હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી

NAAC A (3.02) State University

પો.બો.નં.-૨૧, યુનિવર્સિટી રોડ, પાટણ (ઉ.ગુ.) ૩૮૪૨૬૫

ફોનઃ(૦૨૭૬૬) ૨૩૭૦૦૦ ફેક્સ : (૦૨૭૬૬) ૨૩૧૯૧૭

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રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦

પરિપત્ર નં.- ૨૦૦/૨૦૨૩

વિષયઃ વિજ્ઞાન વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના સેમેસ્ટર-૧ અને ૨ના જૂન ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવતા અભ્યાસક્રમ / પરિક્ષા સ્કીમ અંગે.

આ યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા અંતર્ગત વિષયોના સ્નાતક વિભાગો તથા સંલગ્ન વિજ્ઞાન વિદ્યાશાખાની તમામ કોલેજોના આચાર્યશ્રીઓને જણાવવાનું કે, એકેડેમિક કાઉન્સિલની તારીખઃ ૧૪/૦૮/૨૦૨૩ની મળેલ સભાના નિર્દિષ્ટ ઠરાવોથી રાષ્ટ્રીય શિક્ષણ નીતિ-૨૦૨૦ અંતર્ગત UGCની Guideline તથા રાજય સરકારશ્રીના શિક્ષણ વિભાગના તારીખઃ ૧૧/૦૭/૨૦૨૩ના ઠરાવ નં.કે.સી.જી./એડમીન/૨૦૨૩-૨૪/૦૬૦૭/ખ-૧ થી પ્રકાશિત કરેલ કોમન કરિકયુલમ એન્ડ ક્રેડિટ ફ્રેમવર્ક હેઠળ ક્રેડિટ માળખું તથા પ્રકાશિત કરેલ સ્ટાન્ડર્ડ ઓપરેટીંગ પ્રોસિજર (S.O.P.) મુજબ વિજ્ઞાન વિદ્યાશાખા હેઠળના નીચેના સ્નાતક કક્ષાના સામેલ પરિશિષ્ટ પ્રમાણેના નવા અભ્યાસક્રમો શૈક્ષણિક વર્ષઃ ૨૦૨૩-૨૪ થી ક્રમશઃ અમલમાં આવે તે રીતે મંજુર કરેલ છે, જેનો અમલ કરવા સારૂ સબંધિતોને આ સાથે મોકલવામાં આવે છે.

ક્રમ નં	અભ્યાસક્રમ	ઠરાવ ક્રમાંક	સેમેસ્ટર
૧	બી.એસ.સી. (ગણિતશાસ્ત્ર)	૧૯	સેમેસ્ટર ૧ અને ૨
૨	બી.એસ.સી. (વનસ્પતિશાસ્ત્ર)	૨૦	સેમેસ્ટર ૧ અને ૨
૩	બી.એસ.સી. (બાયોટેકનોલોજી)	૨૧	સેમેસ્ટર ૧ અને ૨
૪	બી.એસ.સી. (ભૌતિકશાસ્ત્ર)	૨૨	સેમેસ્ટર ૧ અને ૨
૫	બી.એસ.સી. (ઝુલોજી)	૨૩	સેમેસ્ટર ૧ અને ૨
૬	બી.એસ.સી. (રસાયણશાસ્ત્ર)	૩૨	સેમેસ્ટર ૧ અને ૨

સદર બાબતની જાણ આપના સ્તરેથી અધ્યાપકશ્રીઓ તથા વિદ્યાર્થીઓને કરવા વિનંતી છે.

નોંધઃ

(૧) વિદ્યાર્થીઓની જરૂરીયાત માટે પરિપત્રની એક નકલ કોલેજના / ડિપાર્ટમેન્ટના ગ્રંથાલયમાં મૂકવાની રહેશે.

(૨) આ પરિપત્ર યુનિવર્સિટીની વેબસાઇટ www.ngu.ac.in પર પણ ઉપલબ્ધ કરવામાં આવેલ છે. આથી સંબંધિત કોલેજોને ડાઉનલોડ કરી ઉપયોગ કરવા સારૂ જણાવવામાં આવે છે.

(૩) <u>વિજ્ઞાન વિદ્યાશાખા</u> વિદ્યાશાખા હેઠળના સ્નાતક કક્ષાના પ્રોગ્રામ્સના અભ્યાસક્રમોનો પરિપત્ર નં.૧૩૦/૨૦૨૩, તારીખઃ૨૩/૦૬/૨૦૨૩ રદ કરવામાં આવે છે.

કા. કુલસચિવ

બિડાણઃ ઉપરમુજબ

નં-એકે/અ×સ/૩૬૪/૨૦૨૩
તારીખઃ૩૧/૦૮/૨૦૨૩

પ્રતિ,

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા તરફ.
૨. વિજ્ઞાન વિદ્યાશાખા હેઠળની કોલેજોના આચાર્યશ્રીઓ તરફ
૩. પરીક્ષા નિયામકશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૪. ગ્રંથપાલશ્રી, હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૫. માન.કુલપતિશ્રી/કુલસચિવશ્રીનું કાર્યાલય હેમચંદ્રાચાર્ય ઉત્તર ગુજરાત યુનિવર્સિટી પાટણ.
૬. સિસ્ટમ એનાલીસ્ટશ્રી, કોમ્પ્યુટર (રીઝલ્ટ સેન્ટર) હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ.(વેબસાઇટ પર મુકવા સારૂ)
૭. પ્રવેશ પ્ર-શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ
૮. મહેકમ શાખા, હેમ.ઉ.ગુ.યુનિવર્સિટી, પાટણ (૨ નકલ)

Principal
The H.N.S.B.Ltd Science College
Himatnagar-383 001.

Curriculum and Credit Framework For SEM I and II

Asper UGC Guideline

(According to NATIONAL EDUCATION POLICY (NEP) – 2020)

Submittedon21st July 2023

Principal
The H.N.S.B Ltd Science College
Himatnagar-383 001.

PROGRAM CODE : SCIUG102

Syllabus and Scheme of Examination

for

Sem. I and Sem. II of B.Sc. Honors Chemistry

Four-year Graduate Honors Program in Chemistry
Under NEP 2020

Submitted

to

Hemchandracharya North Gujarat University, Patan

Under

Choice Based Credit System

Implemented w.e. f June, 2023

Submitted on May, 2023
ReSubmitted on July, 2023
Resubmitted on August, 2023

A. Common Formula for Setting Question Papers for Major Discipline Specific course

Time: 2.30 Hours Total Marks: 50

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	13 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	12 Marks
Que. No: 3	Write any Two out of Three Questions	Unit III	13 Marks
Que. No: 4	Write any Two out of Three Questions	Unit IV	12 Marks

B. Common Formula for Setting Question Papers for Minor/ Multi/Inter disciplinary Courses

Time: 2.00 Hours Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

C. Common Formula for Setting Question Papers for Value added/ Skill Enhancement Courses

Time: 2.00 Hours Total Marks: 25

Theory Examination Pattern

Que. No: 1	Write any Two out of Three Questions	Unit I	08 Marks
Que. No: 2	Write any Two out of Three Questions	Unit II	08 Marks
Que. No: 3	Write any three Small relevant Questions	Unit I, II	09 Marks

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name : B. Sc. Chemistry Semester : I
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE101

Type of course : Major Discipline Specific course
Name of course : Fundamentals of chemistry I
Total Marks : 100

Effective from June 2023 Under NEP 2020

Total Credits : 04 Teaching Hours per Week: 04 Teaching Hours per Semester: 60		Theory	External 50 Marks Internal 50 Marks

Course Objectives:

1. To understand the core concepts of valence bond theories.
2. To understand organic chemistry i.e. resonance, hyperconjugation, inductive effect etc. and their application.
3. To study about the chemical kinetics and types of reactions.
4. To know about the Volumetric titrations and calculations for estimation.

Course Outcome:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
4. Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
5. To know about the Volumetric titrations and calculations for estimation.

Unit	Topic	Credit	Hr
1	**CHEMICAL BONDING** **(A) Valence Bond Theory:**Introduction; Hitler-London theory (energy changes taking place during the formation of H_2 Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covent bond, ionic bond, Coordination covalent bond Coordination bond and Wanderwals force bond. Hybridization and types of hybridization. SP, Sp^2, Sp^3, dsp^2,sp^3d, sp^3d^2 **(B) Molecular Orbital Theory:** Introduction. M.O. Treatment for H_2 molecules Bonding molecular orbitals and Anti-boding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A_2 type (H_2; H_2^+; N_2 ;N_2^+ ;O_2 ;O_2^+; O_2^{-2}) Formation and configuration of Molecular orbiral in a Hetero-nuclear diatomic species of AB type (CO; CN; CN^-; NO; NO^-)	1	15
2	**(A) Structure And Properties** Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anillinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals) **(B) Reaction Mechanism** Fission of Covalent bond (With at least one example of each intermediates), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic & Electrophilic), Elimination reactions (E1& E2), Addition reactions (Nucleophilic & Electrophilic)	1	15
3	**Chemical Kinetics.** Introduction : Rate of reaction, Order of reaction, Molecularity, Rate equation for zeroth order reaction, Rate equation for first order reaction, Characteristics of first order reaction, Rate equation for	1	15

	second order reaction.(a = b) & (a≠b); Characteristics of second order reaction, Rate equation for third order reaction (a = b = c) ; Characteristics of third order reaction, Consecutive reaction, Parallel reaction, Reversible reaction, Numerical.		
4.	**Analytical Chemistry** Introduction to Analytical Chemistry : Classification of Classical and Electro analytical Techniques, Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews), Criterion for Selection of analytical Techniques, Define: Accuracy, Precision, Specification, Detection limit, Characterization limit, Linearity, Range, Robustness, etc.Analytical Data Treatment: Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Significant figures, 2.5 d and 4.0 d rules.	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5^{th} edn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4^{th} edn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. ChemPMJDSCistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMJDSCCHE101

Type of Course : Practicals Major Discipline Specific Course PMJDSC
Name of Course : Practical's for Fundamentals of chemistry I
Total Marks : 100

Effective from June 2023 Under NEP 2020

GROUP A

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 12	Practicals	External 25 Marks Internal 25 Marks

GROUP B

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum Number Practicals to be Performed: 08	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

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

Course Outcomes:

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

Sr.No.	List of Practicals	Credit	Hr
GROUP A	**Organic Chemistry (Any twelve)** 1) Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point. Preparation of suitable derivative. 2) Candidate should perform the analysis of at least 06 compounds. List of compounds **Acids**: Benzoic acid. Cinnainic acid, Phthalic acid.Oxalic	2	60

	acid.Succinic acid. **Phenols**: α-Napthol. β-Naphthol. **Bases**: *p*-Toludine, Diphenylamine. Aniline.Methyl aniline. **Neutrals:** Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene. Acetone, Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
GROUP B	**Standardization (Any Eight)** 1. Identify laboratory glassware and equipments. 2. Calibration of burette, Pipette and measuring flasks. 3. Preparation of standard stock solution of HCI by v/v method and their different dilutions. 4. Preparation of standard solution of succinic acid and standardization of NaOH 5. Preparation of standard solution of oxalic acid and standardization of KOH 6. Preparation of standard solution of $Na_2S_2O_3$ and standardization of I_2 solution. 7. Preparation of standard solution of EDTA and estimation of Ca^{+2} in $CaCl_2$ solution. 8. Preparation of standard solution of EDTA and estimation of Mg^{+2} in $MgCl_2$ solution. 9. Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 10. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 11. Preparation of standard stock (i.e. 0.1 N NaOH solutions by w / v method and their different dilutions.	2	60
Books Recommended: 1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By			

Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

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

Effective from June 2023 Under NEP 2020

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

Course Objectives:

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

Course Outcome:

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

Unit	Topic	Credit	Hr
1	**CHEMICAL BONDING** **(A) Valence Bond Theory:** Introduction; Hitler-London theory (energy changes taking place during the formation of H_2 Molecule, Pauling-Slater's Theory (orbital Overlap theory of Covalent Bond). Types of Bond, Covent bond, ionic bond, Coordination covalent bond Coordination bond and Wanderwals force bond. Hybridization and	1	15

	types of hybridization. SP, Sp^2, Sp^3, dsp^2,sp^3d, sp^3d^2 **(B) Molecular Orbital Theory:** Introduction. M.O. Treatment for H_2 molecules Bonding molecular orbitals and Anti-boding molecular orbitals, Sigma and Pi Molecular orbitals. Formation and configuration of Molecular orbital in a Homo-nuclear diatomic species of A_2 type (H_2; H_2^+; N_2 ;N_2^+ ;O_2 ;O_2^+; O_2^{-2}) Formation and configuration of Molecular orbiral in a Hetero-nuclear diatomic species of AB type (CO; CN; CN^-; NO; NO^-)		
2	**(A) Structure And Properties** Factors affecting to the properties of organic molecule: Intramolecular forces (dipole-dipole interaction, vander waals forces), Electromeric effect, Inductive effect, Resonance effect(draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anillinium ion, Acetate ion), Hyper conjugation (O,P-directing effect of Alkyl group, Stability of Carbonium ion and Free radicals) **(B) Reaction Mechanism** Fission of Covalent bond (With at least one example of each intermediates), Types of reagents.: Nucleophile, electrophile, Free Radical, Types of organic reaction with mechanism, Substitution reactions Nucleophilic & Electrophilic), Elimination reactions (E1& E2), Addition reactions (Nucleophilic & Electrophilic)	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.

2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.

4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.

5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.

6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.

7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

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

Type of Course : Practicals Minor (Elective) Discipline Specific Course PMIDSC
Name of Course : Practical's for Fundamentals of chemistry I
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

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

Course Outcomes:

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

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

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	**Standardization** : **(Any Four)** **1**. Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2. Preparation of standard solution of Na_2S2O_3 and standardization of I_2 solution. 3 .Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{+2} in $CaCl_2$ / $MgCl_2$ solution. 4. Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 5. Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 6. Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions. 7. Preparation of standard stock solution of HCI by v/v method and their different dilutions.	1	30

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE103

Type of course : Multidisciplinary Course MDC
Name of course : General chemistry I
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To study about the Chemical kinetics and types of reactions.
2. To know about the Volumetric titrations and calculations for estimation.

Course Outcomes:

1. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
4. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Chemical Kinetics.** Introduction : Rate of reaction, Order of reaction, Molecularity, Rate equation for zeroth order reaction, Rate equation for first order	1	15

	reaction, Characteristics of first order reaction, Rate equation for second order reaction.(a = b) & (a≠b); Characteristics of second order reaction, Rate equation for third order reaction (a = b = c) ; Characteristics of third order reaction, Consecutive reaction, Parallel reaction, Reversible reaction, Numerical.		
2	**Analytical Chemistry** Introduction to Analytical Chemistry : Classification of Classical and Electro analytical Techniques, Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews), Criterion for Selection of analytical Techniques, Define: Accuracy, Precision, Specification, Detection limit, Characterization limit, Linearity, Range, Robustness, etc.Analytical Data Treatment: Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Significant figures, 2.5 d and 4.0 d rules.	1	15

Books Recommended:

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.
5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.
6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.
7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.
8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE103

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practical's for General chemistry I
Total Marks :50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

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

Course Outcomes:

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

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

	Benzaldehyde, Methy acetate, Ethyl acetate.Ethanol, 1-Propanol, Glycerol, Chloroform.Carbon tetrachloride, Chlorobenzene, Nitrobenzene.		
2	**Standardization (Any Four)** 1) Preparation of standard solution of succinic acid and standardization of NaOH / KOH 2) Preparation of standard solution of Na_2S2O_3 and standardization of I_2 solution. 3) Preparation of standard solution of EDTA and estimation of Ca^{+2} / Mg^{+2} in $CaCl_2$ / $MgCl_2$ solution. 4) Preparation of standard solution of Oxalic acid and standardization of $KMnO_4$ solution. 5) Preparation of standard solution of $K_2Cr_2O_7$ and standardization of $FeSO_4$ solution. 6) Preparation of standard stock (i.e. 0.1 N NaOH solution by w / v method and their different dilutions. 7) Preparation of standard stock solution of HCI by v/v method and their different dilutions.	1	30

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE103A

Type of course : Multi Disciplinary Course MDC
Name of course : Agricultural Chemistry
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To know about types of fertilizers
2. Major industrial suppliers of fertilizers
3. Need and importance of organic forming
4. To have Knowledge about Dry land agricultural forming.

Course Outcome:

1. Students will have a firm foundation in the fundamentals and application of current fertilizers.
2. Students will know about organic forming and its importance.
3. Status of dry land farming in India and its solution.

Unit	Topic	Credit	Hr
1	**Organic Farming** Introduction & history of organic farming, objective of organic farming, principle of organic farming, types of organic farming, techniques of organic farming, method of organic farming, difference between organic and Nonorganic farming, importance of organic farming, pros of organic farming, cons of organic farming, growth of organic farming, government initiative for organic farming, benefit: economical.	1	15

	Plant Nutrients, Major Nutrients, Minor Nutrients, Trace Nutrients		
2	**Reinforced & Dry land Agriculture:** Introduction & history of Reinforced & Dry land Agriculture, Problem & prospects of rainfed and& Dry land Agriculture in India, Soil and climatic conditions prevalent in dry land areas. Definition of Fertilizer, Classification of Fertilizer, Nano fertilizer, Super Phosphate, Tripal Super Phosphate. Mix Fertilizer. Droughts: Types, effect of water deficient on physio-morphological characteristics of plant. Crops management practices in dry land areas, Contingent crop planning for aberrant weather	1	15

Books Recommended:

1. Principle of Organic farming: S R Ready, As per ICAR Syllabus
2. Prakrutik Kheti (Gujarati Version) June 2020 By Shree Acharya Devrat, Dr. A. R. Pathak

Further Reading:

1. Industrial Chemistry by B. K. Sharma, Pragati Prakashan, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE103A

Type of course : Practicals Multi disciplinary Course PMDC
Name of course: Practical's for Agricultural chemistry
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand soil taxonomy.
2. To know about metrological properties of soil.
3. To provide information about essential elements in soil.
4. To understand about nanofertilizers.

Course Outcome:

1. Students will understand about quality of soil inour locality.
2. To know about preparation of organic fertilizers.
3. Interpretation of satellite data.

Sr.	List of Practicals	Credit	Hr
1	**(Any six)** 1. Classification of soils using soil taxonomy. 2. Identification and quantification of minerals in soil fractions 3. Analysis of plants for essential elements 4. Chemical analysis of soil for total and available nutrients. 5. Identification of fertilizers and nanofertilizers 6. Nutrient contents in nitrogenous, phosphatic and potassic fertilizers	1	15

	7. Decomposition of organic matter in soil		
2	**(Any Four)** 8. Aerial photo and satellite data interpretation for soil and land. 9. Morphological properties of soil profile in different landforms 10. Grouping soils using available data base in terms of soil quality. 11. Field Project - Preparation of Organic farming fertilizers 12. Field Project - Appling and studying Organic Farming fertilizers.	1	15

Books Recommended:

1. Indian Society of Soil Science. 2002.
2. Fundamentals of Soil Science. ISSS, New Delhi Kirkham, D. and Powers, W. L. 1972.
3. Lal, R. and Shukla, M. K. 2004. Principles of Soil Physics. Marcel Dekker

Further Reading:

4. Brady N. C. and Weil R. R. 2002. The Nature and Properties of Soils. 13th Ed. Pearson Edu.
5. Principles Plant Nutrition. International Potash Institute, Switzerland.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23VACCHE105

Type of course : Value Added Course VAC
Name of course : Pollution laws and Environment Protection
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To provide for prevention, control, and abatement of air pollution. To provide for the establishment of the boards at the central and state levels to implement the act.
2. To preserve and protect the nature's gifts from pollution.
3. To protect the man's fundamental rights of freedom
4. To enforce laws regarding the protection of environment in the regions.

Course Outcome:

1. Students willl understand that Equality and adequate conditions of life in an environment of quality that permits a life of dignity and wellbeing
2. To take strict actions against those who harm the environment
3. To safe guard better environment and better environment conditions..

Unit	Topic	Credit	Hr
1	**Introduction:** Environmental pollution, Types of pollution, Environment legislation, climate change in India ,Need for environment legislation, Purpose of environment legislation, Laws related to environment in India, Environment policies in India.	1	15
2	**Regulations:** The Noise Pollution (Regulation and Control)	1	15

	(Amendment) Rules, 2010, The Air (prevention and control of pollution) Act, 1981, The National Environment Appellate Authority Act, 1997, The Environment (Siting for Industrial Projects) Rules, 1999, The Ozone-Depleting Substances (Regulation And Control) Rules, 2000. Landmark cases on environment legislation in India 1. J.C. Galstaun v. DuniaLal Seal (1905) 2. M.C. Mehta & Another vs. Union of India & Others 3. Subhash Kumar v. State of Bihar (1991) 4.A global perspective on environment laws United Nations Conference on the Human Environment, Stockholm, 1972.		

Books Recommended:

1.Pollution Control Acts, Rules & Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest & Climate Change, Government Of India) PariveshBhawan, East Arjun Nagar, Delhi – 110032 Website: Http://Www.Cpcb.Nic.In April, 2021.

2.Environmental Law In India, By P Leelakrishnan, 6th Edition 2021 By P Leelakrishnan**,** Publisher: Lexis Nexis.

3.Environmental Law and Policy in India,ShyamDiwan& Armin Rosencranz, Oxford University Press.

Further Reading:

1.Pollution Control Acts, Rules & Notifications Issued thereunder, Central Pollution Control Board (Ministry Of Environment, Forest & Climate Change, Government Of India) Parivesh Bhawan, East Arjun Nagar, Delhi – 110032 Website: Http://Www.Cpcb.Nic.In April, 2021.

2. Environmental Law and Policy in India,Shyam Diwan & Armin Rosencranz, Oxford University Press.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106

Type of course : Skill Enhancement course SEC
Name of course : Analytical Chemistry-I
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand importance of taking precautions in Chemical laboratory
2. To have knowledge of lab apparatus
3. To know about primary and secondary laboratory reagents .

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing laboratory reagents.
2. To understand the importance glass wares in chemical laboratories and in performing experiments.
3. Students will learn how to prepare chemical solutions needed in chemical laboratories.

Unit	Topic	Credit	Hr
1	**Lab Apparatus** (A) Glass apparatus Beaker, test tube, boiling tube, conical flask, filtration flask, round bottom flask, flat bottom flask, funnel, separating funnel, watch glass, measuring cylinder, petridish, desiccator, measuring cylinder, glass rod, glass tube. (B) Volumetric and Heating apparatus Volumetric apparatus: Volumetric flask, burette, pipette, analytical balance, electronic balance. Heating apparatus: Bunsen burner, water bath, sand bath, hot air oven, heating mantle	1	15

	(C) Miscellaneous Apparatus Buchner funnel, burner, test tube stand, tong, burette stand, clamp, china dish, wire gauze, cork, vacuum pumps, crucibles, clay pipe triangle, pestle and mortar, spatulas, thermometer, pH meter, Kipp's apparatus		
2	**Laboratory Reagents And Solvents Reagents** Classification of reagents according to their action; (i) acids (ii) bases (iii) salts (iv) complexing agents (v) oxidizing and reducing agents (vi) precipitating agents (vii) chelating agents. Each type to be explained with at least one suitable example. Primary and secondary standards: Definition, characteristics, uses examples for different types of reactions. Solvents: Solute, Solvent & Solution, classification of solvents (i) Protic and aprotic (ii) Acidic, basic amphiprotic and neutral (iii) Aqueous and non-aqueous (iv) Polar and nonpolar. Each type is to be explained with at least one example.	1	15

Books Recommended:

1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman

2. Willard, Hobert H. et. al: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.

3. Christian, Gary D; Analytical Chemistry, 6th Ed. New York- John Willy, 2004.

4. Harris, Daniel C,Quantitative Chemical Analysis, 3rd Edition, W.H. Freeman and Company, New York, 2001.

5. Khopkar, S.M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.

6. Koogs, West and Holler, Fundamentals of Analytical Chemistry, 6th Edition, Sauders College Publishing, New York. 1991.

Further Reading:

Suggestive Digital Platforms Web Links:

1. http://chemcollective.org/vlabs
2. https://www.vlab.co.in/broad-area-chemical-sciences
3. https://wp.labster.com/chemistry-virtual-labs/
4. https://www.youtube.com/watch?v=O_nyEj_hZzg

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106A

Type of course : Skill Enhancement Course SEC
Name of course : Chemical Laboratory Management
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. 1. To understand and appreciate role of laboratory assistants chemicals laboratories at school, college and university level.
2. Handling of chemicals in safer ways.
3. To manage chemicals and assist students in learning of chemical experiments.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in prepare solutions in the laboratory.
2. This course will prepare students for entry-level roles in the industry.
3. A proper chemical lab management will help in safety of chemical sciences department and success to reach different applications

Unit	Topic	Credit	Hr
1	**Laboratory assistant** – Duties and Qualifications of laboratory assistant, Lab Assistant job title, Tasks and duties, different type of lab duties, Essential skills in laboratory assistant, Role and responsibilities, Duties of lab assistant in school, college and University Understanding safety rules, Maintaining record of students usage of chemicals and glasswares, use greener ways and reduce waste in labs. Design Experimental Products for Degradation after Use. Labelling of chemicals, classification of	1	15

	chemical mixtures.		
2	**Fundamentals of laboratory management**, Types of laboratory management, Importance of quality of laboratory management, Management of chemicals-Acquisition of chemicals, Receiving the chemicals, Inventory and tracking of chemicals, Chemical segregation, storage limitations, Guidance on Safe Storage of Chemicals in Laboratories: Principles of Safe Storage, checking Quality of chemicals . **Laboratory safety manual:** chemical management questions, Laboratory information system, Lab Collector LIMS,	1	15

Books Recommended:

1. Prudent Practices in the Laboratory, Handling and Management of Chemical Hazards, National research Council, committee on Prudent Practices in laboratory, National Academic Press, 2011.
2. Laboratory Quality/Management by Parson Kenneth N, Publisher Xilbris, Atlantic publishers Hardcover, 2006.
3. Safe Storage of Laboratory Chemicals, Hardcover 2nd edition, Printed May 1991 by Wiley-Inter science.

Further Reading:

1. Laboratory Work in Chemistry by Keiser Edward H., Publisher: Forgotten Books
2. Laboratory Management System - General Requirements by Kumar Pawan Bharati) Publisher: Discovery Publishing House Pvt Ltd, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : I**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE106B

Type of course : Skill Enhancement Course SEC
Name of course: Soil Testing and Analysis
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. 1. To estimate the physical properties and available nutrient status (macro, secondary and micro-nutrients) of soils.
2. Evaluation of fertility status of soil
3. To provide soil test based recommendations to farmers for improving soil fertility and economic return to farmers.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing land suitability for various agricultural and non-agricultural uses.
2. Explores the problems and potentials of soil and decide the most appropriate land use.
3. Soil analysis is a valuable tool for your farm as it determines the inputs required for efficient and economic production.
4. A proper soil test will help ensure the application of enough fertilizer to meet the requirements of the crop while taking advantage of the nutrients already present in the soil.

Unit	Topic	Credit	Hr
1	**Introduction:** Definition of Soil, Formation of Soil, Types of Soils & Basic Concepts. Soil Components: Air, Water, inorganic and organic solids,	1	15

	Properties of Soil: A) Physical Properties :- Soil Separates, Texture, Aggregation and Structure, Temperature, Colour, Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration and Drainage, Compaction, Surface area, Soil water relationships. B) Chemical Properties :- Morphology of Colloids, Chemistry of Clays, Ionic Exchange, Acidity, Alkalinity, pH, Salinity, Reactions in Liming and Acidification. C) Biological Properties :- Soil Organic Matter, C: N Relationships, N-Transformation, Soil Organisms, Sulfur Transformation.		
2	**Sample Collection and Processing:** Purpose of Soil testing and analysis, selection of field, Method of Soil Sample collection Methods of soil sample processing, precautions during soil collection & processing, Preservation labeling and Storage of soil samples, various types of boys used for collection. **Study of Instruments:** PH Meter, Conductivity meter, spectrometer, UV-Spectrophotometer, use of soil testing kit and mobile soil testing van. Kjeldahl's Assembly for determination of nitrogen. **Soil Test Report & Fertilizer Recommendation:** Preparation of Soil analysis and test report, Fertilizer recommendation, preparation of soil test summaries and fertility maps.	1	15

Books Recommended :

1. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
2. Fundamentals of soil science, foth, H.D. Wiley Books.
3. Soil Science and Management, Plaster, Edward J., Delmar Publishers.
4. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York.

Further Reading:

5. Handbook of Agricultural Sciences, S.S.Singh, P.Gupta, A.k.Gupta, Kalyani Publication.
6. Soil Sampling, Preparation and analysis, Marcell Dekker, Inc, New York.
7. Soil Sampling and methods of analysis, carter M.R. and E.G.Gregorich, 2007, 2nd Ed..
8. Methods of soil analysis, Part, American society of Agronomy Inc., Kuete, A.Et.at., 1986.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MJDSCCHE201

Type of course : Major Discipline Specific course MJDSC
Name of course : Fundamentals of chemistry II
Total Marks : 100

Effective from June 2023 Under NEP 2020

Total Credits : 04	Teaching Hours per Week: 04 Teaching Hours per Semester: 60	Theory	External 50 Marks Internal 50 Marks

Course Objectives:

1. To understand concepts of inorganic chemistry in terms of coordination compounds, p lock elements.
2. To apply Stereo chemistry and spatial arrangement of some compounds.
3. To understand Thermodynamics as basis of general laws of sustainable equilibrium.
4. To know about the Volumetric titrations and calculations for estimation various ions.

Course Outcomes:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries. Majors to be certified by the American Chemical Society will have extensive laboratory work and knowledge of Biological Chemistry.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
5. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Coordination Compounds** Werner,s Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2.	**Stereochemistry** Introduction of Stereo Isomers; **(A) Optical isomerism :** General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. **(B) Geometrical isomerism:** Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). **(C) Conformational isomerism:** Definition, Conformational analysis of ethane, n-butane with rotationalAnd tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher &flying wedge formula, Difference between conformation and configuration.	1	15
3.	**Thermodynamics** Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy,	1	15

	enthalpy, free energy, maximum work function. First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
4.	**(A) Introduction To Volumetric Analysis** Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs $KMnO_4$), Complexo metric Titrations (Only $Ca^{+2/}Mg^{+2}$Vs EDTA), Precipitation Titrations (Only Vs $AgNO_3$), Related Numerical. **(B) Complexometric titrations** Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.

2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.

3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.

2. Analytical Chemistry, Garry D.Christain.

3. Analytical Chemistry, Day & Underwood.

4. Analytical Chemistry by Lerry&Hergins.

5. Qualitative Analysis by A.I.Vogel, 5thedn.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.

2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.

4. Organic Chemistry. T.W.GrahamSolomons, 4thedn. John Wilay. 1998.

5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.

6. Essentials of physical Chemistr by B.S.Bahal, ArunBahal. G. D.Tuli.

7. Physical Chemistry by P.W.Atkins. 5^{th} edn.Oxferd 1994 7thedn-2002.

8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.

9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.

10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMJDSCCHE201

Type of course : Practicals Major Discipline Specific Course PMJDSC
Name of Course : Practical's for Fundamentals of chemistry II
Total Marks : 100

Effective from June 2023 Under NEP 2020

GROUP A

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 12	Practicals	External 25 Marks Internal 25 Marks

GROUP B

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 08	Practicals	External 2 5Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals **(Any twelve)**	Credit	Hr
GROUP A	**Inorganic Chemistry Semi micro Analysis:** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 12 compounds.	2	60
GROUP B	**Volumetric Titrations (Any Eight)** 1. To determine the strength of NaOH and Na_2CO_3 present in	2	60

	the mixture of NaOH & Na_2CO_3 solution and to find out their percentage composition. 2. To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$ & Na_2CO_3 solution and to find out their percentage composition. 3. To determine the Normality, gram/liter and molarities of $H_2C_2O_4.2H_2O$ and H_2SO_4 present in the mixture of $H_2C_2O_4.2H_2O$ and H_2SO_4 solution by using X N NaOH and Y N $KMnO_4$ solutions. 4. To determine the Normality, gram/liter and molarity of $H_2C_2O_4 .2H_2O$ and $K_2C_2O_4$ present in the mixture of $H_2C_2O_4. 2H_2O$ & $K_2C_2O_4$ solution by using X N NaOH and Y N $KMnO_4$ solutions. 5. To determine the amount of Ca^{2+} and Mg^{2+} ion by EDTA solution from the mixture of $CaCl_2$ and $MgCl_2$ solution. 6. Determination of chloride ions in the given solution by titrating against the standardized solution of silver nitrate. 7. To determine the concentration/molarity of $KMnO_4$ solution by titrating it against Standard solution of ferrous ammonium sulphate. 8. Preparation of standard stock solution of NaOH by W/V method and their different dilutions. 9. Preparation of standard stock solution of $K_2Cr_2O_7$ by W/V method and their different dilutions. 10. To determine molar mass of unknown acid by titration with NaOH.		

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.
2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MIDSCCHE202

Type of course : Minor (Elective) Discipline Specific course MIDSC

Name of course : Fundamentals of chemistry II

Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand concepts of inorganic chemistry in terms of coordination compounds, p lock elements
2. To apply Stereo chemistry and spatial arrangement of some compounds.

Course Outcomes:

1. Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Inorganic and Physical Chemistries.
2. Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
3. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
4. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

Unit	Topic	Credit	Hr
1	**Coordination Compounds** Werner,s Theory; Explain the structure of Co(III) ammines on the basics of Werner's theory, Experimental evidence in favor of Werner's theory Sidgwick's effective atomic number (EAN) rules, Application of EAN rules, Nomenclature of Coordination compounds. Nature of Metal legend bonding VB theory, Limitation of VB theory. Isomerism in Coordination Compounds, Structural, Conformation, Ionization, Hydrate, Coordination, Linkage, Coordination position, Ligand and Polymerization isomerism. Stereo isomerism, Geometrical isomerism and Optical isomerism.	1	15
2	**Stereochemistry** Introduction of Stereo Isomers; **(A) Optical isomerism :** General, Discussion of elements of symmetry, Molecular chirality, Enantiomers, Optical activity, Properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, Diastereomers, R-S Nomenclature, Threo and Erythro diastereomers, Meso compounds. **(B) Geometrical isomerism:** Definition and general discussion of geometric isomers, General Methods of structure determination (physical methods), E-Z nomenclature, (Simple illustration should be given). **(C) Conformational isomerism:** Definition, Conformational analysis of ethane, n-butane with rotationalAnd tortional diagram, Conformation of cyclohexane, Axial and Equitorial bonds, Newmann projection, Show horse formula, Fisher &flying wedge formula, Difference between conformation and configuration.	1	15

Books Recommended:

Inorganic Chemistry

1.Modern Inorganic Chemistry' by G.F.Liporni, ELBS, 4th edn. coilingEducational. 1983.

2. 'Inorganic Chemistry' D.F.Shriver. P.W.Atkinss and C.H.Longford, 3rd edn, ELPS Oxford University Press, 1999..

3. 'Concise Inorganic Chemistry' J.D.Lee. 5thedn.

4. 'Inorganic Chemistry', D.F.Slirjver, P.W.Atkinss, 3rdedn, Oxferd. 1999.

5. 'Concise Inorganic Chemistry' J.D.Lee, 4thedn, Champman and hall ELBS,1991.

6. 'Inorganic Chemistry' by A.G.Sharp, 3rdedn, ELBS, Longman, 1990.

Organic Chemistry

1. 'Organic reaction and mechanism, P.S.Kalsi, New Age internationalPublishers.

2. Text book of organic Chemistry. P.S.Kalsi, New Age international Publishers.

3. Organic Chemistry Vol. I&II.S.M.Muklierji, S.P.Singh.R.P.Kapoor.

4. Reaction mechanism in Organic Chemistry, S.M.Mukhergi. S.P.Singh. 3rdedn. Macmillan.

Further Reading:

1. Reaction Mechanism and Reagents in Organic Chemistry, GurdeepR.Chatwal 4thedn, Himalaya Publication House.

2. Text book of Organic Chemistry, ArunBahal, S.Chand.

3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education2003.

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5. Nuclear Chemistry by C.V.Shekhar, Dominent-Publisher. New Delhi.

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7. Physical Chemistry by P.W.Atkins. 5th edn.Oxferd 1994 7thedn-2002.

8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.

9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.

10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMIDSCCHE202

Type of course : Practicals Minor (Elective) Discipline Specific Course PMIDSC
Name of Course : Practical's for Fundamentals of chemistry II
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry Semi micro Analysis: (Any six)** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 08 compounds.	1	30
2	**Volumetric Titrations (Any four)** 1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition. 2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the solution mixture of $NaHCO_3$ & Na_2CO_3 and to find out their	1	30

	percentage composition. 3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions. 4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4$ $2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4$ $2H_2O$ & $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions. 5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$. 6) Calibration of burette Pipette and measuring flasks.		

Books Recommended:

1.Practical Chemistry : For B.Sc. I, II And III Year Students of All India Universities By Pandey O.P. & et Al. publisher S. Chand's, Paperback December 2010.

2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE203

Type of course : Multidisciplinary course MDC

Name of course : General chemistry II

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand Thermodynamics as basis of general laws of sustainable equilibrium.
2. To know about the Volumetric titrations and calculations for estimation of various ions.

Course Outcomes:

1. Students will be able to explore new areas of research in both medicinal chemistry and allied fields of science and technology.
2. Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
4. Students will be able to function as a member of an interdisciplinary problem solving team.

Unit	Topic	Credit	Hr
1	**Thermodynamics** Thermodynamics (only introduction) : System and surrounding- work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function.	1	15

	First law of thermodynamics heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship, Work done in adiabatic and isothermal reversible expansion of an ideal gas. Second law of thermodynamics, Carnot cycle and its efficiency , Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases. Gibbs- Helmholtz equation, Vant hoff isochore equation, Vant hoff isotherm equation, Numerical.		
2	**(A) Introduction To Volumetric Analysis** Principle, Mechanism and Applications of Acid-Base Titrations (Only strong acid Vs strong Base), Redox Titrations (Only Fe(II) Vs $KMnO_4$), Complexo metric Titrations (Only $Ca^{+2/}Mg^{+2}$Vs EDTA), Precipitation Titrations (Only Vs $AgNO_3$), Related Numerical. **(B) Complexometric titrations** Introduction, EDTA :An important chelating Agents Types of EDTA titration metallochromic indicators, Factors Affecting on stability of complexes, masking and de masking, selectivity of titration construction of the titration curve.	1	15

Books Recommended:

Physical Chemistry

1. Advance Physical Chemistry by Gurdeep raj.
2. Physical Chemistry (Question and Answer) by R.N.Madan, G.D.Tuli..S.Chand.
3. Principal of Physical Chemistry by Puri Sharma, Pathania.

Chemical Thermodynamics by R.P.Rastogi and R.R.Misra.

Analytical Chemistry

1. Fundamentals of Analytical Chemistry by Skoos& West.
2. Analytical Chemistry, Garry D.Christain.
3. Analytical Chemistry, Day & Underwood.
4. Analytical Chemistry by Lerry&Hergins.
5. Qualitative Analysis by A.I.Vogel, 5thedn.

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2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Organic Chemistry, R.Morrison and R.Boyd, 6thedn, Pearson Education 2003.
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8. Physical Chemistry b R.A.Albert and RJ. Silby, John Wiley 1995.
9. Physical Chemistry by G.H.Barrow. 5thedn, Mac GrawHill . 1988. 6thedn. 1996.
10. Physical Chemistry by W.J.Moore. 4thedn. Orient Longmans 1969.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE203

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practical's General chemistry II
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To identify the cationic and .anionic ions in mixture.
2. Preparation of solutions for volumetric solutions.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of cations and anions in inorganic mixtures.
2. Students will have basic knowledge of volumetric titrations.

Sr.No.	List of Practicals	Credit	Hr
1	**Inorganic Chemistry Semi micro Analysis: (Any six)** Cation analysis: separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Anion analysis like (Water Soluble and insoluble). Candidate should perform the analysis of at least 08 compounds.	1	30
2	**Volumetric Titrations (Any four)** 1) To determine the strength of NaOH and Na_2CO_3 present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition. 2) To determine the strength of $NaHCO_3$ and Na_2CO_3 present in the	1	30

	solution mixture of $NaHCO_3$ & Na_2CO_3 and to find out their percentage composition. 3) To determine the Normality, gram/liter and molarities of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$ $2H_2O$ and H_2SO_4 by using X N NaOH and Y N $KMnO_4$ solutions. 4) To determine the Normality, gram/liter and molarity of $H_2C_2O_4$ $2H_2O$ and $K_2C_2O_4$ present in the solution mixture of $H_2C_2O_4$ $2H_2O$ & $K_2C_2O_4$ by using X N NaOH and Y N $KMnO_4$ solutions. 5) To determine the amount of Ca^{+2} and Mg^{+2} ion by EDTA solution from the mixture solution of $CaCl_2$ and $MgCl_2$. 6) Calibration of burette Pipette and measuring flasks.		

Books Recommended:

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2.Basic Principles of Practical Chemistry,

by V. Venkateswaran (Author) publisher S. Chand's, Paperback – 1 January 2012

3. Chemistry In Laboratory-B.Sc.-Sem-I-Vi-Hons.

By Dr.Subhojit Ghosh (Author), Dr.Madhushree Das Sharma (Author), publisher CBCS, Paperback – 1 January 2019.

Further Reading:

1. Practical Chemistry, By Sonia Ratnani (Author), Swati Agrawal (Author), Sujeet Kumar Mishra (Author) publisger Mc Graw Hill, 1st Edition Paperback – 16 September 2020.

2. B.Sc. Practical Chemistry First Year By Paperback, Dr. M.M.N. Tandon, Publisher: Shiva Lal Agarwal & Company, 2020.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Course Name **: B. Sc. Chemistry Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23MDCCHE203A

Type of course : Multi Disciplinary Course MDC
Name of course : Pollution and Climate change
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. The course on Climate Change has been framed with an intention to provide a general concept within the dimensions of climate changes.
2. It is to equip the learners with appropriate tools and techniques for interpreting the impacts of climate change, and evaluating & implementing measures that reduce vulnerability of systems.
3. It offers an opportunity to interact with administrators, community leaders, NGOs and professionals helping the students to understand the broad framework of Climate Change in India in general and Gujarat in particular.

Course Outcomes:

1.To know the impacts that climate change is having on the natural environment; understand how climate change has the potential to exacerbate air pollution , soil erosion with potentially life threatening consequences
2. To understand how climate change can lead to habitat destruction and how habitat destruction can interact with other aspects of climate change to threaten the survival of some animal species.
3. Recognize how systems work by seeing the relationships between climate and other forms of environmental change.

Unit	Topic	Credit	Hr
1	**Pollution:** Environment pollution: Causes, effects and control measures of, Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards Climate change, Causes of climate change, Climate Change and Water , Forest and Biodiversity , Coastal Ecosystem , Agriculture and Food Security. Issues due to climate change: Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and Holocaust, Vertical temperature.	1	15
2	**Status due to climate change:** Sustainable Development Goals: An Climate Change and Sustainable Development, World, National and State Policies for Achieving Sustainable Development Goals, Role of Various Stakeholders , Building Partnership for Climate Change and Sustainable Development. Calculation of global mean temperature, Climate change threats in India, CCPI climate change Performance Index, Some Case Studies.	1	15

Books Recommended:

1. Textbook for Environmental Studies Bharati Vidyapeeth Institute of Environment Education and Research Pune. Online available: https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf
2. Environmental Chemistry by H Kaur, Pragati prakashan, 2020

Further Reading:

1. The Climate Solution: India's Climate-Change Crisis and What We Can Do About It by Mridula Ramesh, Hachette book publications, Gurugram , New Delhi 2018
2. The New Climate War, The Fight to Take Back Our Planet By Michael E. Mann , scribe publishers. Co. Uk, 2021.
3. The Nutmeg's Curse: Parables for a Planet in Crisis by Amitav Ghosh, University of Chicago Press, 2021.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23PMDCCHE203A

Type of course : Practicals Multi Disciplinary Course PMDC
Name of course : Practicals For Climate change and Pollution
Total Marks : 50

Effective from June 2023 Under NEP 2020

Total Credits : 02 Teaching Hours per Week: 04 Lab Teaching Hours per semester:60 Minimum number of practicals to be performed: 10	Practicals	External 25 Marks Internal 25 Marks

Course Objectives:

1. To learn about climate change mapping.
2. To Prepare the data for carbon dating.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in identification of various parameters for climate change.
2. Students will have basic knowledge about instruments needed for climate change.
3. To relate pollution parameters toclimate change.

Sr.No.	List of Practicals	Credit	Hr
1	**(Any five)** 1. Conventional Measurements Of Pressure, Temperature, Humidity, Wind, Precipitation, Visibility, Clouds, Soil Temperature, Moisture. 2. Fieldwork and checking climatic conditions In Nearest Climate in Farm or Forest or Desert or Water body, Analysis and interpretation of surface meteorological data. 3. Introduction to MATLAB in climate change. 4. To demonstrate the concept of thermal expansion of water when heated, as an analogy to thermal expansion of oceans due	1	30

	to global warming. 5. Showing windy, animated weather map using GIS interface using current and projected wind and other weather conditions for any location in country. 6. Global temperature projections with increasing and decreasing greenhouse gas emissions. 7. The animation showing changes in temperature across the cities, countries, relative to pre industrial level under two different emissions in climate change model. The first emission increasing continuously in a period and second showing decrease in emission in different period or state or country.		
2	**(Any Five)** 8. Two experiments showing role of plants in mitigationg the acidification caused by dissolution of CO2 in water: Uptake of Carbon dioxide from water by plants 9. Useof Carbon Footprint Calculator to study Climate Change for three sectors home energy use, local transportation and home waste generation. 10. To study Comparison of the Effects of Increased CO2 in the Air to Seawater and Distilled Water **11.** To study detailed information on low-carbon lifestyles**.** 12. To develop data for your area on save energy.To arrange and assess data on Walk, bike, or take public transport. And shift to electric vehicles to save climate. 13. Demonstrate save food and environ protection by throwing less food or no food. 14. Prepare report on Environmental Policy Debate at National level or at international agreements, or Montreal protocol 1987 Kyoto protocol 1997, or Convention on Climate Change, or Carbon credit and carbon	1	30

	trading, or Clean development mechanism.		

Books Recommended:

1. Practical Agricultural Meteorology: Srivastava A.K. and P. K. Thyagi; New India Publishing Agency, New Delhi
2. The Practice of Weather Forecasting: Wickham P.G; HMSO, London 3. Weather and Climate: Woodcock R. G., Macdonald and Evans

Further Reading:

1. A guide to matlab: Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg. Kevin R. Coombes, John E. Osbom, Garrett J. Stuck.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23VACCHE205

Type of course : Value Added course VAC
Name of course : Ethical and Social Dimensions of Chemistry
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. Understanding basic Philosophy of chemistry and applying it in daily research activity.
2. Increasing knowledge on theory, conduct and communication of science.
3. Applying Ethics to chemistry Practice.
4. Developing a sense of right and wrong leading to practical ethical behavior.

Course Outcomes:

1. Development of a positive character, empathetic human being, responsible citizen, a compassionate and empathetic being.
2. Learning concepts of responsibility and sustainability in S&T.
3. Promoting a sustainable life style for the individual, community and environment protection.
4. Inculcating a positive work culture respecting professional ethics.

Unit	Topic	Credit	Hr
1	**Introduction:** Science conduct, logic and theory of science, experimentation, writing publications, dealing with uncertainty, social impact of scientific activity. Applying the fundamentals in philosophy of science and research ethics to the particular conduct of science and its internal and	1	15

	external domains of responsibility is expected to sharpen and solidify the students' awareness for the theory of research practice, their knowledge of Ethics and their ability to exploit ethical thinking for the application in the social sphere , science and technology as a field of human activity that impacts the quality of life of people all over the planet.		
2	**Applied Ethics:** Applied Ethics in Science and Technology, domains of Bioethics, Medical Ethics, Environmental Ethics, Profession Ethics and Business Ethics. Some examples from chemistry, science in general, research, engineering, R&D, etc. in the history of societies worldwide, the students should get a sense for the Ethos of science conduct, on the one hand, challenges in society and environment with a higher degree of sustainability. Qualities of good citizen, volunteerism, building chemistry through volunteerism, Patriotic values and ingredients of nation building,	1	15

Books Recommended:

1. Indian Culture Values and Professional Ethics (For Professional Students) by P. S. R. Murty, Edition, 2nd Edition, publisher
2. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur (Author), R. Sangal (Author), G.P. Bagaria , publisher KirtiPrakashan,30 April 2010.
3. The Power of Ethics: How to Make Good Choices When Our Culture Is on the Edge by Simon and Schuster · Narrated by Susan Liautaud, publisher :The Little Book of Big Ethical Questions,Susan Liautaud, Jan 2021.
4. Ethics in chemistry from poison gas to climate engineering by Joachim Schummer and TomBorsen (Aalborg University, Denmark), https://doi.org/10.1142/12189 | March 2021.

Further Reading:

1. International ethics in chemistry: Developing common values across cultures by Susan M. Schelbe and Kelly M. Elkins, Publication American chemical Society, United states, Nov 21, 2021.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206

Type of course : Skill Enhancement Course SEC
Name of course : Analytical Chemistry-II
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To estimate the physical properties and available nutrient status (macro, secondary and micro-nutrients) of soils.
2. Evaluation of fertility status of soil
3. To provide soil test based recommendations to farmers for improving soil fertility and economic return to farmers.

Course Outcomes:

1. Students will gain a comprehensive knowledge and skills in assessing laboratory reagents.
2. To understand the importance glass wares in chemical laboratories and in performing experiments.
3. Students will learn how to prepare chemical solutions needed in chemical laboratories.

Unit	Topic	Credit	Hr
1	**BASICS OF NANOMATERIALS** Basics of Nanomaterials: Definition, size-shape dependent properties, top-down and bottom-up approaches for nanomaterials, synthesis, general applications of nanomaterials, names of techniques for analysis of nanomaterials.	1	15

2	**POLYMERS:** Introduction, natural and synthetic polymers, Degradation in polymer, issues related degradation, biodegradable and non-degradable polymers. The RCI codes for plastic: Use in recycling. Applications of polymers, single use plastic. Status of polymer degradation at national and international level.	1	15

Books Recommended:

1. Poole, Jr.; Charles, P.; Owens, Frank, J. (2003), Introduction to Nanotechnology, a. John Wiley and Sons.

2. Chattopadhyay, K. K.; Banerjee, A. N. (2009), Introduction to Nanoscience and a. Technology, PHI. 3. Carraher, C. E. Jr. (2013), Seymour's Polymer Chemistry, Marcel Dekker, Inc.

4. Ghosh, P. (2001), Polymer Science and Technology, Tata Mcgraw-Hill.

5. Gwarikar, Polymer Science (2009), New India publisher.

6. Billmeyer, Text book of Plymer science, Tata Mcgraw-Hill. 1998.

Further Reading:

1.https://www.youtube.com/watch?v=0k4ryWpwhmo

2. https://en.wikipedia.org/wiki/Cement

3. https://nptel.ac.in/courses/118104008

4. https://ccsuniversity.ac.in/bridge-library/pdf/L3%20Synthesis%20of%20Nanostructured%20Materials%20Prof%20BPS.pdf

5. https://www.tutorialsduniya.com/notes/chemistry-of-cosmetics-perfumes-notes

6. https://pharmacy.hebmu.edu.cn/trywhx/resources/43/2019624163611.pdf

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206A

Type of course : Skill Enhancement Course SEC
Name of course : Food Analysis and Quality Control
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To develop the skills on the standardization of food products with respect to quality maintain according to universal food standards worldwide.
2. To learn principles of analysis.
3. To know about chemical properties of food components in food industries..
4. To manage the long term quality of foods in storage.

Course Outcomes:

1.Students will have a thorough understanding on the quality attributes, their measurement principle and instrumentation of various instruments used in food quality analysis.

2. The students will know the importance of various methods to identify any adulteration aspect of food.

3. Students will have a thorough understanding on various food laws with their amendments and regulation guidelines followed in national and international.

Unit	Topic	Credit	Hr
1	**Concept of quality:** Quality attributes: physical, chemical, nutritional and microbial evaluation and measurement, physiochemical method, microscopic examination and physical method; Sensory evaluation: Sensory characteristics of food, sensory requirements, Types of sensory evaluation. Objective evaluation: Tests used for objective evaluation,	1	15

	application and limit, Instruments used for quality assessment-color & gloss, size & shape, defects, texture, Viscosity & consistency, **Food adulteration and food toxins:** Common adulterant in food (milk and milk products, edible oils, cereals&pulses, prepared foods, spices, beverages); simple screening, control of food adulteration. Food Toxins: Natural antinutritional factors, microbial toxins.		
2	**Measurement of toxicants and toxicity:** Assessment of toxicity of evaluation of limits of contaminants in contexts of food safety. Food associated carcinogenesis, Food chemical carcinogens-sources and mechanism, food allergens, Industrial food processing and Packaging contaminants. **Food laws and regulation:** Mandatory and voluntary food laws, International quality systems and standards like ISO and Food Codex, BRC; International trades & federal agencies, Indian act-Food Safety and Standards Act, 2006, Various food acts- PFA,FPO,AGMARK, MMPO,MFPO, edible oil acts, standard weight acts.	1	15

Books Recommended:

1. Subash. C Jain, International Marketing, 6th edition.

2. Varshney, R.L and Bhattacharya, B International markaetying management and Indian perspective, Sultan chand and sons, New Delhi.

3. Kohler P, Keller K.L, Koshy A, Jha M, 13th edition 2009, Marketing Management- A South Africa Perspective, Pearson Education, New Delhi.

Further Reading:

4. Ramaswamy, V.S and Namakumari ,S.; 4th edition Marketing Manangement –Global Perspective- Indian Content, McMillan Publishers India Ltd, New Delhi.

5. Saxena, Rajan, 3rd edition; Marketing management, Tata McGraw Hill Publishing Company Ltd, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**
PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206B

Type of course : Skill Enhancement Course SEC
Name of course : Chemical Storage Management
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. To understand and appreciate the importance of store keeper in storage of chemicals.
2. Safety in storage of chemicals.
3. To manage the long term quality of chemicals in storage.

Course Outcome:

1. Students will gain a comprehensive knowledge and skills in assessing the role of store keeper in chemical sciences.

2. Explores the problems that can arise during storage of chemicals in a storage.

3. Chemical Store management is a valuable tool for smooth functioning of chemical laboratories.

4. A proper store management will help in safety of chemical sciences department and success to reach applications

Unit	Topic	Credit	Hr
1	**Storing Chemicals:** General rules for storing chemicals, General requirements, Segregation of incompatible chemicals, Specifications for chemical storerooms, Chemical storage in laboratories (outside of chemical storerooms) , Additional storage requirements and recommendations for specific hazard chemical classes. Organization and types of chemicals to be	1	15

	stored. **Store Keeper:** Qualities of store keeper, duties of store keeper, Responsibilities of storekeeper, functions of storekeeper, skills of storekeeper, management ofinventory,Trade exemption, Tendering for new purchase.		
2	**Classification of laboratory Chemicals:**, Classification of Chemicals on the basis of hazard level**,** (Explosive, Oxidizing, Flammable, toxic, Harmful), Chemical segregation, storage limitations, storage cabinets and safety cabinets, Guidance on Safe Storage of Chemicals in Laboratories: Principles of Safe Storage, Storage Facilities, Acid cabinets, Flammable solvent cabinets, Ventilated cabinets T, Storage of Different Materials, Carcinogens and Mutagens (class 1 and 2) and Substances Toxic to Reproduction - Substances subject to special security & licensing requirements, Novel /experimental substances.	1	15

Books Recommended:

1. The Merck Index : An Encyclopedia of Chemicals, Drugs, and Biologicals, Hardcover, 14th edition, Printed Nov. 2006.
2. Safe Storage of Laboratory Chemicals, Hardcover2nd edition, Printed May 1991 by Wiley-Interscience.

Further Reading:

1. Safe Laboratories : Principles and Practices for Design and Remodeling, Hardcover (January 1991), prepared with the assistance of American Chemical Society Committees.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

Program Name **: B. Sc. Chemistry** **Semester : II**

PROGRAM CODE : SCIUG102
COURSE CODE : SC23SECCHE206C

Type of course : Skill Enhancement Course SEC
Name of course : Water Quality Assessment
Total Marks : 50

Effective from June 2023 Under NEP 2020

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

Course Objectives:

1. to obtain quantitative information on the physical, chemical, and biological characteristics of water via statistical sampling
2. The type of information sought depends on the objectives of the monitoring program.

Course Outcomes:

1. Explain the general properties of water and understand water resources and water conservation.
2. Develop awareness about water quality criteria and standards, and their relation to public health and environment
3. Understand important parameters for measuring water quality.
4. Know about the methods for the determination of water quality parameters
5. Learn how to run accurate water quality tests and to determine how the parameters relate to each other.

Unit	Topic	Credit	Hr
1	**Water Quality Fundamentals:** Chemistry of water, Physical and chemical properties, Water recourses, water pollution, Important water Quality parameters and methods for their determination - turbidity, color, taste, pH, acidity, alkalinity,	1	15

	They will learn how to overcome the generation gap and connect with their family more. **Module: Selfless Service** **Subject: Seva: (2 Hour)** Students will learn that performing seva is beneficial to one's health, well-being, and happiness. It also benefits and inspires others.	

Text & Reference Books:

- IPDC Workbook – I

University Question Paper Scheme			
Q.1	Unit-I	Descriptive/ Long questions with choice	10 Marks
Q.2	Unit-II	Descriptive/ Long questions with choice	10 Marks
Q.3	All Unit	Objective / Short Question / True –False etc.	5 Marks

I/c. Principal
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