Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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-: પરિપત્ર :-

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ અનુસ્નાતક અભ્યાસક્રમ ચલાવતી કોલેજોનાં આચાર્યશ્રીઓને તથા વિભાગીય વડાશ્રીને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc. Chemistry Sem-I નો અભ્યાસક્રમ અભ્યાસ સમિતિ વતી ચેરમેનશ્રીએ મંજૂર કરવા વિજ્ઞાન વિદ્યાશાખાને કરેલ ભલામણ સ્વીકારી વિજ્ઞાન વિદ્યાશાખાની તા.૧૯/૦૬/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૩૨ અન્વયે કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૨૩/૦૬/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૫૨ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

વિજ્ઞાન વિદ્યાશાખાની તા.૧૯/૦૬/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૩૨

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc. Chemistry Sem-I નો અભ્યાસક્રમ અભ્યાસ સમિતિ વતી ચેરમેનશ્રીએ મંજૂર કરવા કરેલ ભલામણ સ્વીકારી M.Sc.Chemistry Sem-I નો અભ્યાસક્રમ સુધારા–વધારા સાથે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૨૩/૦૬/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૫૨

:: આથી ઠરાવવામાં આવે છે કે, વિજ્ઞાન વિદ્યાશાખાની તા.૧૯/૦૬/૨૦૨૩ ની સભાની ઠરાવ ક્રમાંકઃ૩૨ અન્વયે કરેલ ભલામણ સ્વીકારી મંજૂર કરવામાં આવે છે.

(બિડાણઃ ઉપર મુજબ)

ક્રમાંક : એસ./સાયન્સ/પરિપત્ર/૧૬૨૪૦/૨૦૨૩
તા.૨૮–૦૬–૨૦૨૩

કુલસચિવ(ઇ.ચા.)

પ્રતિ,
૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ અનુસ્નાતક અભ્યાસક્રમ ચલાવતી કોલેજોનાં આચાર્યશ્રીઓ.
તથા વિભાગીય વડાશ્રી.
..... આપશ્રીની કોલેજના 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.Chemistry

Semester-I

To be effective from June-2023

NEP-2020

Name ofProgram	**MasterofScience(Chemistry)**
Abbreviation	**M.Sc.**
Duration	**2Years**
Eligibility Criteria	**M.Sc.(OrganicChemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc.(InorganicChemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc.(PhysicalChemistry)** 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. EnvironmentalChemistry** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc.(PharmaceuticalChemistry)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry. **M.Sc.OrganicChemistry(Evening)** Eligibility: Graduation in Science with Chemistry or any subject equivalent to or allied to Chemistry.
Objective ofProgram	Thecore objective of the M.Sc. programmeis toprepare the students fordynamiccareerinindustryandacademiabyprovidinganexcellentenvironment of teaching and research in the core and emerging areas of thediscipline.

Program Outcome	PO1:Toenhancetheknowledgeofchemistrydomainsandbecomemaster inrespective branch of chemistry. To be able to communicate clearly andeffectivelywithinandacrossdisciplinarylines. PO2:Builtup entrepreneurshipabilitybytakingadvantageofindustrialhubinperipheryofouruniv ersity. PO3:Establishmentofresearchcenter withtheaidofinterdisciplinarysubjectbeingruninuniversity. PO4: Persuasion of doctoral degree in the concern subject and further study.PO5:Developmentofrelatedshorttermcoursesrelatedtodemandedsubjecti nanticipationofstrengtheningknowledge andapplication PO6:Training/internshipofstudentsforemploymentinpublicsector,privatesectora ndnationallaboratories. PO7:Participationinscientificdiscussionsshowingrespectandleadinterdisciplinar yworkwithexpertsfromotherfields. PO8:Tounderstandandadoptthebestsafetypracticesinchemicalresearch. PO9:Participationinscientificdiscussionsshowingrespectandlead Interdisciplinaryworkwithexpertsfromotherfields. PO10:Tounderstandandadoptthebestsafetypractices inresearch.

Mappingbetween POsandPSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
	PO1												
	PO2												
	PO3												
	PO4												
	PO5												
	PO6												
	PO7												
	PO8												
	PO9												
	PO10												
Medium ofInstruction	English												

Structure of M.Sc. Syllabus
M.Sc. Semester-I

Sr. No.	CourseCode	CourseTitle	L	Credit
1	1803080201010001	Inorganic Chemistry	4	4
2	1803080201020001	Organic Chemistry	4	4
3	1803080201030001	Physical Chemistry	4	4
4	1803080201040001	Analytical Chemistry-A **OR** Analytical Chemistry-B	4	4
5		Skill Enhancement	2	2
6		Practicals	12	6
			30	24

FacultyCode:Science Subjectcode: Level
code:Nameofprogram: M.Sc. Subject:Chemistry
ExternalExaminationTimeDuration:03hrs

Name ofExam	Semester	Paper No	Courseg roup	Credit	Internal Marks	External Marks	Total Marks
M.Sc.	I	I	Core	04	30	70	100
		II	Core	04	30	70	100
		III	Core	04	30	70	100
		IV	Elective	04	30	70	100
		V	Skill Enhance ment	02	20	30	50
			Practical	06	60	140	200
			Total	24	210	440	650

Faculty Code: Science Subject code: Level code:
Name of program: M. Sc. Subject: Chemistry
External Examination Time Duration: 03 hrs

Name of Exam	Semester	Paper No	Course group	Credit	Internal Marks	External Marks	Total Marks
M. Sc.	I	I	Core	04	30	70	100
		II	Core	04	30	70	100
		III	Core	04	30	70	100
		IV	Elective	04	30	70	100
		V	Skill Enhance ment	02	30	20	50
			Practical	06	60	140	200
			Total	24	210	440	650

Structure of M.Sc. Syllabus
M.Sc. Semester-II

Sr. No.	Course Code	Course Title	L	Credit
1	1903080202010001	Inorganic Chemistry	4	4
2	1903080202020001	Organic Chemistry	4	4
3	1903080202030001	Physical Chemistry	4	4
4	1903080202040001	Analytical Chemistry-C **OR** Analytical Chemistry-D	4	4
5		Skill Enhancement	2	2
5		Practicals	12	6
			30	24

Faculty Code: Science Subject code: Level code:
Name of program: M. Sc. Subject: Chemistry
External Examination Time Duration: 03 hrs

Name of Exam	Semester	Paper No	Course group	Credit	Internal Marks	External Marks	Total Marks
M. Sc.	II	I	Core	04	30	70	100
		II	Core	04	30	70	100
		III	Core	04	30	70	100
		IV	Elective	04	30	70	100
		V	Skill Enhance ment	02	30	20	50
			Practical	06	60	140	200
			Total	24	210	440	650

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

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

Total Periods: 60

Course Code	[1803080201010001]	Title of the Course	Inorganic Chemistry
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	
Unit	Description
1.	**SYMMETRY AND GROUP THEORY IN CHEMISTRY AND ITS APPLICATIONS** **(15 Periods)** Representation of Group: preparation of matrics and vectors matrix notation for geometric transformation, Orthogonality theorem and itsconsequences, reducible and irreducible representation and their relation, preparation of character table for C_{2v} and C_{3v} point groups, applications of group theory transformation properties of atomic crystals, Hybridization of σ-bond.
2.	**QUANTUM MECHANICS** **(15 Periods)** Discussion of solution of Schrodinger equation to same model system e.g. the one dimensional harmonic oscillator, two particle rigid rotator. Ordinary angular momentum, generalized angular momentum, Eigen functions of angular momentum, eigen values ofangular momentum, different types of operators and their uses, addition of angular momentum, spin, Russell-Saunders terms and coupling scheme, term separation energies of the p^n and d^n configuration, magnetic effect: spin orbit coupling and Zeeman effect(splitting)

3.	**INORGANIC REACTION MECHANISM** **(15 Periods)** Labile and inert complexes, factors responsible for lability andinertness of complexes. Reactivity of metal complexes, ligand replacement reaction: classification of mechanism and energy profile of reaction. Inert and labile complexes, interpretation of liability and inertness of transitionmetal complex on the basis of reaction rate, VBT and CFT. Transition state or activated complex, substrate, attacking regents electrophilic and nucleophilic, nature central atom. Kinetic application of CFT. Determination stability complex by Job's method. Substitution reactions in square planar complexes e.g. Kinetic substitution reactions in Pt(II) complexes. Kinetics of octahedral substitution, acid hydrolysis, factor affectingacid hydrolysis, base hydrolysis conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism.
4.	**METAL CLUSTERS** **(15 Periods)** Introduction, classification, carbonyl cluster, low nuclearity carbonyl clusters, high nuclearity carbonyl clusters, electron counting scheme for HNCCS, Wade's rules. Halides types clusters: dinuclear clusters, trinuclear clusters, tetranuclear clusters, hexanuclear cluster. Chevrel phases and zintl ions, Carboranes, metalloboranes, metallo carboranes, higher boranes (hexaborane-10, decaborane-14), number and types of bonds present in higher boranes.

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 / 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.	Understand the of matrices and vectors matrix notations, reducible representation and their relation, applications of group theory
2.	Learn regarding quantum mechanics, angular momentum, understanding the solution of Schrodinger equation, Different types of operators and their uses
3.	Learn different types of inorganic reaction mechanism, acid hydrolysis, base hydrolysis, conjugate base mechanism their synthetic application
4.	Understand the introduction and classification of metal clusters, electron counting scheme for HNCCS and Wade's rule and their synthetic application

Suggested References:

1. Chemical applications of group theory by F.A Cotton (Second edition), Wiley Eastern Limited, 1976 New Delhi
2. Group theory and its application by P.K. Bhattacharya, Himalaya publishing hours, Mumbai, 1986
3. Group theory and symmetry by L. R. hall, McGraw hill, New York, 1989.
4. Quantum Chemistry by Ira N. Levine, Prentice-Hall of India Pvt. Lid, New Delhi, 1994.
5. Introductory Quantum Chemistry (Third edition) by N. W. Hanna, Benjamin, Menlo Park, Cailf, 1988.
6. Quantum Chemistry and Spectroscopy by M. S. Pathania, Vishal Publications, India, 1981.
7. Kinetic and Mechanism' by A. A. Frost and R. G. Pearson, Wiley, New York, 1953, 1961.
8. Mechanism of Inorganic Reactions by F. Basolo and R.G. Pearson, Second Edition, Wiley Eastern Limited, New Delhi, 1977.
9. Advanced Inorganic Chemistry by F. A Cotton and R.G. Wilkinson, John Wiley & Sons, N. Y.
10. Principales of Inorganic Chemistry, by Puri. Sharma and Kalia, 33rd Edition, Vishal publishing Co. Jalandhar, Dehli, 2017.
11. Advanced Inorganic Chemistry by S. K. Agarwala and Keemtilal, Pragati Prakashan, Meerut.
12. Advanced Inorganic Chemistry, Volume-II by Gurdeep Raj, Krishna Prakashan Media Ltd., Meerut.
13. Inorganic Chemistry by Gary L Miessler and Donald A. Tarr, Pearson Education International

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

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

Total Periods: 60

Course Code	[1803080201020001]	Title of the Course	Organic Chemistry
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To understand concept of reactive intermediate and their application in organic synthesis. • To understand basics of pericyclic reaction, familiarize with various theories of pericyclic reaction to access the feasibility of various pericyclic reaction and implant the knowledge to predict stereo chemical outcome of various pericyclic reactions. • To learn anchimeric assistance, stereo chemistry and internal substitution reaction of aliphatic and allylic compounds. Aromatic nucleophilic substitution, cine substitution, elimination reactions, their stereo chemistry and mechanisms. • Understanding of concepts of chirality, topicity, prochirality, dynamic resolutions, types of stereo selective and stereo specific reactions, conformation of substituted and fused aromatic rings along with respective strains theories.

Unit	Description
1.	**REACTION MECHANISM & REACTIVE INTERMEDIATES (15 Periods)** Detailed study of organic reaction intermediates. Generation,structure, stability and reactions of – **Carbocations (Classical and non-classical):** Phenonium ion, norbornyl system, common carbocation rearrangements- Demjanov,Dienone-Phenol, Rupe. **Carbanions:** Mechanism of condensation involving enolates - Aldol, Mannich, Dieckmann, Michael and Shapiro reactions. **Carbenes:** Mechanism of Arndt-Eistert reaction, Wolf rearrangement and Bamford Steven's rearrangement reaction. **Free Radicals:** Coupling of alkenes andarylation of aromatic compounds by diazonium salts. Sandmeyer reactions. Free radical rearrangements, Hunsdiecker reaction.

2.	**PERICYCLIC REACTIONS** **(15 Periods)** **Introduction** - Definition, Characteristics and ClassificationMolecular orbitals and symmetry propertiesofethylene, 1,3- butadiene, 1,3,5- hexatriene and allylsystems. **Electrocyclic Reactions:** Woodward-Hoffman Correlation diagram and derivation of selectionrules, Conrotatory and disrotatory motions,FMO and PMO approach for 4n and (4n+2)π electron system and allyl systems. **Cycloaddition Reactions**: Antarafacial and suprafacial additions. FMOand PMO approach for 4n and (4n+2)π electron Systems, Diels-Alder reaction, stereoselectivity. **Sigmatropicrearrangements:** Suprafacial and antarafacialshifts involving H & C moieties, retention and inversion of configurations. 1, 3- dipolar cydoadditions. Examples of electrocyclic, cycloaddition and sigmatropicrearrangements.
3.	**SUBSTITUTION AND ELIMINATION REACTIONS** **(15 Periods)** **A: Aliphatic Nucleophilic Substitution:** The SN^1 , SN^2 , SN^i mechanisms. Reactions of Allylic halides, neighbouring group participation by -OH, -NH2, -COO- , -RS, - halogen, aromatic ring.**B: Aromatic Nucleophilic Substitution:** The SN^2 , SN^1 and benzyne mechanisms, Reactivity - effect of substrate structure, leaving group and attaching nucleophile, The Von Richter rearrangement. **C: Elimination reaction:** Hoffmann and Zaitsev's rule of elimination, E1, E2 and E1CB Reaction and their regioselectivity
4.	**STEREOCHEMISTRY AND CONFIRMATIONAL ANALYSIS (15 Periods)** **A. STEREOCHEMISTRY:** Stereo chemical principles; Enantiomeric relationships; Distereomeric relationship; R-S and E-Z nomenclature; Dynamic stereochemistry; Chiral-Prochiral relationships; Stereo selective and Stereo specific reactions; Racemates and racemic modification, Resolution of racemic modification, Optical activity in the absence ofchiral carbons biphenyl, allenes, spiranes. **B. CONFIRMATIONAL ANALYSIS:** Interconversion of Fischer, Newman and Sawhorse projections. Newer method of asymmetric synthesis (including enzymatic and catalytic nexus), enantio and diastereo selective synthesis. simple acyclic and cyclic (chair and boat cyclohexanes, Decalins, Perhydrophenanthrene) systems. Effects of conformation on reactivity in acyclic compounds, mono and di substituted cyclohexanes and determination of their stability order.

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 / 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.	Understand generation of reactive intermediates, their mechanism, rearrangement based on each intermediate, application of reactive intermediate in organic synthesis and industries application.
2.	Recognise pericyclic reactions, understanding of thermal and photochemical reaction, determination of mechanistic pathway, symmetry properties, aromaticity based on mobius method, application of pericyclic reactions in organic synthesis.
3.	Learn difference between eliminations and addition reaction, concept of anchimeric assistance in various groups like sulphide, halogen, phenyl, hydroxyl, tosylates & mesilates, amino group etc, aromatic nucleophilic substitution through addition elimination, elimination addition, cine substitution and their synthetic application.
4.	Detect chirallity in moleculer structure, recognize the relationship between enantiomeric and diastereomeric structures, understand & distinguish stereoselective and stereospecific reactions, dynamic resolution, confirmative study of various substituted aromatic and fused aromatic rings and their application inn pharmaceutical industry.

Suggested References:

Unit I:

1. Carbenes, Benzynes and Nitrenes by Gilchrist, T. L. and Rees.
2. Advanced Organic Chemistry-Reactions, Mechanism and Strucuture, Jerry March, JohnWiley.
3. Reaction Mechanism in Organic Chemistry by S. M. Mukherji and S. P. Singh (McMillanIndia Ltd., 1976).
4. Organic Chemistry (3/e) by J. B. Hendrickson, Donald J. Crem and George S. Rammond (McGraw-Hill Book Co. &Kogekusha Co. Ltd., 1970).
5. Organic Chemistry (5/e) by Morrison & Boyd (Prentice Hall).
6. Advanced Organic Chemistry by Carey &Sundberg (3rd edition).
7. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
8. Advanced Organic Chemistry, F. A. Carey and R. J. Sundberg, Plenum.
9. Organic chemistry 2nd ed. Jonathan clayden, Nick greeves, Stuart Warren.
10. Reaction Mechanism and Reagents in Organic Chemistry by C. R. Chatwal (HimalayaPublishing House, Bombay, 1987).

UNIT II:

1. March's Advanced Organic Chemistry Reactions, Mechanisms, And Structure 7th ed.2013 Michael B. Smith. Wiley.
2. Mechanism And Theory In Organic Chemistry-2007 by Thomas H. Lowry, Kathleen S. Richardson, Forbes.Harper& Row, Publishers. New York, Hagerstown, San Francisco,London.
3. Advanced Organic Chemistry Part A: Structure and Mechanisms by Carey &Sundberg(5th edition), 2000, Springer.
4. Pericyclic Reactions, S. M. Mukherji, Macmillan, India.
5. Photochemistry AndPericyclic Reactions 3rd ed. by Jagdamba Singh 2010. New AgeInternational Publishers Ltd. New Delhi.
6. Pericyclic Reactions A mechanistic and problem solving approach Sunil Kumar, VinodKumar, S.P.Singh Academic Press 2015

UNIT III:

1. Advanced Organic Chemistry-Reactions, Mechanism and Strucuture, Jerry March, JohnWiley.
2. Reaction Mechanism in Organic Chemistry by S. M. Mukherji and S. P. Singh (McMillanIndia Ltd., 1976).
3. Organic Chemistry (3/e) by J. B. Hendrickson, Donald J. Crem and George S. Rammond(McGraw-Hill Book Co. &Kogekusha Co. Ltd., 1970).
4. Organic Chemistry (5/e) by Morrison & Boyd (Prentice Hall).
5. Advanced Organic Chemistry by Carey &Sundberg (3rd edition).
6. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
7. Physical organic chemistry by Jack Hyne
8. Reaction mechanism by Jagdambasingh.
9. Organic chemistry - Reaction mechanism, by P.S. Kalsi, New age international publishers.

UNIT IV:

1. Advanced Organic Chemistry: Part A: Structure and Mechanisms; By Francis A. Carey,Richard J. Sundberg, fifth edition, Published by Springer.
2. Advanced Organic Chemistry: Part B: Reaction and Synthesis; By Francis A. Carey, Richard J. Sundberg, fifth edition, Published by Springer
3. Stereochemistry of Carbon Compounds; By Ernest L. Eliel, Published by Tata McGraw-HillPublishing Company Ltd.
4. Basic organic stereochemistry; By Ernest Ludwig Eliel, Samuel H. Wilen, Michael P. Doyle,Published by Wiley-Interscience.
5. Introduction to Stereochemistry; By Kurt Martin Mislow, Dover Publication INC.
6. Stereochemistry of Organic Compounds: Principles and Applications; By D. Nasipuri, NewAge International (P) Ltd. Publisher.
7. Stereochemistry Conformation and Mechanism; By P.S. Kalsi, New Age International (P) Ltd.Publisher.
8. Basic Stereochemistry of Organic; By SubrataSen Gupta, First edition, Published by OxfordUniversity Press.

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

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

To be effective from June-2023

(NEP-2020)

Paper-III: Physical Chemistry

Total Periods: 60

Course Code	[1803080201030001]	Title of the Course	Physical Chemistry
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To understand concept of thermodynamics in solution. • To understand type of interactions and orientation of molecules in solution. • To understand basic concept of statistical thermodynamics. • Understanding of concepts of kinetics of different types of chemical reaction. • To lean basic concept of synthesis of polymer and solution behaviour of polymer

Unit	Description
1.	**CHEMICAL KINETICS** **(15 Periods)** Theories of Unimolecular gas reactions: Lindemann theory, Kinetics of some complex reactions (i)Reversible reactions(only first order opposed by first order) (ii)Consecutive reactions(A→B→C); Equation of Relaxation time for (i) first order oppsed by first order and (ii) second order opposed by second order, Steady state treatment or approximation, Enzyme catalysed reactions, Kinetics of general Chain reaction, Kinetics of photochemical reactions(H_2-$Cl_2$and H_2-Br_2) , Kinetics , Mechanism ,determination of activation energy and chain length of some organic decomposition (i) decomposition of ethane (ii) decomposition of acetaldehyde, Effect of Ionic strength on rates of ionic reactions (Primary and secondary salt effect) Numerical.

2.	**THERMODYNAMICS**	**(15 Periods)**
	Introduction to Laws of thermodynamics, state and path functions and their applications, thermodynamic description of various types ofprocesses,Maxwell's relations, Partial molar quantities, Calculation of partial molar quantities, determination of partial molar volume andpartial molar enthalpy, Ideal and non-ideal liquid mixtures,Thermodynamics functions of mixing of non-ideal solutions (i) free energy of mixing (ii) entropy of mixing (iii) volume of mixing and (iv) enthalpy of mixing ,Excess functions(μ^E,G^E, S^E ,H^E and V^E) for non-ideal solutions and expression for excess thermodynamic functions. Numerical	
3.	**STATISTICAL THERMODYNAMICS**	**(15 Periods)**
	Basics of Statistical thermodynamics(Assembly,Canonical ensemble, occupation numberstatistical weight factor, probability), Thermodynamic probability, Probability and entropy, Maxwell- Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Lagrange's methods of multipliers, Partition function,Thermodynamic properties in term of partition functions(i) Internal energy (ii) Heat Capacity (iii) Helmholtz free energy (iv) Enthalpy (v) Gibb's free energy(vi) Chemical potential (viii) Equilibrium constant Molecular partition functions for an ideal gas , Derivation for Translational, Rotationaland Vibrational partition functions Numerical.	
4.	**POLYMER CHEMISTRY**	**(15 Periods)**
	Types of polymers, Stereochemistry of polymers, Kinetics of Addition polymerization (free radical, cationic and anionic) and Condensation polymerization,Thermodynamics of polymerization, Phase techniques of polymerization (Bulk, solution, suspension and emulsion), Number & Mass average Molecular mass, Polydispersity Index (P.D.I) Molecular mass determination by Viscometry and Osmometry, Thermal transitions in polymer: glass transition temperature and its significance, Numerical	

Teaching-Learning Methodology	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 / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course	
1.	Students learn thermodynamic terminology, fundamental thermodynamic properties, properties of solution, fundamental knowledge assist student to understand related topic in next semester.
2.	Understand kinetics of different types of reaction. Understand the factors responsible for behaviour of different kind of chemical reaction
3.	Learn relation between quantum chemistry and statistical thermodynamics. Understand basic terminology and their application in calculation of thermodynamic function.
4.	Understand the method for synthesis of polymer and their characterization

Suggested References:

Unit I:

1. Chemical Kinetics, Laidler K.J. TATAMcGRAW-HILL PUBLISHING COMPANY LTD
2. Principles of Chemical Kinetics, James E. House, Elsevier Publication
3. Kinetics and Mechanism of Chemical Transformations,Rajaraman, J. and Kuriacose, J., McMillan (2008)
4. Kinetics of chemical reactions, S.K. Jain, Vishal Publications
5. Engel, T. & Reid, P. Physical Chemistry, Pearson
6. Maron, S. & Prutton Physical Chemistry

UNIT II:

1. Thermodynamics for chemist Samuel Glasstone, East-West Press Pvt. Ltd. (2008)
2. Physical Chemistry, Volume1: Thermodynamics and Kinetics (10thEdition) by Professor Peter Atkins, Julio De Paula
3. Principles of Physical ChemistryPuri B.R., Sharma L.R. and Pathania, M.S., Vishal Publishing Co
4. A Text Book of Physical chemistry K.L.Kapoor Vol-5 Macillan India Ltd. 2007

5. An Introduction to Chemical Thermodynamics R P Rastogi and R R Mishra VIKASH PUBLISHING HOUSE PVT LTD. 6th edition

6. Advanced Physical Chemistry D.N.Bajpai S.CHAND& COMPANY LTD. 2nd EDITION

UNIT III:

1. Statistical Thermodynamics BY M. C. Gupta, New Age International, 2007
2. An Introduction to Statistical Thermodynamics, Terrell L. Hill, ADDITION WESLAY PUBLISHING COMPANY
3. Principles of Physical Chemistry Puri B.R., Sharma L.R. and Pathania, M.S., Vishal Publishing Co
4. A Text Book of Physical chemistry K.L.Kapoor Vol-5 Macillan India Ltd. 2007

UNIT IV:

1. Polymer science by V.R.Gowarikar. WILEY EASTERN LTD
2. Principal of polymer chemistry by A. Ravve, Springer
3. A Textbook of Polymer Chemistry, M S Bhatnagar, S Chand Publications.
4. Principles of Physical Chemistry Puri B.R., Sharma L.R. and Pathania, M.S., Vishal Publishing Co

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

To be effective from June-2023

(NEP-2020)

Paper-IV: Analytical Chemistry (Elective Paper-A)

Total Periods: 60

Course Code	[1803080201040001]	Title of the Course	**Analytical Chemistry**
Total Credits of the Course	4	Hours per Week	4 hrs.

Course Objectives:	• To understand concept of electromagnetic radiation, auxochrome, chromophores, various factors affecting the UV-Visible spectra and impart the knowledge to understand the spectra. • To understand basics of concepts of chromatography, their classification and importance as well as working of various parts of the chromatography instruments. Use of this TLC and GC in various application. • To learn the different types of errors that occur in qualitative and quantitative and the validation of result obtained in experiments with the help of Q test and Students' t test. • To understand units of solution their uses in numerical and solution preparation. To understand the uses of non-aqueous titration when aqueous titration fails and also analysis of C, H, N, O, S with various techniques.

Unit	Description
1.	**UV-VISIBLE SPECTROPHOTOMETRY** **(15 Periods)** Types of electronic transition, auxochrome, chromophore, Bathochromic effect, Hypsochromic effect, Hyperchromic effect, Hypochromic effect, Factor affecting λ_{max} like resonance, hyper conjugation, hydrogen bonding, steric effect, Woodward's rules for α, β-unsaturated ketones, Diene systems, aromatic system, Effectof solvent on absorption bands, law of absorption with derivation, Elementary idea of double beam automatic recording, Spectrophotometer, Application.

2.	**CHROMATOGRAPHY** **(15 Periods)** **Thin-Layer Chromatography**: Selection of stationary and mobile phase, Detection techniques – Elementary idea of HPTLC **Gas Chromatography:** Selection of mobile phase – Selection of stationary phase in GLC and GSC, Methods of Injection, Detectors: FID (with modifications), TCD and ECD, Their comparison, Packed column, Capillary Column (WCOT, SCOT) (advantages and disadvantages) –Temperature programming – Derivatization in GC – Qualitative (Basic terms: retention Time, Retention Volume, Relative Retention) and Quantitative (Measurement of Area, Area Normalization Method, Internal Standard Method) Analysis.
3.	**CHEMICAL MATHEMATICS** **(15 Periods)** Errors in Chemical analysis, classification of errors, nature and origin of errors, Propagation of error, Accuracy and precision, Average deviation and standard deviation and its physical significance, Normal Distribution curve and its properties. Confidence limit and probability, Statistical treatment for error analysis, students' 't' test, rejection criteria and Q test, method of least square.
4.	**TITRIMETRIC METHODS AND ELEMENTALANALYSIS** **(15 Periods)** **Solution and Their Concentration**: Molarity, Molality, Normality, ppm, ppb, ppt, %w/v, %w/w, %v/v, Formality, Primary and Secondary standard, Acid Value, Density and Specific Gravity, Numerical. **Non-Aqueous Titration:** Protic and Aprotic Solvent, Solvent system, Dielectric constant, Titrant, Titration Curve, Determination of Equivalence point, KarlFisher Titration. **Elemental Analysis:** Step on Analysis, C and H Analysis, N Analysis, Halogen Analysis and Sulphur Analysis, Elementary Idea of Modern Elemental analyzer.

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprises 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 / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcome: Having Completed this course, the learner will be able to	
1.	Understand the basic concept of electromagnetic radiation and their interaction with the matter and use of UV-Visible spectrophotometer in structure identification and quantitative determination.
2.	Recognize the use of different stationary and mobile phase for the separation of organic molecule and identify the problems and their solution during the analysis and learn the use of the chromatography for those which can't be identified by the techniques.
3.	Learn difference between different types of errors observed during analysis and use of statistical treatment of data. Also learn to accept and reject the data with help of different type of tests.
4.	Understand the making of different solution with the help of different concentration and learn the non-aqueous titration when aqueous titration fails. Also learn the determination of various elements in organic compounds.

Suggested Reference Books:

1. Fundamental of molecular spectroscopy, C. N. Banwell, Tata Mc-Graw Hill Pub. Camp.
2. Spectrometric Identification of Organic Compounds (4th edition/5th edition), Silverstein, Bassler & Morril, John Wiley & Sons.
3. Introduction to Molecular Spectroscopy, G. M. Barrow, McGraw – Hill.
4. Modern Spectroscopy, J.M.Hollas, John Wiley.
5. Basic Principles of Spectroscopy, R.Chang, McGraw-Hill.
6. Modern Methods of Chemical Analysis (2nd ed.), Pecsok, Shields, Cairns & McWilliam, John Wiley & Sons.
7. Instrumental Analysis by R. D. Braun, McGraw-Hill.
8. Introduction to Instrumental Analysis by R. D. Brawn, McGraw-Hill Book.
9. Fundamentals of Analytical Chemistry: Skoog D. R. and West D. M. (Holt, Rinehart & Winston, New York).
10. Instrumental Methods of Analysis by G. W. Ewing.
11. Modern Method of Chemical Analysis by Pecsok, Shield, Cairns, McWilliam, John Wiley and Sons.
12. Quantitative Analysis, 6th Ed., R. A. Day and A. L. Underwood, Prentice – Hall of India, 1993.

13. Instrumental Analysis: G. D. Caristian and J. E. O'Reilly (Allyn & Bacon Inc., New York, 2nd edition.
14. Instrumental Methods of Chemical Analysis: G. W. Ewing (McGraw-Hill, New York), 5th edition.
15. Instrumental Methods of Analysis: H. R. Willard, L. L. Merrit, J. A. Dean, F. A. Settle (Van Nostrand Reinhold Co., New York), 6th edition.
16. Modern Methods of Chemical Analysis: Pecsok, Shield & Cairns (John Wiley), 2nd edition.
17. Introduction to Instrumental Analysis (1987), R. D. Braun (McGraw-Hill Book Company), New Delhi.
18. Analytical Chemistry: Principles and Techniques: Larry G. Hargis (Prentice-Hall International edition).
19. Introduction to Modern Liquid Chromatography: L. R. Shyder & J. J. Kirkland (John Wiley & Sons, New York).
20. Handbook of Analytical Chemistry: L. Meites (McGraw-Hill, New York).

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

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

To be effective from June-2023

(NEP-2020)

Paper-IV: Analytical Chemistry (Elective Paper-B)

Total Periods: 60

Course Code		Title of the Course	**Spectroscopy and Extraction Techniques**
Total Credits of the Course	4	Hours per Week	4 hrs.

Course Objectives:	• To understand concept of photoacoustic spectroscopy, its instrumentation and comparison of photoacoustic spectra and UV spectra. Use of this spectroscopy in various field. • To understand the basic idea about optical rotatory dispersion and CD spectroscopy. Learn the application of the spectroscopy and the advantages of CD over ORD. • To understand the extraction of solute from liquid and with pressure, to impart the knowledge of doing extraction of different compounds and their application. • To learn use of microwave and super critical fluid for the extraction of compound as well as their application and limitation.

Course Content		
Unit	Description	Weightage* (%)
1.	**PHOTOACOUSTIC SPECTROSCOPY** Introduction, Principle, Instrumentation, Double beam photoacoustic spectrometer, Comparison photoacoustic spectra with UV spectra, gas monitoring by PAS, Depth profiling condensed systems, chemical, biological and surface application.	25
2.	**OPTICAL ROTATORY DISPERSION AND CIRCULAR DICHROISM SPECTROSCOPY** Introduction, Optical rotation and circular polarization, Rotatory dispersion, Instrumentation of ORD, Instrumentation of CD, Dichrograph, Cotton effect, Axial haloketone rule, Octant rule, application of ORD and CD, Advantages of ORD, Advantages of CD over ORD, Limitation and Comparison.	25

3.	**LIQUID-LIQUID EXTRACTION (LLE):** Introduction, selection of solvents, types of solvent extractions, problems and remedies of LLE process, purge and trap for volatile organics in aqueous samples. **PRESSURIZED FLUID EXTRACTION:** Introduction, Theoretical Consideration to the Extraction Process, Instrumentation, Method development for PFE, Application of PFE.	25
4.	**MICROWAVE ASSISTED AND SUPERCRITICAL FLUID EXTRACTION:** Introduction, concept of magnetron, atmospheric MAE process, pressurized MAE process, Applications. Supercritical fluid extraction: concept of critical state of matter and super critical state, properties of CO2 SFE, instrumentation and applications.	25

Teaching-Learning Methodology	To meet the effective teaching and the learning requirements, teaching-learning methodology comprises 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 / Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcome: Having Completed this course, the learner will be able to	
5.	Understand the basic concept of photoacoustic spectroscopy, its instrumentation and use of photoacoustic spectra in the field of chemical and biology.
6.	Learn the basic difference between optical rotatory dispersion and circular dichroism spectroscopy. Also learn their advantages, limitation and application.
7.	Learn the process of liquid-liquid extraction and pressurized fluid extraction. Also learn the various method development for the extraction of various compound.
8.	Use of microwave and supercritical fluid for the extraction of various compound when regular extraction has some limitation.

Suggested Reference Books:

21. Fundamental of molecular spectroscopy, C. N. Banwell, Tata Mc-Graw Hill Pub. Camp.
22. Spectrometric Identification of Organic Compounds (4th edition/5th edition), Silverstein, Bassler & Morril, John Wiley & Sons.
23. Introduction to Molecular Spectroscopy, G. M. Barrow, McGraw – Hill.
24. Modern Spectroscopy, J.M.Hollas, John Wiley.
25. Basic Principles of Spectroscopy, R.Chang, McGraw-Hill.
26. Extraction technique in analytical science, John R. Dean, Wiley (2009)
27. Spectroscopy by H. Kaur, New Pragati edition.
28. Instrumental Analysis by R. D. Braun, McGraw-Hill.
29. Introduction to Instrumental Analysis by R. D. Brawn, McGraw-Hill Book.
30. Fundamentals of Analytical Chemistry: Skoog D. R. and West D. M. (Holt, Rinehart & Winston, New York).
31. Instrumental Methods of Analysis by G. W. Ewing.
32. Instrumental Analysis: G. D. Caristian and J. E. O'Reilly (Allyn & Bacon Inc., New York, 2nd edition.
33. Instrumental Methods of Chemical Analysis: G. W. Ewing (McGraw-Hill, New York), 5th edition.
34. Instrumental Methods of Analysis: H. R. Willard, L. L. Merrit, J. A. Dean, F. A. Settle (Van Nostrand Reinhold Co., New York), 6th edition.
35. Modern Methods of Chemical Analysis: Pecsok, Shield & Cairns (John Wiley), 2nd edition.
36. Introduction to Instrumental Analysis (1987), R. D. Braun (McGraw-Hill Book Company), New Delhi.
37. Analytical Chemistry: Principles and Techniques: Larry G. Hargis (Prentice-Hall International edition).
38. Introduction to Modern Liquid Chromatography: L. R. Shyder & J. J. Kirkland (John Wiley & Sons, New York).
39. Handbook of Analytical Chemistry: L. Meites (McGraw-Hill, New York).

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

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

To be effective from June-2023

(NEP-2020)

Paper-V: Chemicals: Solution and Safety

(Skill Enhancement Course)

Total Periods: 30

Course Code		Title of the Course	Skill Enhancement Course Chemicals: Solution and Safety
Total Credits of the Course	2	Hours per Week	2 hrs.

Unit	Description
1.	**SOLUTION PREPARATION AND HANDLING** **(15 Periods)** Prepare solution and operate weighing balance for sampling to prepare different types of solution as per the Equivalent weight, Molecular weight, atomic weight, Specific gravity, Normality, Acidity, Basicity, Concentration, Normal Solution and Molar Solutions. Prepare the acid solutions, basic solutions and oxidizing - reducing agent, solutions. Prepare solutions of different concentration and determine the concentration and percentage purity. 4. Prepare the Complexometric solutions, indicators, sampling in solids, liquids and gases. Standardize the solutions, primary standardize, secondary standards, Prepare the Ethylene diamine tetra acetic acid (EDTA) solution & indicator.
2.	**CHEMICAL SAFETY AND ETHICAL HANDLING OF CHEMICALS** **(15 Periods)** Safe chemical working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation, safe storage and use of a hazardous chemicals, procedure for working with substance that pose hazards, flammable or explosive hazards, procedures for working with gases at pressure above and below atmospheric level, safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives, identifications, verification and segregation of a laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals, knowledge about the Personnel safety and use of personnel protective equipment's, explain the Behavior Based Safety (BBS), Operate firefighting extinguisher and knowledge of the Fire prevention.

Suggested Reference Books:

1. Quantitative Analysis, 6th Ed., R. A. Day and A. L. Underwood, Prentice – Hall of India,1993.
2. Elements of Analytical Chemistry by R. Gopalan; P.S. Subramanian and K.Rengarajan
3. Vogel's Qualitative Inorganic analysis
4. Vogel's Qualitative Organic analysis
5. Chemical Hazards in the workplace, measurement and control, Gangadhar Choudhary, American Chemical Society.
6. Safety at work by John Ridley
7. The safe handling of Chemicals in Industry, Vol. I and II, PA Carsion, CJ Mumford, Longmann &JW& Sons, New York

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

Inorganic Chemistry Practicals

To be effective from June-2023

(NEP-2020)

Course Code	[1803081001050001]	Title of the Course	Inorganic Chemistry
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To impart basic knowledge of qualitative analysis of Inorganic mixture • To identify three anions and three cations including one rare earth element by group separation. • To impart knowledge of different radicals by confirmative test. • Preparation of inorganic metal salts and it's crystallization

Course Content

1. Inorganic Qualitative Analysis: (Six elements including ONE rare element Any seven Rare earths elements) (Minimum eight Mixtures)
2. Inorganic Preparation.
   a. Hexa-ammine nickel (II) chloride
   b. Mohr's salt (Ferrous Ammonium sulphate)
   c. Sodium trioxalato ferrate trihydrate
   d. Sodium cobaltinitrite
   e. Tetra amine cupric sulphate
   f. Reineck's salt (Ammonium tetrathiocyanate diammine Chromate)

Teaching-Learning Methodology	Introduction, interaction with students in calculation of mole ratios, Carrying out experiments at each step according to the respective practical.

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.	Understand basics analysis of Inorganic mixtures.
2.	Identify anions by dry test of the mixture.
3.	Separation of each anions by group test from mixture.
4.	Identify each cation and confirm it by confirmative test.
5.	Understand different methods of Preparations of inorganic salts.
6.	Appreciate good laboratory practices.

Suggested References:
1. Textbook of practical inorganic chemistry – A.I. Vogel 2. Practical Chemistry by Dr O. P. Pandey, D. N. Bajpai, Dr. S. Giri 3. Advance inorganic analysis by Agarwal, Keemti lal 4. Qualitative Inorganic analysis - Vogel 5. Inorganic practical by Chatwal and Anand
On-line resources to be used if available as reference material
On-line Resources

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

Organic Chemistry Practicals

To be effective from June-2023

(NEP-2020)

Course Code	[1803081001050001]	Title of the Course	Organic Chemistry
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To impart basic knowledge for carrying out preparation. • Understand nature of reaction and establishment of reaction condition with mechanism. • To understand calculation of mole and mole ratio for each reaction. • Isolation of product from individual step and purification by crystallization. • Determination of physical constant and confirmation of product. • Concept of estimation and determination of each component quantitatively.

Course Content

1. Preparation of organic compounds (Any Six)

a. Nitration: m-Dinitro benzene from benzene
b. Bromination: p-Bromo acetanilide from acetanilide
c. Reduction: m-phenelene diamine from m-dinitrobenzene
d. Oxidation: p-Nitro benzoic acid from p-nitro toluene
e. Diazotization reaction: Preparation of Orange-II
f. Friedl-Craft's reaction: Rescetophenone from resorcinol
g. Cannizzaro reaction: Benzoic acid from benzaldehyde
h. Aldol condensation: Chalcone from benzaldehyde and acetophenone

2. Quantitative Estimations (Any Thee)

a. Estimation of ester + acid
b. Estimation of amide + acid
c. Estimation of formaldehyde via oxime
d. Estimation of number of carboxylic acid (succinic acid, oxalic acid)

Teaching-Learning Methodology	Introduction, interaction with students in calculation of mole ratios, Carrying out experiments at each step according to the respective practical.

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 learnerwill be able to	
1.	Understand the basics to carry out reactions, nature of reaction and calculation of mole and mole ratio.
2.	Establish mechanism and monitora reaction at specified condition.
3.	Work-up after the completion of reaction and purification.
4.	Confirmation of product through the references.
5.	Appreciate good laboratory practices.

Suggested References:

1. A text book of practical organic chemistry – A. I. Vogel
2. Practical organic Chemistry – Mann and Saunders
3. A handbook of quantitative and qualitative analysis – H. T. Clarke
4. Comprehensive Practical Organic Chemistry : Qualitative Analysis V K Ahluwalia & S.Dhingra.
5. Comprehensive Practical Organic Chemistry : Preparations and Quantitative Analysis V K Ahluwalia& R. Aggarwal Universities Press.
6. An Advance Course in practical Chemistry, A K. Nad, B. Mahapatra and A. Ghoshal.

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

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Master of Science, M.Sc. Chemistry,

Semester-I

Physical Chemistry Practicals

To be effective from June-2023

(NEP-2020)

Course Code	[1803081001050001]	Title of the Course	**Physical** Chemistry
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	• To study the rate constant of chemical reaction • To understand pH metric and potentiometric titration of between two solution. • To study the properties of surfactant and polymer in aqueous solution • To determine the concentration of solution by colorimetry • To understand the conductivity behaviour of electrolytes solution. • To understand phase behaviour of three component system

Course Content

1. Determine the dissociation constants of a given dibasic acid pH-metrically.
2. Determine the amount of ferrous sulphate / ferrous ammonium sulphate in given flask potentiometrically using cerric salt solution.
3. Verification of Onsager's equation and determination of equivalent conductance at infinite dilution of strong electrolytes
4. Determine the CMC of a surfactant by conductivity measurements.
5. Calculate the molar absorptivity of each of the given two solutions (A) and (B) and also find out concentration of supplied unknown solution colorimetrically.
6. Investigation the reaction between $K_2S_2O_8$ and KI at two different temperatures and calculate the energy of activation for the reaction.
7. To study the phase diagram of a three component system Water – acetic acid – chloroform.
8. Determination of CMC and area per molecule of a surfactant by surface tension measurement.
9. Determine the molecular weight of a given polymer from viscosity measurement.
10. Determine the relative strength of chloro acetic acid and acetic acid byconductance measurement.
11. Determine the strength of acid HCl with NaOH spectrophotometrically.

Teaching-Learning Methodology	Introduction, explanation of theory and procedure of the experiments and interpretation of results.

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 learnerwill be able to	
1.	Understand chemical kinetics of reaction.
2.	Qualitative analysis of compound
3.	Calculate the concentration of unknown solution by pH, potentiometer and colorimeter
4.	Understand behaviour of surfactant and polymer
5.	Separation of solvent using phase diagram

Suggested References:

1. Advanced Practical Physical Chemistry by Yadav J. B., Krishna Prakashan Media
2. Practical Physical Chemistry, Dr. M. Satish Kumar Sankalp Publication
3. Gurtu, J. N., Kapoor, R., Advanced Experimental Chemistry S. Chand & Co. Ltd.
4. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson

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

On-line Resources