



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, ઉદના-મગદલા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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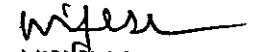
સંદર્ભ:યુનિવર્સિટી પરિપત્ર ક્રમાંક/એસ./સાયન્સ/પરિપત્ર/૧૬૦૮૫/૨૦૨૩ તા.૨૭/૦૬/૨૦૨૩

**-: પરિપત્ર :-**

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, NEP-2020 અંતર્ગત શિક્ષણ વિભાગના તા.૧૧/૦૭/૨૦૨૩ ના ઠરાવ અન્વયે, શૈક્ષણિક વર્ષ-૨૦૨૩-૨૪ થી અમલમાં આવનાર B.Sc.Chemistry Sem.-1 નો Major, Minor, Multidisciplinary, SEC અને Sem.-2 નો Major, Minor નો અભ્યાસક્રમ રસાયણશાસ્ત્ર વિષયની અભ્યાસ સમિતિના ચેરમેનશ્રીએ અભ્યાસ સમિતિવતી મંજૂર કરી વિજ્ઞાન વિદ્યાશાખાને કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાના અધ્યક્ષશ્રીએ વિદ્યાશાખાની મંજૂરીની અપેક્ષાએ વિદ્યાશાખાવતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૦૭/૦૮/૨૦૨૩ ની સભાના ઠરાવ ક્રમાંક: ૯૯ અન્વયે માન.કુલપતિશ્રીને આપેલ સત્તા અંતર્ગત માનનીય કુલપતિશ્રી દ્વારા મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

(બિડાણ: ઉપર મુજબ )

ક્રમાંક : એસ./સાયન્સ/પરિપત્ર/૨૩૧૫૦/૨૦૨૩  
તા.૦૪-૦૯-૨૦૨૩

  
કુલસચિવ

પ્રતિ,

૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન તમામ કોલેજોનાં આચાર્યશ્રીઓ.

..... 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



B.Sc. (Chemistry)

Syllabus as per

NEP 2020

(Effective from June, 2023)

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# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## B. Sc. Chemistry

As per NEP 2020

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B.Sc. Chemistry is an undergraduate degree program that focuses on the study of various aspects of chemistry, including its principles, theories, and practical applications. It is a comprehensive program that equips students with a solid foundation in the field of chemistry and prepares them for a wide range of career opportunities.

**Upon completion of the program, graduates are expected to possess the following general outcomes:**

- **Knowledge and Understanding:** Graduates will have a strong theoretical and practical knowledge of the fundamental concepts and theories in chemistry, including organic, inorganic, physical, and analytical chemistry.
- **Laboratory Skills:** Graduates will be proficient in laboratory techniques, including the handling of chemicals, operation of laboratory equipment, and conducting experiments safely and accurately.
- **Critical Thinking and Problem Solving:** Graduates will develop critical thinking skills and the ability to analyse and solve complex problems in the field of chemistry. They will be adept at designing experiments, interpreting data, and drawing logical conclusions.
- **Communication Skills:** Graduates will be able to effectively communicate scientific ideas and findings through written reports, presentations, and scientific discussions. They will also possess strong teamwork skills, enabling them to collaborate with peers and professionals in the field.
- **Ethical and Professional Conduct:** Graduates will understand the importance of ethical conduct in scientific research and demonstrate professionalism in their interactions with colleagues, clients, and the broader community.

In addition to these general outcomes, B.Sc. Chemistry programs may also have specific outcomes tailored to meet the needs of the particular institution or program.

**The specific outcomes:**

- **Specialized Knowledge:** Graduates will have in-depth knowledge in specific sub-disciplines of chemistry, such as environmental chemistry, medicinal chemistry, dyes, or materials chemistry.
  - **Research Skills:** Graduates will possess research skills and the ability to design and carry out independent research projects in chemistry.
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- **Industrial Applications:** Graduates will be familiar with the applications of chemistry in various industries, such as pharmaceuticals, dyes, petrochemicals, materials science, and environmental science.
- **Advanced Instrumentation Skills:** Graduates will have hands-on experience with advanced analytical instruments used in chemical analysis, such as spectroscopy, chromatography, pH Metry and conductometry.
- **Advanced Computational Skills:** Graduates will be proficient in using computational tools and software for modelling chemical structures, predicting properties, and simulating chemical reactions.

Overall, the B. Sc. Chemistry program aims to provide students with a solid foundation in chemistry, preparing them for various careers in the chemical industry, research institutions, academia, and other related fields. It equips students with the necessary theoretical knowledge, practical skills, and critical thinking abilities to excel in the diverse and ever evolving field of chemistry.

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

B. Sc. Chemistry

Teaching &amp; Evaluation

Scheme

F. Y. B. Sc. Semester-I

MAJOR (MJ) COURSE							
Course Code	Paper Title	Course credit	Teaching schedule Hrs./week	Internal marks	External marks	Total Marks	Duration of external exam
CH-MJ-101	Chemistry- I	3	3	35	35	70	2
CH-MJ-102	Chemistry-II	3	3	35	35	70	2
CHP-MJ-1	Inorganic qualitative analysis and Volumetric titration	2	4	30	30	60	4
Total				100	100	200	
MINOR (ME) COURSE							
CH-ME-101	Fundamental of Chemistry-I	2	2	25	25	50	1
CHP-ME-101	Inorganic qualitative analysis and Standardization	2	4	25	25	50	4
Total				50	50	100	
MULTIDISCIPLINARY COURSE (MDC)							
CH-MDC-101	Green and Environmental Chemistry	2	2	25	25	50	01

CH-MDC-P-101	Green and Environmental Chemistry Practical	2	2	25	25	50	04
Total				50	50	100	
<b>SKILL ENHANCEMENT COURSE (SEC)</b>							
CH-SEC-101	Chemistry Lab Operations and Safety Measures	1	1	13	13	26	01
CH-SEC-P-101	Practical	1	2	12	12	24	02
Total				25	25	50	

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
SURAT**

Syllabus effective from  
June, 2023  
For

F. Y. B. Sc. Semester- I

Total credit: 03 (Theory-3)

Total Hrs: Theory-45

**CH-MJ-101 (Theory)**

Course Code		Title of the Course	Chemistry-I
Total Credits of the Course	3	Hours per Week	3 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Solids, lattice parameters – its calculation, application of symmetry, solid characteristics of simple salts and different theories of acids, salt hydrolysis and acid-base equilibria
2.	Atomic theory and its evolution, learning scientific theory of atoms, Physical and chemical characteristics of elements in various groups and periods according to ionic size, charge, etc. and position in periodic table.
3.	Chemical kinetics: type of reactions, determination of rate, theories of reaction rate, classification and application and synthesis of polymers.

**Unit - 1 A. Solid state**

**9 h**

General characteristics of solid state, classification of crystalline solid, crystal lattice and unit cell, numbers of atoms in unit cell, closed pack structure, packing efficiency, imperfection in solid state, types of point defect, electrical and magnetic properties, Bragg's equation (X-ray diffraction)

**Reference Books:**

1. *Essentials of physical chemistry* by A. S. Bahl and G. D. Tuli, Pub: S. Chand
2. *Advance physical chemistry* by D. N. Bajpai, Pub: S. Chand
3. *Numerical problems* by Dogra and Dogra (for numerical)
4. *A textbook of physical chemistry* by A. S. Negi and S. C. Anand, Pub: New Age International (for numerical)
5. *Solid State Chemistry and its Applications* by A. R. West

**B. Acid Base Theories and pH concept**

**6 h**

Arrhenius theory, Lowry Bronsted theory, Lewis's theory, Solvent - Solute concept of acid-base, Soft-Hard acid base and its application, Calculation of pH and pOH of solution

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**Reference Book:**

1. *Essentials of physical chemistry* by A. S. Bahl and G. D. Tuli, Pub: S. Chand

**Unit - 2    A. Atomic structure** **8 h**

Historical perspective of atomic structure; Rutherford's atomic model, Bohr's theory and its limitation, Spectrum of Hydrogen atom (Lyman, Balmer, Paschen, Brackett & Pfund), Quantum numbers, Aufbau, Hund and Pauli exclusion principles, Penetration and shielding, Effective nuclear charge (Slater rule)

**Reference Books:**

1. *University General Chemistry* by C.N.R. Rao, Pub: McMillan
2. *Principles of Physical Chemistry* by Maron & Pruton, 4<sup>th</sup> edition, Pub: Oxford & IBH
3. *Physical Chemistry* by G.M. Barrow
2. 4. *Advance inorganic chemistry (Vol. II)* by Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan; Pub. S. Chand

**B. Periodic Properties** **7 h**

Definition of atomic and ionic radii, ionisation energy, electron affinity and electron negativity, S-Block elements: Comparative study, diagonal relationship, salient features of hydrides

**Reference books:**

1. *Modern inorganic chemistry* by Gurdeep Raj
2. *Principals of inorganic chemistry* by Puri, Sharma and Kalia; Pub. Vishal publishing
3. *Inorganic Chemistry* by J. D. Lee

**Unit - 3    A. Chemical Kinetics** **8 h**

Chemical kinetics and its scope, rate of reaction, factors affecting rate of reaction: temperature, concentration, pressure, solvent, light and catalyst, Molecularity of reaction, Classification of chemical reaction, Order of reaction with illustration (first order, second order, third order, zero order, pseudo first order) reaction, second order (a=b), half-life and mean life.

**Reference books:**

1. *Essentials of physical chemistry* by A. S. Bahl and G. D. Tuli, Pub: S. Chand
2. *Advance physical chemistry* by D. N. Bajpai, Pub: S. Chand.
3. *Numerical problems* by D. V. S. Jain, Pub. McGraw Hill (for numerical)

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## B. Polymer

7 h

Definition of monomers, polymers. Classification based on (i) source (ii) structure of polymer (iii) modes of polymerization (iv) molecular forces, Uses and application of polyethylene, Nylon 6, Nylon 66, Novalac, Bakelite, Melamine, Natural polymers, Buna - N and Neoprene with reaction, Biodegradable polymers, PHAB, Nylon -2- Nylon 6, Polymers of commercial importance; polypropylene, polystyrene, polyvinyl chloride, urea-formaldehyde resin, Glyptal, Bakelite

### Reference:

1. Odian; George, Principles of Polymerization, McGraw-Hill Book Co., New York (1970).
2. W. Billmeyer, Text book of polymer science, 3rd Edn., 2007, Wiley.
3. J. R. Fried, Polymer Science and Technology, (2005), PHI publication.
4. Billmeyer Jr.; Fred W., Textbook of Polymer Science, Wiley- Interscience Publishers, New York (1962).

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
SURAT**

Syllabus effective from  
June, 2023  
For  
B. Sc. Semester- I  
Total credit: 03 (Theory-3)

Total Hrs: Theory-45

**CH-MJ-102 (Theory)**

Course Code		Title of the Course	Chemistry-II
Total Credits of the Course	3	Hours per Week	3 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Basic of alkanes, cycloalkanes, chemical and physical properties, reactivity and reaction mechanisms, IUPAC Nomenclature of organic compounds
2.	Stereochemistry of organic molecules – conformation and configuration, asymmetric molecules and nomenclature, Understanding hybridization and geometry of atoms, 3-D structure of organic molecules, identifying chiral centers, synthesis and application of some important chemicals
3.	Aromatic compounds and aromaticity, synthesis and properties of Heterocyclic, Polynuclear Hydrocarbons and arenes compounds and organic qualitative analysis

**Unit - 1 A. Alkanes**

**11 h**

IUPAC nomenclature of branched and unbranched alkanes, Alkyl group, Classification of carbon atoms in alkanes. Isomerism in Alkanes, sources, methods of formation special reference to Wurtz reaction, Kolbe reaction and Corey-House reaction and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenations of alkanes: orientation, reactivity & selectivity.

**Cycloalkanes**

Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (Cyclo propane and cyclo butane), Theory of strainless ring. The case of cyclo propane ring: banana bonds.

**B. IUPAC Nomenclature of organic compounds**

**4 h**

IUPAC nomenclature of open chain compounds having functional groups: -OH, -O-, -CHO, >C=O, -COOR, -COOH, -CONH<sub>2</sub>, -NO<sub>2</sub>, -X, NH<sub>2</sub>, -R.

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<b>Unit - 2</b>	<b>A. Stereochemistry</b>	<b>11 h</b>
	a) Isomerism: Optical activity, Chiral and Achiral molecules,	
	b) Optical isomerism of tartaric acid, Enantiomers, diastereomers (Threo & Erythro), Meso compounds Resolution of Racemates, inversion retention and racemization.	
	c) Geometrical Isomerism: Alkene derivative & oximes E & Z system of nomenclature.	
	d) Relative and absolute configuration, sequence rules. D & L and R & S system of nomenclature.	

<b>B. Preparation, Chemical reactions, and Applications</b>	<b>4 h</b>
Diethyl ether, Citric acid, Anthranilic acid, Acetamide, Resorcinol.	

<b>Unit - 3</b>	<b>A. Heterocyclic compounds</b>	<b>6 h</b>
	Nomenclature aromaticity, and synthesis properties uses and canonical structures of Pyrrole, Benzopyrrole, Furan, Benzofuran, Thiophene, Benzothiophene.	

<b>B. Polynuclear Hydrocarbons</b>	<b>4 h</b>
Classification aromaticity and Industrial preparation, properties, uses and canonical structures of Naphthalene, Anthracene and Phenanthrene.	

<b>C. Arenes</b>	<b>3 h</b>
Method of preparation of Benzene, Toluene, Xylene from petroleum and chemical reaction, activating and deactivating substituents, Orientation, Activating and Deactivating Substitution, Ortho-para ratio	

<b>D. Organic Qualitative Analysis</b>	<b>2 h</b>
<b>(I) Elemental Analysis</b> (Lassaigne Test with equation)	
<b>(II) Solubility of Organic Compound</b> (Ref.: Vogel's qualitative organic analysis)	
<b>Chemical Methods:</b> Solubility in NaHCO <sub>3</sub> , NaOH and HCl, Acid, Base and Phenol and amphoteric compounds (Sulphanilic acid and Anthranilic acid)	

**Reference Book:**

1. *Organic chemistry Vol. I and Vol. II by I. L. Finar (Longman group)*
2. *Organic chemistry by P. L. Soni*
3. *Organic chemistry by R.T. Morrison and Boyd Prentice Hall India.*
4. *Organic chemistry by B.K. Sharma.*
5. *Organic chemistry by Bahl and Bahl*
6. *Organic reaction mechanism by Mukharji and singh*
7. *Fundamentals of Organic chemistry by Soloman, John Wiely*
8. *Vogel's qualitative organic analysis*

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
SURAT**

Syllabus effective from  
June, 2023  
For  
B. Sc. Semester-I

Total credit: 02 (Theory-2)

Total Hrs: Theory-30

**CH-ME-101 (Theory)**

Course Code		Title of the Course	Fundamental of Chemistry-I
Total Credits of the Course	2	Hours per Week	2 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Solids, lattice parameters – its calculation, application of symmetry, solid characteristics of simple salts and atomic theory and its evolution, learning scientific theory of atoms
2.	Basic of alkanes, cycloalkanes, chemical and physical properties, reactivity and reaction mechanisms and basics of corrosion, its types and its protection methods

**Unit - 1 A. Solid state**

**8 h**

General characteristics of solid state, classification of crystalline solid, crystal lattice and unit cell, numbers of atoms in unit cell, closed pack structure, packing efficiency, imperfection in solid state, types of point defect, electrical and magnetic properties, Bragg's equation (X-ray diffraction)

**Reference Books:**

1. *Essentials of physical chemistry* by A. S. Bahl and G. D. Tuli, Pub: S. Chand
2. *Advance physical chemistry* by D. N. Bajpai, Pub: S. Chand
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4. *A textbook of physical chemistry* by A. S. Negi and S. C. Anand, Pub: New Age International (for numerical)
5. *Solid State Chemistry and its Applications* by A. R. West

**B. Atomic structure**

**7 h**

Historical perspective of atomic structure; Rutherford's atomic model, Bohr's theory and its limitation, Spectrum of Hydrogen atom (Lyman, Balmer, Paschen, Brackett & Pfund), Quantum numbers, Aufbau, Hund and Pauli exclusion principles, Penetration and shielding, Effective nuclear charge (Slater rule)

**Reference Book:**

1. *University General Chemistry* by C.N.R. Rao, Pub: McMillan
2. *Principles of Physical Chemistry* by Maron & Pruton, 4<sup>th</sup>

edition, Pub: Oxford & IBH

3. *Physical Chemistry* by G. M. Barrow

4. *Advance inorganic chemistry (Vol. II)* by Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan; Pub. S. Chand

**Unit - 2 A. Alkanes and Cycloalkanes**

**8 h**

**Alkanes**

IUPAC nomenclature of branched and unbranched alkanes, Alkyl group, Classification of carbon atoms in alkanes. Isomerism in Alkanes, sources, methods of formation special reference to Wurtz reaction, Kolbe reaction and Corey-House reaction and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenations of alkanes: orientation, reactivity & selectivity.

**Cycloalkanes**

Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (Cyclo propane and cyclo butane), Theory of strainless ring. The case of cyclo propane ring: banana bonds.

**Reference Book:**

1. *Organic chemistry Vol. I and Vol. II* by I. L. Finar (Longman group)
2. *Organic chemistry* by P. L. Soni
3. *Organic chemistry* by R.T. Morrison and Boyd Prentice Hall India.
4. *Organic chemistry* by B.K. Sharma.
5. *Organic chemistry* by Bahl and Bahl
6. *Organic reaction mechanism* by Mukharji and singh
7. *Fundamentals of Organic chemistry* by Soloman, John Wiley
8. *Vogel's qualitative organic analysis*

**B. Corrosion and its Protection:**

**7 h**

Definition and importance of corrosion, Types of corrosion: uniform, pitting, inter crystalline and stress cracking corrosion, electro-chemical theory of corrosion. Protection methods: Coating, Inhibitors (Organic, Inorganic, anodic, cathodic), anodic and cathodic protection.

**Reference Book:**

1. *Environmental Chemistry* by A.K. De.
2. *The corrosion and oxidation of metals* by Evans U.R. (1961), Arnold, London.
3. *Corrosion, Causes and Prevention*, Speller. F., Mc Graw Hill, New York.
4. *Dhatvik Ksharan, Part-I & II* by M.N. Desai, Uni. Granth Nirman Board (Gujarat).
5. *Corrosion and Corrosion Control*, Uhlig H., Wiley.
6. *Corrosion Engineering* by Fontana M.G. and Green N.D., Mc Graw Hi

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY,  
SURAT**

**CHEMISTRY PRACTICAL SYLLABUS effective from June,**

**2023For**

**B. Sc.**

**Semester- I**

**CHP-MJ-1**

**Total credit: 02**

**Total Hrs: Practical: 60**

**(Practical)**

Course Code		Title of the Course	Inorganic qualitative analysis and Volumetric titration
Total Credits of the Course	2	Hours per Week	4 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Imparting practical knowledge of qualitative analysis of soluble inorganic salts
2.	Various analytical methods of volumetric analysis especially acid-base and redox titration

**A. INORGANIC QUALITATIVE ANALYSIS LIST OF INORGANIC CHEMICALS**

**CHLORIDES:**  $\text{Cu}^{+2}, \text{Fe}^{+3}, \text{ME}^{+2}, \text{Co}^{+2}, \text{Ni}^{+2}, \text{Ca}^{+2}, \text{Ba}^{+2}, \text{Sr}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**BROMIDES:**  $\text{Sr}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**IODIDE:**  $\text{K}^{+}$

**NITRATE:**  $\text{Pb}^{+2}, \text{Co}^{+2}, \text{Ni}^{+2}, \text{Ba}^{+2}, \text{Sr}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**SULPHIDE:**  $\text{Zn}^{+2}, \text{Sb}^{+3}$

**SULPHATE:**  $\text{Cu}^{+2}, \text{Al}^{+3}, \text{Fe}^{+2}, \text{Zn}^{+2}, \text{ME}^{+2}, \text{Co}^{+2}, \text{Ni}^{+2}, \text{Mg}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**CHROMATE:**  $\text{Na}^{+}, \text{K}^{+}$

**CARBONATE:**  $\text{Cu}^{+2}, \text{Zn}^{+2}, \text{ME}^{+2}, \text{Co}^{+2}, \text{Ni}^{+2}, \text{Ca}^{+2}, \text{Ba}^{+2}, \text{Sr}^{+2}, \text{Mg}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**PHOSPHATE:**  $\text{Cu}^{+2}, \text{Al}^{+3}, \text{Fe}^{+3}, \text{Zn}^{+2}, \text{ME}^{+2}, \text{Ca}^{+2}, \text{Ba}^{+2}, \text{Sr}^{+2}, \text{Mg}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**OXIDE:**  $\text{Sb}^{+3}, \text{Zn}^{+2}$

**BROMIDES:**  $\text{Sr}^{+2}, \text{Na}^{+}, \text{K}^{+}, \text{NH}_4^{+}$

**N. B. Candidate should perform the analysis of at least 12 compounds.**

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**B. VOLUMETRIC EXERCISE**

$\text{H}_2\text{SO}_4$	$\text{NaHCO}_3$	$\text{HNO}_3$
$\text{KMnO}_4$	$\text{H}_2\text{C}_2\text{O}_4$	$\text{KOH}$
$\text{KMnO}_4$	$\text{FeSO}_4$	$\text{K}_2\text{Cr}_2\text{O}_7$
$\text{K}_2\text{Cr}_2\text{O}_7$	$\text{Fe-NH}_4\text{-SO}_4$	$\text{KMnO}_4$
$\text{H}_2\text{C}_2\text{O}_4$	$\text{KMnO}_4$	$\text{FeSO}_4$

**N. B. Candidate should perform at least 3 volumetric exercises.**

*hhs*

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

CHEMISTRY PRACTICAL SYLLABUS effective from June,

2023For

B. Sc.

Semester- I

CHP-ME-

101

Total credit: 02

Total Hrs: Practical: 60

(Practical)

Course Code		Title of the Course	Inorganic qualitative analysis and Standardization
Total Credits of the Course	2	Hours per Week	4 hrs.

Course Outcome: Having Completed this course, the learner will be able to understand	
1.	Imparting practical knowledge of qualitative analysis of soluble inorganic salts
2.	Standardization and various preparation of standard solution

A. INORGANIC QUALITATIVE ANALYSIS LIST OF INORGANIC CHEMICALS

CHLORIDES:  $\text{Cu}^{+2}$ ,  $\text{Fe}^{+3}$ ,  $\text{ME}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

BROMIDES:  $\text{Sr}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

IODIDE:  $\text{K}^{+}$

NITRATE:  $\text{Pb}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

SULPHIDE:  $\text{Zn}^{+2}$ ,  $\text{Sb}^{+3}$ .

SULPHATE:  $\text{Cu}^{+2}$ ,  $\text{Al}^{+3}$ ,  $\text{Fe}^{+2}$ ,  $\text{Zn}^{+2}$ ,  $\text{ME}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

CHROMATE:  $\text{Na}^{+}$ ,  $\text{K}^{+}$

CARBONATE:  $\text{Cu}^{+2}$ ,  $\text{Zn}^{+2}$ ,  $\text{ME}^{+2}$ ,  $\text{Co}^{+2}$ ,  $\text{Ni}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

PHOSPHATE:  $\text{Cu}^{+2}$ ,  $\text{Al}^{+3}$ ,  $\text{Fe}^{+3}$ ,  $\text{Zn}^{+2}$ ,  $\text{ME}^{+2}$ ,  $\text{Ca}^{+2}$ ,  $\text{Ba}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

OXIDE:  $\text{Sb}^{+5}$ ,  $\text{Zn}^{+2}$

BROMIDES:  $\text{Sr}^{+2}$ ,  $\text{Na}^{+}$ ,  $\text{K}^{+}$ ,  $\text{NH}_4^{+}$ .

N. B. Candidate should perform the analysis of at least 8 compounds other than Inorganic Substances given in Major Course (MJ) Practical syllabus.

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**B. PREPARATION OF STANDARD SOLUTION (BY STUDENTS) OF FOLLOWING.**

1. 0.1 N succinic acid against NaOH
2. 0.1 N KHP against NaOH/KOH
3. 0.01 N  $\text{Na}_2\text{S}_2\text{O}_3$  against  $\text{I}_2$  solution
4. 0.1 N  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$  against  $\text{KMnO}_4$  solution
5. 0.1 N  $\text{K}_2\text{Cr}_2\text{O}_7$  against  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  Or  $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  solution

**N. B. Candidate should perform at least 3 standard solution preparation.**

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**B. Sc. Chemistry**  
**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**

Syllabus effective from June, 2023 For

B. Sc. Semester- I

Multidisciplinary Subject

Total credit: 02 (Theory)

Total Hrs: Theory: 30

Course Code		Title of the Course	Green and Environmental Chemistry
Total Credits of the Course	2	Hours per Week	2 hr.

Course Outcome: By the end of the course, students will be able to understand	
1.	Basic principles of green chemistry, about the principle and concept of ecosystem and their functioning
2.	Awareness and sense of responsibilities towards environment and apply knowledge to solve the issues related to Environmental pollution

**Unit – 1: Green Chemistry**

**15 hours**

Basic introduction of green chemistry, Definition of green chemistry, Importance and goals of green chemistry, Green solvents.

The twelve principles of Green Chemistry:

Detailed discussion of all the 12 principles of green chemistry, their examples and their application in industries and our daily life.

**Unit – 2: Environmental Pollution**

**15 hours**

Definition, classification, causes and effects of: Air Pollution, Water pollution, Soil pollution, Noise pollution, Radiation Pollution.

Climate Change and Global warming: Cause and Effects, Acid Rain, Ozone-Layer depletion;

Water quality parameters and standards; pH, suspended solids, Hardness of water, measurement of TDS

Effect of pollution on living systems.

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**Recommended Books/References:**

- *V. K. Ahluwalia, M. R. Kidwai, New Trends in Green Chemistry, Anamalaya Publishers (2005).*
- *R. Sanghi and M.M. Srivastava, Green Chemistry-Environment Friendly Alternatives, Narosa Publishing House, New Delhi 2009.*
- *K. R. Desai; Green Chemistry, Himalaya Publishing House , New Delhi*
- *P. T. Anastas, and J. K. Warner, Green Chemistry- Theory and Practical, Oxford University Press (1998).*
- *S. Matlack, Introduction to Green Chemistry, Marcel Dekker (2001).*
- *Environmental Chemistry by B.K. Sharma & H. Kaur, Goel Publishing House.*
- *Environmental Chemistry by A. K De, New Age International Publishers.*
- *A Test Book of Environmental Chemistry & Pollution Control by S. S. Dara, S. Chand and Co.*
- *Environmental Chemistry by Samir K. Banerjee, Prentice Hall of India Pvt. Ltd. New Delhi.*

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**B. Sc. Chemistry**  
**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**  
**Syllabus effective from June, 2023 For**  
**B. Sc. Semester- I**  
**Multidisciplinary Subject**  
**Total credit: 02 (Practical)**  
**Total Hrs:60**

Course Code		Title of the Course	<b>Green and Environmental Chemistry Practical</b>
Total Credits of the Course	2	Hours per Week	4 hr.

<b>Course Outcome:</b> By the end of the course, students will be able to	
1.	Perform practicals based on the use of green chemistry principle and processes in laboratory reactions
2.	Perform the Instrumental analytical techniques or water analysis

**(Minimum 6 practicals, to be performed)**

1. Acetylation of primary amines by using vinegar.
2. Preparation of nanoparticles by green synthesis methods (using leaves, barks etc.).
3. Base catalyzed Aldol condensation
4. Diels-Alder reaction in aqueous medium.
5. Preparation of biodiesel from vegetable/ waste cooking oil.
6. Determination hardness of water in different samples (tap water, rain water, bore-well water, sea water etc.).
7. Determination temporary hardness, permanent hardness and total hardness of water in tap-water.
8. Measurement of TDS in water samples.
9. Measurement of pH in soil samples.
10. Determination of % of heavy metals in industry water.

**Reference book:**

- *Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K. I.K. Green Chemistry Experiment: A monograph International Publishing House Pvt Ltd. New Delhi. Bangalore CISBN 978-93-81141-55-7 (2013).*
- *Vogels Textbook of Quantitative Chemical Analysis, 6th Eds, (2006).*

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**B. Sc. Chemistry**  
**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**  
**Syllabus effective from June, 2023 For**  
**B. Sc. Semester- I**  
**SEC (Skill Enhancement Course)**  
**Total credit: 01 (Theory)**  
**Total Hrs: Theory: 15**

Course Code		Title of the Course	Chemistry Lab Operations and Safety Measures
Total Credits of the Course	1	Hours per Week	1 hr.

Course Outcome: By the end of the course, students will be able to	
1.	Understand the importance and significance of laboratory safety and proper regulation of chemistry laboratory, Learn about various handling of chemicals, its storage and disposal.
2.	Identify the appropriate chemical and fire safety hazards and its associated risks, Know the various protective equipment, emergency procedure & first aid.

**Introduction to lab operations**

**8 hours**

General guidelines, Handling of glassware, Handling of equipment, Equipment protection, Handling of chemicals, Receipt and labelling of chemicals, Precautions in handling, Chemical spills, Storage and Disposal of chemicals and glassware, Mercury and Biohazardous clean up and disposal procedure.

**Safety measures**

**7 hours**

Safety rules, Hygiene, Knowledge about personal safety, Use of personal safety equipment, Respiratory protective equipment, Electrical safety, Fire extinguisher, Laboratory injuries and treatment, Accident management.

**Recommended Books/References:**

1. *Hazards in Chemical Laboratory* - G. D. Muir
2. *Research Methodology* - C. R. Kothari, New Age International Publishers, New Delhi (2004).
3. *Manufacture, Storage and Import of Hazardous Chemicals Rules* - 1989.
4. *Laboratory safety for chemistry students* - R. H. Hill, D. C. Finster, Wiley (2016).

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**B. Sc. Chemistry**  
**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT**  
**Syllabus effective from June, 2023 For**  
**B. Sc. Semester- I**  
**SEC (Skill Enhancement Course)**  
**Total credit: 01 (Practical)**  
**Total Hrs: Practical: 30**

**Chemistry Lab Operations and Safety Measures:**

Course Code		Title of the Course	SEC-Practical
Total Credits of the Course	1	Hours per Week	2 hrs.

<b>Course Outcome:</b> By the end of the course, students will be able to	
1.	Understand how to minimize the risk of injury and other accidents during chemistry laboratory work

**(Minimum 6 Practicals, to be performed)**

1. Demonstration and handling of fire-extinguisher.
2. Calibration and handling of burette and pipette.
3. Handling, precautions and calibration of weighing machine.
4. Storage and disposal of chemicals: demonstration and handling.
5. Preparation technique of standard solutions.
6. Laboratory preparation of standard soap.
7. Laboratory preparation of liquid soap.
8. Laboratory preparation of detergent.

**Recommended Books/References:**

1. *Hazards in Chemical Laboratory* - G. D. Muir
2. *Research Methodology* - C. R. Kothari, New Age International Publishers, New Delhi (2004).
3. *Manufacture, Storage and Import of Hazardous Chemicals Rules -1989.*
4. *Laboratory safety for chemistry students* - R. H. Hill, D. C. Finster, Wiley (2016).

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Veer Narmad South Gujarat University,

Surat



B.Sc. (Chemistry)  
Syllabus as per

NEP 2020

(Effective from June, 2023)

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# VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

## B. Sc. Chemistry

As per NEP 2020

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B.Sc. Chemistry is an undergraduate degree program that focuses on the study of various aspects of chemistry, including its principles, theories, and practical applications. It is a comprehensive program that equips students with a solid foundation in the field of chemistry and prepares them for a wide range of career opportunities.

**Upon completion of the program, graduates are expected to possess the following general outcomes:**

- **Knowledge and Understanding:** Graduates will have a strong theoretical and practical knowledge of the fundamental concepts and theories in chemistry, including organic, inorganic, physical, and analytical chemistry.
- **Laboratory Skills:** Graduates will be proficient in laboratory techniques, including the handling of chemicals, operation of laboratory equipment, and conducting experiments safely and accurately.
- **Critical Thinking and Problem Solving:** Graduates will develop critical thinking skills and the ability to analyse and solve complex problems in the field of chemistry. They will be adept at designing experiments, interpreting data, and drawing logical conclusions.
- **Communication Skills:** Graduates will be able to effectively communicate scientific ideas and findings through written reports, presentations, and scientific discussions. They will also possess strong teamwork skills, enabling them to collaborate with peers and professionals in the field.
- **Ethical and Professional Conduct:** Graduates will understand the importance of ethical conduct in scientific research and demonstrate professionalism in their interactions with colleagues, clients, and the broader community.

In addition to these general outcomes, B.Sc. Chemistry programs may also have specific outcomes tailored to meet the needs of the particular institution or program.

**The specific outcomes:**

- **Specialized Knowledge:** Graduates will have in-depth knowledge in specific sub-disciplines of chemistry, such as environmental chemistry, medicinal chemistry, dyes, or materials chemistry.
  - **Research Skills:** Graduates will possess research skills and the ability to design and carry out independent research projects in chemistry.
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- **Industrial Applications:** Graduates will be familiar with the applications of chemistry in various industries, such as pharmaceuticals, dyes, petrochemicals, materials science, and environmental science.
- **Advanced Instrumentation Skills:** Graduates will have hands-on experience with advanced analytical instruments used in chemical analysis, such as spectroscopy, chromatography, pH Metry and conductometry.
- **Advanced Computational Skills:** Graduates will be proficient in using computational tools and software for modelling chemical structures, predicting properties, and simulating chemical reactions.

Overall, the B. Sc. Chemistry program aims to provide students with a solid foundation in chemistry, preparing them for various careers in the chemical industry, research institutions, academia, and other related fields. It equips students with the necessary theoretical knowledge, practical skills, and critical thinking abilities to excel in the diverse and ever evolving field of chemistry.

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**VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT****B. Sc. Chemistry****Teaching & Evaluation****Scheme****F. Y. B. Sc. Semester-II**

<b>MAJOR (MJ) COURSE</b>							
<b>Course Code</b>	<b>Paper Title</b>	<b>Course credit</b>	<b>Teaching schedule Hrs./week</b>	<b>Internal marks</b>	<b>External marks</b>	<b>Total Marks</b>	<b>Duration of external exam</b>
CH-MJ-201	Chemistry- I	3	3	35	35	70	2
CH-MJ-202	Chemistry-II	3	3	35	35	70	2
CHP-MJ-2	Organic qualitative analysis and Standardization	2	4	30	30	60	4
Total				100	100	200	
<b>MINOR (ME) COURSE</b>							
CH-ME-201	Fundamental of Chemistry-I	2	2	25	25	50	1
CHP-ME-201	Organic qualitative analysis and Volumetric titration	2	4	25	25	50	4
Total				50	50	100	
<b>MULTIDISCIPLINARY COURSE (MDC)</b>							
CH-MDC-201		2	2	25	25	50	01
CH-MDC-P-201		2	2	25	25	50	04

Total				50	50	100	
SKILL ENHANCEMENT COURSE (SEC)							
CH-SEC-201		1	1	13	13	26	01
CH-SEC-P-201		1	2	12	12	24	02
Total				25	25	50	

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# B. Sc. Chemistry

VEER NARMAD SOTH GUJARAT UNIVERSITY, SURAT

Syllabus effective from June, 2023

For

B. Sc. Semester- II

Total credit: 03 (Theory-3)

Total Hrs: Theory: 45

CH-MJ-201

Course Code		Title of the Course	Chemistry-I
Total Credits of the Course	3	Hours per Week	3 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Electrical conductance, Effect of dilution on concentration, Cell constant, Ostwald's dilution law and its limitations, Acid & Basic buffer, Second law of thermodynamics (in detail), Carnot cycle, Entropy concept, Change of entropy for reversible isothermic, isobaric, isochoric and adiabatic processes.
2.	Dry Reaction and theory, Analysis of Cations, Complexometric reactions involved in qualitative analysis; shape of d-orbitals, CFT – Basic assumption, splitting of d-orbitals in Octahedral, Tetrahedral, Square planer complexes, distribution of dx electrons in Octahedral and Tertahedral complexes and CFSE.
3.	Chemical bonds, Polarisability, Molecular Orbital theory, bond order, magnetic properties and molecular orbital energy level diagram of hetero diatomic molecule, VSEPR theory; Classification of physical properties, Atomic volume, Molar volume and Chemical constitution, Kopp's law, Surface tension, Drop number method, Parachor, Viscosity

## Unit - 1 A. Conductance and Ionic Equilibrium

8 h

Electrical conductance, Specific conductance, equivalent conductance, Molar conductance, Effect of dilution on concentration, Cell constant, Determination of Cell constant, Ostwald's dilution law and its limitations, Acid & Basic buffer actions (Henderson Hasselbalch equation), Buffer capacity, Numerical.

## B. Thermodynamics

7 h

Second law of thermodynamics (in detail), Carnot cycle and its efficiency, Entropy concept, change of entropy for reversible isothermic, isobaric, isochoric, and adiabatic processes, Entropy change for ideal gases (T & V as variables, P & T as variables), Numerical.

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**Reference books:**

1. *Physical Chemistry* by Arun Bahl, B. S. Bahl and G. D. Tuli; Pub. S. Chand
2. *Advance physical chemistry* by D. N. Bajpai; Pub: S. Chand
3. *Text book of physical chemistry* by P. L. Soni, O. P. Dharma; Pub. S. Chand

**Unit - 2 A. Basic Principles of Qualitative Analysis** 6 h

- a) **Dry Reaction:** theory behind borax bead test with equation, Flame test (Theory, structure of non-luminous Bunsen flame)
- b) **Analysis of Cation:** Application of common ion effect, solubility product constant, Complexometric reactions involved in qualitative analysis; **1.** For identification [reaction between Cu(II) ion with ammonia, Fe(III) with thiocyanide,  $\text{NH}_4^+$  with Nessler Reagent]. **2.** For masking [ $\text{Cd}^{+2}$ ,  $\text{Cu}^{+2}$ ]. **3.** Separation of two ions [ $\text{Ag-Hg}$ ,  $\text{Zn}^{+2}$ ,  $\text{ME}^{+2}$ ]

**Reference books:**

1. *Qualitative analysis* by R. A. Day and A. L. Underwood
2. *Vogel's qualitative Inorganic analysis*

**B. Co-ordination Chemistry** 9 h

Werner's theory of co-ordination compounds, Isomerism in co-ordination compounds, Bonding in coordination compounds, Valence bond theory, Hybridization of  $[\text{Co}(\text{NH}_3)_4]^{+3}$ ,  $[\text{Co}(\text{F})_6]^{-3}$ ,  $[\text{Ni}(\text{Cl})_4]^{-2}$ ,  $[\text{Ni}(\text{CN})_4]^{-2}$ ,  $[\text{Fe}(\text{CN})_6]^{-3}$ ,  $[\text{Fe}(\text{CN})_6]^{-4}$ , Magnetic property of coordination compounds, Shape of d-orbitals, CFT - Basic assumption, splitting of d-orbitals in Octahedral, Tetrahedral, Square planer complexes, distribution of  $d^x$  electrons in Octahedral and Tetrahedral complexes and CFSE, Limitation of CFT

**Reference books:**

1. *Inorganic chemistry* by Wahid Malik, G. D. Tuli, R. D. Madan; Pub. S. Chand
2. *Coordination Chemistry* by Gurdip Chatwal, M. S. Yadav; Pub. Himalaya pub. house
3. *Advance inorganic chemistry (Vol. II)* by Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan; Pub. S. Chand

**Unit - 3 A. Chemical Bonding** 5 h

Definition of chemical bonds (covalent, co-ordinate covalent, ionic, metallic, H-bond, Van der Waals forces of attraction), Polarizability (Fajan's rule), Molecular Orbital theory; LCAO method, Bonding molecular orbital, non-bonding molecular orbital, anti-bonding molecular orbital, bond order, magnetic properties, and molecular orbital energy level diagram of hetero diatomic molecule: CO and NO, VSEPR theory.

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**Reference books:**

1. *Concise Inorganic Chemistry (5<sup>th</sup>ed.)* by J. D. Lee
2. *Basic Inorganic Chemistry* by Cotton & Wilkinson.
3. *Inorganic Chemistry – Principles of structure and reactivity* by J. E. Huheey, E. A. Keiter; Pub. Person Education Publishers.

**B. Physical properties and chemical constitution**

5 h

Classification of physical properties (additive, constitutive, colligative, additive constitutive), Atomic volume, Molar volume and Chemical constitution, Kopp's law, Surface tension, Drop number method, Parachor, Viscosity, Determination of viscosity by Ostwald viscometer, Define: Refraction, Specific refraction, molar refraction, Numerical.

**Reference books:**

1. *Principles of Physical chemistry* by Puri, Sharma and Madan; Pub. Vishal publishing
2. *Essentials of physical chemistry* by A. S. Bahl and G. D. Tuli, Pub: S. Chand
3. *Advance physical chemistry* by D. N. Bajpai, Pub: S. Chand

**C. Colloid Chemistry**

5 h

Colloids: Definition of colloid, crystalloids, dispersion phase, dispersion medium, Classification based on (i) physical state and dispersed phase and dispersion medium (ii) nature of interaction between dispersed phase and dispersion medium, Preparation of colloidal solution (i) condensation method, (ii) dispersion method, Purification of colloidal solution (electrodialysis and ultrafiltration), Properties of colloids (Tyndall effect and Brownian movement), Coagulation and gold number, Cleansing action of soap, General application of colloids.

**Reference books:**

1. *Principles of Colloid and Surface Chemistry*, by Paul C. Hiemenz and Raj Rajagopalan
2. *Handbook of Surface and Colloid Chemistry*, 4<sup>th</sup> Edition by K. S. Birdi,

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VEER NARMAD SOTH GUJARAT UNIVERSITY, SURAT

Syllabus effective from June, 2023

For

B. Sc. Semester- II

Total credit: 03 (Theory-3)

Total Hrs: Theory: 45

CH-MJ-202 (Theory)

Course Code		Title of the Course	Chemistry-II
Total Credits of the Course	3	Hours per Week	3 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Organic reactions such as Homolytic and Heterolytic fission, reactive intermediates, classify organic reactions, electrophilic and nucleophilic substitution reactions, Mechanism of addition reaction, substitution
2.	Carbohydrate, its classification, structure of glucose and fructose, step up, step down and kilyani synthesis; oils and fats, determine empirical formula and its relation with molecular formula determination of molecular weight of organic acid
3.	Nomenclature, method of preparation, properties and uses of alkenes, dienes, alkynes, Synthesis and uses of some industrially important chemicals

**Unit - 1 Reaction mechanism**

15 h

- a) Homolytic and Heterolytic fission free radicals carbonium ions (carbocations) and carbanions reactive intermediates carbenes, arynes and nitrenes.
- b) Types of reagents, electrophiles nucleophiles.
- c) Electromeric effect, inductive effect, conjugative effect.
- d) Types of reactions: Addition, substitution, elimination, rearrangements. Addition, and Substitution with respect to electrophilic and nucleophilic reaction,  $SN^1$  &  $SN^2$
- e) Mechanism of (i) addition reaction to alkenes and dienes (ii) substitution in benzene Ring, nitration, sulfonation, alkylation, acylation, halogenation, cyanohydrin formation and acetal formation,
- f) Mechanism of Perkin reaction, Benzoin Condensation and Cannizaro's reaction

**Unit - 2 A. Carbohydrates**

7 h

Modern definition of carbohydrates, classification of carbohydrates, optical isomers, Diastereoisomers and enantiomers of Glucose and Fructose, Structure of D-Glucose and D-Fructose, Osazone formation in glucose and fructose, D and L nomenclature in Carbohydrates, step up and stepdown reaction (Kiliani method and Ruff method), conversion of glucose to Fructose and conversion of Fructose to glucose.

**B. Oils and Fats** 4 h

Natural fats, Edible and Industrial oils of vegetable origin, common fatty acids, Glycerides, Saponification, Saponification value and Iodine value of an oil

**C. Empirical formula, Molecular formula, and Structural formula** 4 h

Determination of empirical formula and its relation with molecular formula determination of molecular weight of (a) Organic acid by silver salt method and (b) organic base by chloroplatinate method and its limitations. Numerical example.

**Unit - 3 A. Alkanes, dienes, and alkynes** 11 h

a) **Alkenes:** Nomenclature, method of preparation, properties and uses of ethylene and propylene, Markovnikov's rule and Saytzeff's rule, polymerization of ethylene styrene and vinyl chloride. Alkenes. Reactions: Hydroboration, Oxidation, Epoxidation, Ozonolysis, Oxymercuration, Hydroxylation, Hydrohalogenation, Dehydrohalogenations, Hydration.

b) **Dienes:** Nomenclature, classification of dienes methods of formation of Butadiene chemical reactions 1,2 and 1,4 additions, Diels - Alder reaction.

c) **Alkynes:** Nomenclature, methods of formation, chemical reactions: Hydroboration, Oxidation, metal ammonia reduction, oxidation, polymerization. Electrophilic and nucleophilic addition reactions of acetylene.

**B. Synthesis and uses of some industrially important chemicals** 4 h

1) Drugs: Paracetamol, Aspirin

2) Dyes: Methyl orange, Methyl red

3) Explosives: TNG, TNT

4) Insecticides: BHC, 2,4-D

**Reference Books:**

1. *Organic chemistry Vol. I and Vol. II by I. L. Finar (Longman group)*
2. *Organic chemistry by P. L. Soni*
3. *Organic chemistry by R.T. Morrison and Boyd Prentice Hall India.*
4. *Organic chemistry by B.K. Sharma.*
5. *Organic chemistry by Bahl and Bahl*
6. *Organic reaction mechanism by Mukharji and singh*
7. *Fundamentals of Organic chemistry by Soloman, John Wiely*
8. *Vogel's qualitative organic analysis*
9. *Industrial chemistry by B. K. Sharma*

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# VEER NARMAD SOTH GUJARAT UNIVERSITY, SURAT

Syllabus effective from June, 2023

For  
B. Sc. Semester-I

Total credit: 02 (Theory-2)

Total Hrs: Theory: 30

## CH-ME-201

Course Code		Title of the Course	
Total Credits of the Course	2	Hours per Week	2 hrs.

Course Outcome: Having Completed this course, the learner will be able to understand

1.	Organic reactions such as Homolytic and Heterolytic fission, reactive intermediates, classify organic reactions, electrophilic and nucleophilic substitution reactions, Mechanism of addition reaction, substitution; Electrical conductance, Effect of dilution on concentration, Cell constant, Ostwald's dilution law and its limitations, Acid & Basic buffer
2.	Polymers, Classification, Uses and application of some important polymers, rubbers, Biodegradable polymers; Chemical bonds, Polarisability, Molecular Orbital theory, bond order, magnetic properties and molecular orbital energy level diagram of hetero diatomic molecule, VSEPR theory;

### Unit - 1    A. Reaction mechanism    10 h

- Homolytic and Heterolytic fission free radicals carbonium ions (carbocations) and carbanions reactive intermediates carbenes, arynes and nitrenes.
- Types of reagents, electrophiles nucleophiles.
- Electromeric effect, inductive effect, conjugative effect.
- Types of reactions: Addition, substitution, elimination, rearrangements. Addition, and Substitution with respect to electrophilic and nucleophilic reaction,  $SN^1$  &  $SN^2$

#### Reference Books:

- Organic chemistry Vol. I and Vol. II by I. L. Finar (Longman group)*
- Organic chemistry by P. L. Soni*
- Organic chemistry by R.T. Morrison and Boyd Prentice Hall India.*
- Organic chemistry by B.K. Sharma.*
- Organic chemistry by Bahl and Bahl*
- Organic reaction mechanism by Mukharji and singh*
- Fundamentals of Organic chemistry by Soloman, John Wiely*
- Vogel's qualitative organic analysis*  
*Industrial chemistry by B. K. Sharma*

### B. Conductance and Ionic Equilibrium

05 h

Electrical conductance, Specific conductance, equivalent conductance, Molar conductance, Effect of dilution on concentration, Cell constant, Determination of Cell constant, Ostwald's dilution law and its limitations, Acid & Basic buffer actions (Henderson Hasselbalch equation), Buffer capacity, Numerical.

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**Reference Books:**

1. *Physical Chemistry* by Arun Bahl, B. S. Bahl and G. D. Tuli; Pub. S.Chand
2. *Advance physical chemistry* by D. N. Bajpai; Pub: S. Chand
3. *Text book of physical chemistry* by P. L. Soni, O. P. Dharma; Pub.

**Unit - 2****A. Polymer****7 h**

Definition of monomers, polymers. Classification based on (i) source (ii) structure of polymer (iii) modes of polymerization (iv) molecular forces, Uses and application of polyethylene, Nylon 6, Nylon 66, Novalac, Bakelite, Melamine, Natural polymers, Buna - N and Neoprene with reaction, Biodegradable polymers, PHAB.

**Reference Books:**

1. *Principles of Polymer Science* by P. Bahadur and N. V. Sastry

**B. Chemical Bonding****8 h**

Definition of chemical bonds (covalent, co-ordinate covalent, ionic, metallic, H-bond, Van der Waals forces of attraction), Valence Bond Theory, Molecular Orbital theory; LCAO method, Bonding molecular orbital, non-bonding molecular orbital, anti-bonding molecular orbital, bond order, magnetic properties, and molecular orbital energy level diagram of homo diatomic molecule B<sub>2</sub>, C<sub>2</sub>, N<sub>2</sub>, F<sub>2</sub>, VSEPR theory.

**Reference Books:**

1. *Concise Inorganic Chemistry (5<sup>th</sup>ed.)* by J. D. Lee
2. *Basic Inorganic Chemistry* by Cotton & Wilkinson.
3. *Inorganic Chemistry - Principles of structure and reactivity* by J. E. Huheey, E. A. Keiter; Pub. Person Education Publishers.

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**VEER NARMAD SOTH GUJARAT UNIVERSITY, SURAT**

**CHEMISTRY PRACTICAL SYLLABUS effective from June, 2023**

**For**

**B. Sc. Semester- II**

**CHP-MJ-2**

**Total credit: 02**

**Total Hrs: Practical: 60**

**(Practical)**

Course Code		Title of the Course	Organic qualitative analysis and Standardization
Total Credits of the Course	2	Hours per Week	4 hrs.

**Course Outcome:** Having Completed this course, the learner will be able to understand

1.	Imparting practical knowledge of qualitative analysis of Acid, Phenol, Base and Neutral (solid, liquid and semisolid) Organic substances
2.	Various analytical methods of volumetric analysis especially acid-base and redox titration

**A. ORGANIC SPOTTING**

Primary tests, Ignition test, Detection of Elements, Nature of the substance (solubility test), Functional group tests, C. T., Molecular formula, Structural formula & M. P./ B. P. of the given substance.

**ACID** - Benzoic, Phthalic acid, Succinic acid.

**BASE** - Aniline, p - Toluidine

**PHENOL** - Resorcinol,  $\alpha$  - Naphthol,  $\beta$  - Naphthol

**NEUTRAL** -

**CARBOHYDRATE** - Glucose, Fructose

**KETONE** - Acetone, Acetophenone

**ESTER** - Methyl salicylate, Methyl acetate

**ALCOHOL** - Methanol, Ethanol

**HYDROCARBON** - Toluene, Naphthalene

**NITRO HYDROCARBON** - Nitrobenzene, m-di-nitrobenzene

**HALOGENATED HYDROCARBON** - Carbon tetrachloride, Chlorobenzene

**AMIDE** - Urea, Benzamide

**ANILIDE** - Acetanilide

**N. B. Candidate should perform the analysis of at least 8 compounds.**

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**B. PREPARATION OF STANDARD SOLUTION (BY STUDENTS) OF FOLLOWING.**

1. 0.1 N succinic acid against NaOH
2. 0.1 N KHP against NaOH/KOH
3. 0.01 N  $\text{Na}_2\text{S}_2\text{O}_3$  against  $\text{I}_2$  solution
4. 0.1 N  $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$  against  $\text{KMnO}_4$  solution
5. 0.1 N  $\text{K}_2\text{Cr}_2\text{O}_7$  against  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  Or  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  solution

**N. B. Candidate should perform at least 3 standard solution preparation.**

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**VEER NARMAD SOTH GUJARAT UNIVERSITY, SURAT**

**CHEMISTRY PRACTICAL SYLLABUS effective from June, 2023**

**For**

**B. Sc. Semester- II**

**CHP-ME-201**

**Total credit: 02**

**Total Hrs: Practical: 60**

**(Practical)**

Course Code		Title of the Course	Organic qualitative analysis and Volumetric exercise
Total Credits of the Course	2	Hours per Week	4 hrs.

Course Outcome: Having Completed this course, the learner will be able to understand

1.	Imparting practical knowledge of qualitative analysis of Acid, Phenol, Base and Neutral (solid, liquid and semisolid) Organic substances
2.	Various analytical methods of volumetric analysis especially acid-base and redox titration

**A. ORGANIC SPOTTING**

Primary tests, Ignition test, Detection of Elements, Nature of the substance (solubility test), Functional group tests, C. T., Molecular formula, Structural formula & M. P./ B. P. of the given substance.

**ACID** - Benzoic, Phthalic acid, Succinic acid.

**BASE** - Aniline, p - Toluidine

**PHENOL** - Resorcinol,  $\alpha$  - Naphthol,  $\beta$  - Naphthol

**NEUTRAL** -

CARBOHYDRATE - Glucose, Fructose

KETONE - Acetone, Acetophenone

ESTER - Methyl salicylate, Methyl acetate

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HYDROCARBON - Toluene, Naphthalene

NITRO HYDROCARBON - Nitrobenzene, m-di-nitrobenzene

HALOGENATED HYDROCARBON - Carbon tetrachloride, Chlorobenzene

AMIDE - Urea, Benzamide

ANILIDE - Acetanilide

**N. B. Candidate should perform the analysis of at least 8 compounds other than Organic Substances given in Major Course (MJ) Practical syllabus.**

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**B. VOLUMETRIC EXERCISE**

$\text{H}_2\text{SO}_4$	$\text{NaHCO}_3$	$\text{HNO}_3$
$\text{KMnO}_4$	$\text{H}_2\text{C}_2\text{O}_4$	$\text{KOH}$
$\text{KMnO}_4$	$\text{FeSO}_4$	$\text{K}_2\text{Cr}_2\text{O}_7$
$\text{K}_2\text{Cr}_2\text{O}_7$	$\text{Fe-NH}_4\text{-SO}_4$	$\text{KMnO}_4$
$\text{H}_2\text{C}_2\text{O}_4$	$\text{KMnO}_4$	$\text{FeSO}_4$

**N. B. Candidate should perform at least 3 volumetric exercises.**

113