2/e) by Andrejus Korolkovas (A Wiley Interscience Publication, 1988, John Wiley & Sons, Canada).
6. Medicinal Chemistry by Ashutoshkar (Wiley Eastern Ltd., 1993).
7. The Pharmaceutical Basis of Therapeutics by Goodman and Gilman (The Macmillan Co.).
8. The Organic Chemistry of Drug Synthesis, Vol. I, II & III (1980), Ed. By D. Lednicer and L.A. Mitscher (John Wiley and Sons, New York).
9. Topics in Medicinal Chemistry, Vol. I & II by Rabinowitz and Myerson (Editor) (Interscience, 1968).
10. Adhunik Sanshleshit Aushodhonu Rasayanvighyan, Dr. Anamik Shah, University Granth Nirman Board, Ahmedabad.
11. Medicinal Chemistry, D. Sriram and P. Yogeeswari, 1st edi, Pearson Education, 2007.

M. B. Mahida

12. Handbook of pharmaceutical chemicals by Dr. A. R. Shenoy and Dr. V. R. Shenoy Multitech Publishing Co., 15-Yogesh, Hingwala Lane, Ghatkopar (East) Mumbai.
13. Fundamentals of Medicinal Chemistry by G Thomas.

On-line resources to be used if available as reference material
On-line Resources

M.B. Mahida.

Master of Science, M.Sc. Organic Chemistry,
Semester-IV
To be effective from June-2023
(NEP-2020)
Paper-IV: Dyes and Intermediates-II (Elective-II)

Total Periods: 60

Course Code	OEC-402	Title of the Course	**Dyes and Intermediates-II**
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To understand vat dyes, their classification, various methods, various processes, synthesis and uses. • To learn about reactive, acid and TPM dyes, classification, methodof application, synthesis and uses. • To learn about various disperse, indigo and cationic dyes, classification, methods of application, synthesis and uses. • To understand nature of fibres, application of various dyes on various fibres, application of dyes as medicine, LCD, laser, photo- sensitizer etc.

Unit	Description
1.	**ANTHRAQUINONE DYES** **(15 Periods)** Reactivity of Anthraquinone dyes, Classification of Anthraquinone dyes, Vat Dyes and Solubilized Vat dyes, Acid dyes, Mordant dyesand dyes for cellulose acetate. Synthesis of only the following: Indanthrene Orange 7RK, Indanthrene Yellow FFRK, Indanthrene Khakhi 2G, Indanthrene Orange FFRK, Indanthrene Yellow 4GK, Indanthrene Scarlet B, Caledon Jade Green XBN, Anthracene Blue SWX, Indanthrene Brilliant Orange GR, CellitonFast Blue FFG.

M.B. Mahida.

2.	General nature, classification, structural variation, synthesis andapplication of fibres of the following classes of dyes: **(15 Periods)** (i)Reactive dyes (ii)Triphenylmethane dyes (TPM) (iii)Acid dyes Synthesis of only the following: Procion Brilliant Blue MR, Procion Brilliant Red H-3B, Remazol Brilliant Blue R, Malachite Green, Crystal Violet, AcidYellow 73, Acid Red 1, Acid Black 24
3.	General nature, classification, structural variation, synthesis andapplication of fibres of the following classes of dyes: **(15 Periods)** (i) Disperse dyes (ii) Indigoid and Thio-indigoid dyes (iii) Cationic dyes Synthesis of the following: Disperse Yellow 16, Disperse Blue 14, Celliton Fast Yellow 7G,Ciba Blue 2B, Indanthrene Brilliant Pink R, Bismarck Brown, Chrysoidine Y, Methylene Blue, Acridine Yellow G, Disperse Orange 29
4.	General nature, classification, structural variation, synthesis andapplication of fibres of the following classes of dyes: **(15 Periods)** (A) Sulphur Dyes (B) Phthaleins and xanthene dyes (Synthesis & Property) (i) Phthaleins dyes: Phenolphthalein and Phenolsulphothalein (ii) Xanthene dyes: Erythrosin, Mercurochrome, Pyromine-G (C) Indamine and Indophenol (D) High tech application of dyes (i) Liquid crystal display (ii) Laser dyes (iii) Dye sensitizer solar cells (iv) Biological stain and Biomedical application of dyes

M. B. Mahida

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library, IT tools, encourages students to participate in seminars/ workshops, presentations by students, assignments etc.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course, the learne rwill be able to	
1.	Understand vating process, mechanism, classes of dyes, synthesis and uses ofselected dyes.
2.	Learn application of dyes on various fibres for reactive, TPM and acid dyes andsynthesis of selected dyes.
3.	Understand disperse, indigo and cationic dyes, their application on various fibres, mechanism of application, structure and uses of selected dyes.
4.	To learn about medicinal, ecology and toxicity of dyes, LCD, photochemical dyes,laser dyes, their application and synthesis od selected dyes.

M. B. Mahida

Suggested References:

Reference Books Recommended

1. The chemistry of synthetic Dyes, Vol. I to VII by Venkataraman, Academic Press, New York.
2. Chemistry of Synthetic Dyes & Pigments by Lubs.
3. Dyes and their intermediates by E. N. Abrahart.
4. Handbook of synthetic dyes and pigments, Vol. I & II by K. M. Shah.
5. Industrial Dyes by Klans Hunger, Germany by Wiley-VCH.
6. Development in the Chemistry and technology of Organic Dyes by J.Griffiths, Blackwell Sci. Pub., Oxford, London.
7. Principles of colour Technology by Fred W. Billmeyer and Max Saltzman, John Wiley& Sons.
8. Advance in colour chemistry, series vol.-3, Modern colourants: Synthesis and structure, edited by A.T.Peters and H.S. Freeman, Blackie Academic and Professional (1995).
9. Colour chemistry: Synthesis, properties and applications of organic dyes and pigments, Heinrich Zollinger VCH, Germany (1987).
10. Organic Chemnistry in Colour V., P.F.Gordan, P. Gregory, Spinger-Verlag (1983).
11. Textile Auxiliaries, J.W. Batty
12. The production and applications fluorescent brightening agents, Milos Zahradnik, John Wiley & Sons (1982).
13. Chemistry of Dyes and Principles of dyeing-V.A. Shenai
14. Synthetic dyes- G.R. Chatwal
15. Critical reports on Applied chemistry, Vol-7, Developments in chemistry and Technology of organic dyes, Edited by : J. Griffths, Blackwell

On-line resources to be used if available as reference material
On-line Resources

M. B. Mahida.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Syllabus of Master of Science,

M.Sc. Organic Chemistry,

Semester IV

To be effective from June 2023

(NEP-2020)

Paper-V: Green Chemistry

(Skill Enhancement Course)

Total Periods: 30

Course Code	**OSEC-401**	**Title of the Course**	Green Chemistry
Total Credits of the Course	2	**Hours per Week**	2 hrs.

Course Objectives:	• To provide knowledge on green and sustainable chemistry • To learn and introduces various principle of green chemistry. • To learn about the replacement of toxic chemicals with environment friendly green compounds and benefits of utilizing concept of green reagents and green catalyst. • To create awareness among students regarding to develop skills to develop an understanding of social and environmental responsibilities within the broad area of Green Chemistry

Unit	Description
1.	**BASICS CONCEPTS OF GREEN CHEMISTRY & GREEN REAGENTS** **A. BASICS CONCEPTS OF GREEN CHEMISTRY** Basic principles of green chemistry: (i) Waste minimization (ii) Atom economy(iii) Hazardous products minimization (iv) Designing safer chemicals (V) Planning for minimum energy requirement for synthesis (vi) Proper Solvent selection (vii) Proper starting material selection (viii) Use of Protecting groups (ix) Use of Catalysts (x) Biodegradable product designing (xi) Proper designing of manufacturing plants (xii) Strengthening analysis techniques. **B. GREEN REAGENTS AND WATER BASED GREEN SYNTHESIS** Polymer Based Green Reagents, Water Based Reactions:Diels-Alder Reaction, Claisen Rearrangement, Michael Reaction, Aldol Condensation, Knoevenagel Reaction, Benzoin Condensation, Claisen-Schmidt Condensation and Heck Reaction

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2.	**GREEN CATALYSTS** (i) Acid Catalysts (ii) Oxidation Catalysts (iii) Basic Catalysts (iv) Polymer Supported Catalysts (v) Polystyrene-aluminium Chloride (vi) Polymeric Super Acid Catalysts (vii) Polystyrene-metalloporphyrins (viii) Polymer Supported Photosensitizers (ix) Polymer Supported Phase Transfer Catalysts and (x)Phase Transfer Catalyst in Green Chemical Reaction(xi) Miscellaneous Illustration catalysts like TiO_2 Photocatalyst in Green Chemistry, Solid Support Reagents, Synthesis of Bromo organics: Development of Newer and Ecofriendly Sromination Protocols and Brominating Agents, Synthesis of Pyridinium Fluorochromate (PFC) and Synthesis of Isooctane

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprise classroom teaching, use of e-resources, library books, IT tools, encouraging students to participate in seminars/ workshops, presentations by students, assignments etc.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written	15 Marks
2.	University External Written Examination	35 Marks

Course Outcome: Having Completed this course, the learner will be able to	
1.	To get the basic concept, background and significance of green chemistry, various tools and twelve principles of green chemistry.
2.	To get the design and development of green synthetic methods by using principles of green chemistry that reduces the generation of waste and hazardous substances.
3.	To get basic concepts to Identify and differentiate between green reagents and conventional reagents and find out suitable green alternatives in chemical processes.
4.	To differentiate and critically evaluate the green catalysts against conventional catalysts and applications of these green catalysts.

Suggested Reference Books:

1. V.K. Ahluwalia, M. Kidwai, New Trends in Green Chemistry, Kluwer Academic Publishers, Boston, London, 2012, pp. 5-36 and the reference cited there in.
2. Paul T. Anastas and John C. Warner, Green Chemistry, Theory and Practice, Oxford University Press, New York, 1998.
3. Colin Baird, Environmental Chemistry, W.H. Freeman, New York, 1999.
4. V.K. Ahluwalia and Renu Aggarwal, Organic Synthesis: Special Techniques, Narosa Publishing House, New Delhi, 2001, pp. 150-190 and the references cited therein.
5. P. T. Anastas and 1.c. Warner, 'Green Chemistry, Theory and Practice', Oxford University Press (1998).

M. B. Mahida.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Organic Chemistry,

Semester-IV

To be effective from June-2023

(NEP-2020)

Organic Chemistry Practicals

Course Code	**OP-401**	Title of the Course	**Practicals**
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• Able to interpret structure of organic compounds from spectra likeUV, IR, NMR and Mass. • To impart basic knowledge for carrying out multistep synthesisbased on some name reactions. • Understand nature of reaction and establishment of reaction condition with mechanism • To learn about the calculation of mole ratio for each reaction. Isolation of product from individual step, purification and confirmation of the product. • To understand the purpose of green synthesis.

Course Content

1	Spectral Exercise	4- Credit
2	Preparation or organic compounds	
3	Green Synthesis	4- Credit
4	Viva-Voce	

M. B. Mahida

1 Spectral Exercise (Minimum 10 from syllabus)

Structure interpretation of organic compounds from spectra (UV, IR, NMR and Mass)

2. Preparation of industrially important compounds (Minimum 8)

1. Sulfanilamide from via p-acetamido benzene sulphonyl chloride and acetamido benzene-sulfonamide.
2. Acridone from anthranilic acid via o-chloro benzoic acid and N-phenylanthranilic acid
3. Benzocaine from p-nitro toluene via p-nitro benzoic acid and p-amino benzoic acid.
4. Eosin from phthalic acid via phthalic anhydride and fluorescein.
5. Benzanilide from benzene via Benzophenone and Benzophenonoxime.
6. p-Nitro chloro benzene from acetanilide via p-nitro acetanilide and p-nitroaniline.
7. p-Chloro bromo benzene from acetanilide via p-bromo acetanilide and p-bromoaniline.
8. Anthrone from phthalic anhydride via o-benzoyl benzoic acid and anthraquinone.
9. 4-Methyl-7-hydroxy-8-acetyl coumarin from resorcinol via 4-methyl-7-hydroxycoumarin and 4-methyl-7-acetyl coumarin.
10. Preparation of Congo red dye from naphthionic acid via hydrozobenzene.
11. Preparation of o & p-hydroxyacetophenone from Aniline via phenol and phenylacetate.

3. Green Synthesis (Any Four)

1. Green approach for preparation of benzopinacolone from bezopinacol using iodine catalyst
2. Preparation of 1, 1-bis-2-naphthol under grinding at room temperature
3. Three component coupling reaction by green approach. (Synthesis of dihydropyrimidinone)
4. Green approach to Transesterification reaction (Synthesis of biodiesel)
5. Ecofriendly nitration of phenols and its derivatives using Calcium nitrate

Teaching-Learning Methodology	Introduction, interaction with students in calculation of mole ratios, carry out experiments at each step according to the respective practical, interpretation of spectra and deduce the structure.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

M. B. Mahida.

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the basics to carry out reactions, nature of reaction and calculation of mole ratio.
2.	Establish mechanism and monitoring reaction at specified reaction condition.
3.	Learn to work-up after the completion of reaction, purification.
4.	Confirmation of product through the references.
5.	Learn to interpret structure of organic compounds from given spectra.
6.	Understand the calculation with reference to respective factors.
7.	Appreciate good laboratory practices.

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Suggested References:

Reference Books Recommended:

1. Vogel's Textbook of practical organic chemistry, 5th edition, B. S. Furniss, A. J. , P. W. G. Smith, A. R. Tatchell (Pearson Education).
2. Comprehensive practical organic chemistry: Preparation and Quantitative analysis, V. K. Ahluwalia, Renu Agarwal (Universities Press).
3. Monograph on Green Chemistry Laboratory Experiments by Green Chemistry Task Force Committee, DST
4. L. D. Field, S. Sternhell, J. R. Kalman - Organic Structures from Spectra-Wiley (2013)

On-line resources to be used if available as reference material
On-line Resources

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