

SANKALCHAND PATEL UNIVERSITY, VISNAGAR

Faculty of Science and Humanities



Structure, Teaching Scheme and Syllabus of B. Sc. (Chemistry) Honours with Research

Sem-5 as per NEP 2020

Program Code: SC103

With effect from: 2023-24

Semester-5

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Heterocyclic chemistry
Course Code:	15-CHM301-3C
Pre-requisite Course:	Basic Chemistry up to S.Y.B.Sc.

Course Objectives:

- Know about the most important simple heterocyclic ring systems containing heteroatom and their systems of nomenclature and numbering.
- Understand and discuss the reactivity and stability of hetero aromatic compounds.
- Study the important synthetic routes and reactivity for five, six membered and fused heteroaromatic compounds.
- Understand the important physical and chemical properties of five, six and fused member heteroaromatic compounds.
- Know about the applications of these hetero aromatic compounds in the synthesis of important industrial and pharmaceutical compounds.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Basic concepts of heterocyclic compounds Introduction, classification of heterocyclic compounds, Nomenclature of heterocyclic compounds (trivial method and Hantzsch-Widmann method) and Molecular orbital picture for monoheterocyclic compounds (pyrrole and pyridine).	15	34%
2	Chemistry of monoheterocyclic compounds Structure and aromaticity of pyrrole, furan, thiophene and pyridine, Methods of synthesis, properties and chemical reactions of Pyrrole, Furan, Thiophene and Pyridine, Comparison of basicity of Pyridine, Piperidine and Pyrrole.	15	33%
3	Chemistry of fused heterocyclic compounds Introduction of fused heterocyclic compounds (indole, quinoline and isoquinoline). Structure, synthesis, properties and reactions of indole, quinoline and isoquinoline. Basic applications of indole, quinoline and isoquinoline.	15	33%

Text Books:

1. A Textbook of Organic Chemistry, 4th edition, K S Tewari & N K Vishnoi

Reference Books:

1. Heterocyclic Chemistry: Volume I: By R. R. Gupta, Mahendra Kumar, and Vandana Gupta.
2. Heterocyclic Chemistry: Volume II: By R. R. Gupta, Mahendra Kumar, and Vandana Gupta.
3. Heterocyclic Chemistry: By Rakesh K Parashar, published by Ane Books India in 2010.

List of Open-Source Software/learning website:

1. <https://archive.nptel.ac.in/courses/104/105/104105034/>
2. <https://www.youtube.com/watch?v=P6EK12rWClo&list=PLDjIJRH6sIC4D7H0sR0jxvHHmP3zNh-Fq>

List of Experiments:

Sr.No	Practical Exercise
1.	Separation and identification of unknown components of ternary solid organic mixture (Any 8solid+solid+solid organic mixture having water soluble or water insoluble component)

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Learn basic concept of heterocyclic compounds	2 Understanding
CLO2	Learn nomenclature of mono-, fused-heterocycles and apply it to new heterocycles	2 Understand 3 Applying
CLO3	Understand and discuss the reactivity and stability of hetero aromatic compounds	2 Understanding
CLO4	Understand the important physical and chemical properties of five, six and fused member hetero aromatic compounds.	2 Understanding 4 Analyze
CLO5	Know about the applications of these hetero aromatic compounds in the synthesis of important industrial and pharmaceutical compounds.	3 Applying 4 Analyze

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1																	3	1
CLO2		1				2											1	2
CLO3																	2	1
CLO4					2												3	2
CLO5	1				3	1											2	3

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Spectroscopy - I
Course Code:	15-CHM302-3C
Pre-requisite Course:	-

Course Objectives:

- Demonstrate the development of practical/technical skills Analyse, evaluate and correctly interpret data.
- Basic to advanced level knowledge of organic spectroscopy.
- To impart knowledge and training in chemistry at advanced level, make aware with recent analytical technique.
- To introduce the student to principles and theory of instrument analysis.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Infrared Spectroscopy Introduction, principle of IR spectroscopy, Modes of vibration (AB ₂ Type molecule) instrumentation, sampling technique, selection rules. Characteristic vibrational frequencies of functional groups. Finger print region, Factors affecting vibrational frequencies. Hooke's law. Application of IR. Comparison with FTIR. Interpretation of organic molecules.	15	34%
2	¹H NMR Spectroscopy Introduction, principle of NMR spectroscopy, Equivalent & None equivalent Proton, Shielding & Dshielding, Chemical Shift & Molecular Structure Spin- Spin Splitting & Coupling constant Application of NMR. Interpretation of organic molecules i.e Examples, Toluene, Benzoic acid, Ethanol, Acetone, Ethyl bromide, Methoxy benzene, phenitol, benzyl alcohol, etc	15	33%
3	MASS Spectroscopy Introduction ,Insrumentation,EI,CI,FD and FAB factors affecting, fragmentation,ion analysis ion abundance, Mass spectral fragmentation of organic compounds, common functional group, molecular ion peak, McLafferty rearrangement.	15	33%

Text Books:

Organic Spectroscopy Book by William Kemp

Reference Books:

1. Spectroscopy of organic compounds by P.S.Kalsi
2. Introduction of spectroscopy by Donald L.Pavia,Gary M. Lampman, GeorgeS. Kriz.
3. Analytical Chemistry" by GaryD.Christian, 7thEdition, Published 2013 by John Wiley and Sons Inc. New Jersey.
4. Quantitative Chemical Analysis" by Daniel C.Harris,8thEdition, Published 2010 by W.H.Freeman and Company, New York.

List of Open-Source Software/learning website:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==>
2. <https://archive.nptel.ac.in/courses/104/108/104108078/>

List of Experiments:

Sr.No	Practical Exercise
1.	Qualitative analysis (Minimum 8) Inorganic mixture should be comprised of four radicals. Candidate if required should be guided once for the wrong group and marks deducted for wrong group. Maximum of five marks can be deducted for wrong group. There shall be no deduction of marks for reporting wrong radicals

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify the vibrational frequencies of major functional groups, understand the factors and use this knowledge IR spectra of simple organic molecules.	2 understanding 3 Applying
CLO2	Predict number of signals, splitting patterns in the proton NMR of a compound given its structure and use this knowledge NMR spectra of simple molecules.	2 understanding 3 Applying
CLO3	Describe the principles and phenomenon of Mass spectroscopy.	2 understanding
CLO4	Data interpretation technique and skill to find out molecular structure and functional group identification. (IR, NMR, Mass)	4 Analyzing 5 Evaluating
CLO5	Apply the knowledge of spectroscopy to identify structure of synthesized compounds	3 Applying 4 Analyzing

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1					1												3	1
CLO2					1												3	1
CLO3																	2	1
CLO4	3	2			2					1							1	3
CLO5	2	2				2											1	3

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Chemical Kinetics and Electro Chemistry
Course Code:	15-CHM303-3C
Pre-requisite Course:	-

Course Objectives:

- To correlate and apply the fundamental knowledge in electrochemistry and chemical kinetics to different areas of chemistry and emerging problems in basic science.
- To impart advanced knowledge about dynamics of a chemical reaction.
- To learn kinetic theories of complex reactions and photochemical reactions.
- The learners should be able to apply theories in electrochemistry to analyze electrode kinetics.
- To demonstrate the ability to do some independent research and use some experimental resources at the end of the course.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Chemical Kinetics Introduction, Reaction velocity, Arrhenius equation, Kinetic salt effects: Primary salt effect & Secondary salt effect, Collision theory of bimolecular reactions, Collision theory of unimolecular reactions, Lindemann's Theory. Reaction Kinetics of photochemical Hydrogen-bromine reaction, photochemical Hydrogen-chlorine reaction, Decomposition of Ethane, Pyrolysis of Acetaldehyde.	15	34%
2	Electrochemistry of Solutions Anomaly of strong electrolytes, Debye-Huckel Theory (Mathematical derivation), Wien effect, Structure of electrified interfaces, Thermodynamics of electrified interfaces-Lippmann's equation, Electrical double layer, Theory of structure of electrical double layer and its limitations (Gouy-Chapman theory). Overvoltage: Introduction, types, measurements, factor affecting overvoltage & importance.	15	33%
3	Electro-catalysis Introduction, Mechanism of electro-catalysis, Platinum as Catalysis, Bio-electrocatalysis: enzyme, Immobilization, Membrane phenomenon, Membrane potential, Applications of Donnan Membrane Equilibrium, Bioelectronics, Electrocardiography, Useful preliminaries.	15	33%

Text Books:

1. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002
2. Physical Chemistry, Dr. R. L. Madan & G. D. Tuli, S. Chand publication

Reference Books:

1. Advanced Physical Chemistry, Gurtu-Gurtu, A Pragati Edition
2. Advanced Physical Chemistry, D.N.Bajpai, S.Chand.
3. Physical Chemistry, Walter J. Moori. 5th Edition

List of Open-Source Software/learning website:

1. <https://www.pw.live/chapter-chemical-kinetics/collision-theory-of-reaction-rates>
2. https://www.youtube.com/watch?v=DeSo0eR5U0M&list=PLDjIJRH6sIC6v3ufyngowNIL6hID1y_O8

List of Experiments:

Sr.No	Practical Exercise
	Chemical kinetics (any 3)
1.	To study reaction of decomposition of H_2O_2 catalyzed by iodide ion.
2.	To determine the order of reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI.
3.	To determine the order of reaction between H_2O_2 and KI.
4.	To study the reaction between KBrO_3 and KI at two different temperature and calculate the temperature coefficient and calculate the energy of activation.
	Conductometry(Any 2)
5.	To determine normality & amount of HCl & CH_3COOH in given solution by conductometer against 0.2 N NaOH.
6.	To determine the solubility product and solubility of sparingly soluble salts PbSO_4 by conductometry.
7.	To determine the solubility product and solubility of sparingly soluble salts BaSO_4 by conductometry.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To learn and kinetic theories of complex reactions and kinetic salt effects.	1 Learning 2 Understanding
CLO2	To understand the Reaction Kinetics of photochemical reactions.	2 Understanding 3 Applying
CLO3	To learn & understand theories in electrochemistry like Debye-Huckel Theory, Gouy-Chapman theory etc.	2 Understanding
CLO4	To learn and apply the applications and importance of overvoltage in electrochemistry.	2 Understanding 3 Applying
CLO5	To understand of electro-catalysis along with mechanism and applications.	2 Understanding 3 Applying

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1																	2	1
CLO2		1															3	3
CLO3																	2	2
CLO4		1															2	3
CLO5						2											3	1

3: High, 2: Medium, 1: Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Polymer Chemistry
Course Code:	15-CHE301-3C
Pre-requisite Course:	-

Course Objectives:

- To meet the growing demand of Advanced Courses in polymer chemistry.
- To help the colleges to update and modernize their laboratories.
- To redesign the courses the special emphasis on local requirements, environment, to link the Courses with requirements of the industries and research.
- Comprehension of principles of polymer chemistry and learning of current applications.
- The primary goal of this course is to make students aware of how chemical process can be designed, developed and employed in a sustainable manner.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Introduction of Polymer Classification and Nomenclature of polymers, Isomerism of polymers, Chain growth polymerization – Introduction, Mechanism of free-radical, Cationic and Anionic polymerization, Kinetics of free radical, Cationic and Anionic polymerization, Mechanism and Kinetics polycondensation.	15	34%
2	Polymer Technology Polymerization Techniques, Concept of Averages: (M_n), (M), (M_w) Degree of polymerization, Poly dispersity and molecular weight distribution, Methods for determination of molecular weight: Membrane Osmometry, Viscometry, Light Scattering, GPC.	15	33%
3	Inorganic Polymer Defination and depiction of polymers, classification of inorganic polymers, characteristics of inorganic polymers, characterization of inorganic polymers, Physical, structural features: (1) Backbone bonding (2) Branching & crosslinking (3) chemical & stereo chemical variability. Glass transition temperature, Phosphorus-based polymers, Sulphur-based polymers	15	33%

Text Books:

1. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002

Reference Books:

1. Principles of polymers Science by P.Bahadur and N.V.Sastry.(Second Edition)
2. Polymer Science by V.R.Gowariker, N.V.Vashwanathan and Jaydev Shreedhar
3. Inorganic Polymer by G. R. Chatwal

List of Open-Source Software/learning website:

1. <https://swayam.gov.in>
2. <https://nptel.ac.in>
3. <http://onlinelibrary.wiley.com>
4. https://en.wikipedia.org/wiki/Main_Page

List of Experiments:

Sr.No	Practical Exercise
1.	To determine the viscosity of different mixture of liquid A & B and determine the % composition of unknown solution by graphical method.
2.	To determination of M.W. of high polymer (polystyrene) by viscosity measurement.
3	To determination of M.W. of high polymer (PVA) by viscosity measurement.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Comprehensive understanding of polymer chemistry	1-Remembering 2 Understanding
CLO2	To analysis of polymerization kinetics and mechanisms	2-Understanding 4-Analyzing
CLO3	Proficiency in polymerization techniques and molecular weight determination	2-Understanding 3 Applying
CLO4	To understanding of inorganic polymer characteristics and properties	2-Understanding 3-Applying
CLO5	To learn different methods for determination of molecular weight.	3-Applying 4-Analyzing

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1	1	2							1								2	1
CLO2					1												1	1
CLO3	1				2												1	2
CLO4		1															2	1
CLO5	1				2												1	2

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Nanochemistry
Course Code:	15-CHE301-30
Pre-requisite Course:	

Course Objectives:

- To understand different types of nano materials.
- The course aims to provide students with a comprehensive toolkit of knowledge and skills related to nanomaterial synthesis.
- To learn basic concepts and properties about Carbon Nanotubes.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Introduction of Nano Chemistry Nano chemistry, Nanomaterials, Bulk Materials, Difference between Nanomaterials and Bulk Materials, Basic nano material synthesis, bottom up vs. topdown method, Metal oxide Semi conductors, semiconductors, Application of Nano Chemistry.	15	34%
2	Nano Materials Synthesis Methods Top down Method: Physical Method: Mechanical Method – Attrition Ball Milling, Physical Vapour deposition, Lithography, Pyrolysis – Thermal Evaporation, Bottom up Method: Chemical Method: Sol – Gel , Chemical Vapour Deposition, Co – Precipitation, Micro Emulsions, Hydrothermal, Sonochemical, Microwave , Biological Methods: Using Plant Extracts, Using Enzymes, Using Agriculture wastes, Using Algas, Bacterial, Fungus, Yeasts & Actinomycetes	15	33%
3	Carbon Nano tube Introduction , Conventional Allotropes of Carbon :Diamond and Graphite , C60: Buckminsterfullerene , Basics of Nanotubes : Structure of Carbon Nanotubes , Single-Wall Carbon Nanotubes , Multiwall Carbon Nanotubes , Comparison Between SWCNTs and MWCNTs , Properties of Carbon Nano tubes: Electronic Properties of CNTs , Mechanical Properties of CNTs , Magnetic Properties of CNTs , Thermal Properties of CNTs , Application of Carbon Nanotube: CNTs: A Futuristic Hydrogen Storage material, Uses of CNTs as a Field Emitter.	15	33%

Text Books:

1. Textbook of Nanoscience and Nanotechnology by B.S. Murty

Reference Books:

1. Principles of Nanoscience and Nanotechnology by M. A. Shah, Narosa

List of Open-Source Software/learning website:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=5VgWkgm+l3FGq9cGlsbNmQ==>
2. <https://en.wikipedia.org/wiki/Nanotechnology>
3. <https://nptel.ac.in/courses/118102003>

List of Experiments:

Sr.No	Practical Exercise
	Synthesis of plant based metal nano particles. (Any 3)
1	Iron oxide nano particles from Cadamba leaves.
2	Nickel oxide nano particles from Aegle Marmelos leaves.
3	Iron oxide nano particles from Carica papaya leaves extract.
4	Nickel oxide nano particles from Justicia Adhatoda leaves.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the essential concepts used in nanotechnology	1-Remembering 2-Understanding
CLO2	Understand Applications of nanotechnology	2-Understanding 3-Applying
CLO3	Learn different Physical Method, Mechanical Method, Chemical Method & Biological Methods for the preparation of Nano Materials.	3-Applying
CLO4	Understand basic concepts, properties & Application of Carbon Nanotube.	1-Remembering 2-Understanding
CLO5	Synthesis approach of nano- materials.	3-Applying 4-Analyze

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1																	2	1
CLO2		1															2	2
CLO3	2	1				1											1	2
CLO4	1				1												1	2
CLO5		2			1	2											1	3

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Medicinal Chemistry
Course Code:	15-CHE302-3C
Pre-requisite Course:	-

Course Objectives:

- Generally, awareness with the following areas in chemistry analysis of Medicinal Chemistry.
- Opportunities for student and faculty to interact with Pharmaceutical industry.
- The fundamental medicinal chemistry skills to work effectively in the different fields of chemistry.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Introduction: Medicinal chemistry Introduction of Drugs, History of medicinal chemistry, Classification of Drugs, General Importance of Drugs, Drug Design, Concepts of Quantitative structure–activity relationship models (QSAR models), Concepts of pharmacokinetics and pharmacodynamics.	15	34%
2	Anti-Malarial & Antituberculous Drugs: Introduction and History, life cycle of Plasmodium, Natural anti-malarial drugs: Role of activity side in quinine structure, Classification of anti-malarial drugs, Synthesis of Quinoline derivative: 8-Amino quinoline derivative (Plasmoquine & Pamaquine). An overview of antituberculous drugs; Isoniazid, Rifampicin, Ethambutol, pyrazinamide.	15	33%
3	Sulpha drugs Chemistry of Sulpha Drugs, Synthesis and Uses, `Sulphanilamide, Sulphafurazole, Sulphaguanidine, Sulphathiazole, Sulphamerazine, Sulfalene, Sulfathiazole, Trimethoprim.	15	33%

Text Books:

1. Textbook of Medicinal Chemistry by Malleshappa

Reference Books:

1. Sanshleshit Auoshadho nu Rasayan by Dr. Anamik Shah.
2. Sanshleshit Auoshadho nu Rasayan by Dr. J.P. Trivedi & Dr. K.A. Thakar.
3. Chemistry of Synthetic Drugs by Dyson & May.
4. Medicinal Chemistry by Ashutosh Kar

List of Open-Source Software/learning website:

1. www.google.com
2. <http://onlinelibrary.wiley.com/>
3. <https://en.wikipedia.org/wiki>
4. <https://archive.nptel.ac.in/courses/104/106/104106106/>

List of Experiments:

Sr.No	Practical Exercise
	Synthesis of drugs.(any 3)
1	Preparation of Aspirin.
2	Benzocaine from p-nitro toluene via p-nitro benzoic acid and p-amino benzoic acid.
3	Preparation of Paracetamol.
4	Synthesis of oil of wintergreen (Methyl salicylate)

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Students will demonstrate a comprehensive understanding of the introduction, classification as well as the significance of drugs.	1-Remembering 2-Understanding
CLO2	Students will be able to analyze drug design apply concepts of pharmacokinetics and pharmacodynamics to assess drug action and effectiveness.	2-Understanding 3-Applying
CLO3	Students will acquire an in-depth understanding of anti-malarial drugs and antituberculous drugs.	2-Understanding
CLO4	Students will acquire an in-depth understanding of sulpha drugs	2-Understanding
CLO5	Student will gain knowledge regarding synthesis of drug molecule.	3-Applying 4-Analyze

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1		1															1	1
CLO2		2								1							2	3
CLO3																	2	1
CLO4																	2	1
CLO5	1	2				2											1	3

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Bioinorganic Chemistry
Course Code:	15-CHE302-30
Pre-requisite Course:	-

Course Objectives:

- To understand the significance and important of elements in human body and living systems.
- To illustrate the importance of the various elements in the biological system and to gain more insights into the binding of metal complexes with biomacromolecules and transport and storage mechanism involved in the metalloenzymes.
- To understand effects of heavy metals in the human body- therapeutic and toxicity levels.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	50	25	-	25	100

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Bioinorganic Chemistry: Introduction Introduction, Essential elements, Trace elements, Essential and trace elements in biological system, Metal porphyrine, Structure of Hemoglobin & Myoglobin, Study of hemoglobin & myoglobin, Study of Chlorophyll, Photosystem I & Photosystem-II, Nitrogen fixation: In Vivo and In Vitro	15	34%
2	Bioinorganic Chemistry: Importance in living system Metals ions in biological system, cytochrome, vitamin B12 (cynocobalamin), zincmetalloenzymes, K-Na pump, Glucose storage & ATP cycle, Metalloproteins, Iron sulphur proteins, DNA polymerization.	15	33%
3	Applications of Bioinorganic Chemistry Co-ordination compounds in medicine, Toxic metals and their toxicity, Chelation therapy, Gold compounds and Rheumatoid arthritis, Anticancer drugs-platinum complexes, Gold complexes, Metallocenesets, Metals as antimicrobial agents, Metal complexes as Radiodiagnostic agents, Magnetic Resonance Imaging (MRI).	15	33%

Text Books:

1. Bioinorganic Chemistry. By K. Hussain Reddy

Reference Books:

1. "Bioinorganic Chemistry: A Short Course" by Rosette M. Roat-Malone
2. "Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life" by Wolfgang Kaim, Brigitte Schwederski, and Axel Klein

List of Open-Source Software/learning website:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==>
2. <https://archive.nptel.ac.in/courses/104/104/104104109/>
3. https://youtu.be/tp9slbzTfx8?si=VIFllxs_Exnei8c8

List of Experiments:

	Add mixture (Any 3)
1.	Ca + Mg
2.	Cu + Ni
3.	Ca + Zn
4.	Cr + Fe

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

	Description	Bloom's Taxonomy Level
CLO1	To learn basic concepts of bioinorganic chemistry	1-Remembering 2-Understanding
CLO2	To understand the Metal porphyrine, Structure and study of Hemoglobin, Myoglobin & Chlorophyll .	2-Understanding
CLO3	To understand and analyze the role of Metals ions in biological system.	2-Understanding 4-Analyze
CLO4	To understand role of the Co-ordination compounds in medicine & hazardous effect of Toxic metals .	1-Remembering 2-Understanding
CLO5	To learn synthesis of different inorganic complexes.	3-Applying 4-Analyze

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1		1												1				
CLO2		1												2				
CLO3		2																
CLO4		1				1												
CLO5	1	1				2												

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Term Symbol
Course Code:	15-SEC306-3C
Pre-requisite Course:	-

Course Objectives:

- To understand how term symbols describe the energy, angular momentum, and spin multiplicity of an atom in a particular state.
- Understand how electron configurations results in different manifestations of angular momenta.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Introduction of Term symbol Introduction, Term Symbol, Russel – Saunders coupling and Term Symbol, Examples of Term Symbol, Microstate, Determination of ground state term by hund's rules, Determination of term symbol for all state for p ² & d ² configuration by pigeon hole diagram	15	50%
2	Spectra of d¹-d⁹ Octahedral complexes Spectra of d ¹ & d ⁹ octahedral complexes, Selection rules & intensities transitions, Oral diagram for d ¹ -d ⁹ , d ² -d ⁸ , d ³ -d ⁷ , d ⁴ -d ⁶ octahedral & tetrahedral complexes, explanation of d ¹ & d ⁹ spectra(only introduction-application)	15	50%

Text Books:

1. A Textbook of inorganic chemistry S. Chan

Reference Books:

1. Advanced in inorganic chemistry by Puri, Sharma and Kaliya, 2019
2. Advanced Inorganic Chemistry; F.A. Cotton and G. Wilkinson

List of Open-Source Software/learning website:

1. https://www.youtube.com/watch?v=5ZN5pxoWzQg&list=PLYXnZUqtB3K_F_UXVHC5x-Zj-R4cSLIRI
2. https://www.youtube.com/watch?v=rEw5p2iM-Tc&list=RDQMABYD3v8WFnk&start_radio=1

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Student will learn fundamentals of term symbol.	1-Remembering 2-Understanding
CLO2	Student will get knowledge regarding problem solving for term symbol.	2-Understanding 3-Applying
CLO3	To understand Selection rules & intensities transitions of complexes.	2-Understanding
CLO4	To analyze Oral diagram for different systems of complexes.	2-Understanding 4-Analyzing

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1																	1	
CLO2	2																2	1
CLO3					1												2	1
CLO4	1	2															2	
CLO5																	1	1

3:High, 2:Medium, 1:Low

Branch Name:	B.Sc. Chemistry
Program Code:	SC103
Course Title:	Agriculture Chemistry
Course Code:	15-SEC305-3C
Pre-requisite Course:	

Course Objectives:

- Generally, awareness with the following areas in chemistry analysis of agriculture. Opportunities for student and faculty to interact with industry.
- The fundamental agriculture chemistry skills to work and industrial skills to work effectively in the different fields of chemistry.
- The capacity to produce, divide and characterize compounds using published reactions, protocols, normal laboratory equipment, and current instrumentation.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
2	-	-	2	25	25	-	-	50

Course Contents:

Unit	Topic	Total Hours	Weightage
1	Fertilizers Plant Nutrients, Major Nutrients, Minor Nutrients, Trace Nutrients, Definition of fertilizers, Classification of Fertilizers, Synthesis of N Containing fertilizers i.e. Calcium ammonium nitrate, $\text{Ca}(\text{CN})_2$ and Urea, Synthesis of P containing fertilizers i.e. DAP (Diammonium phosphate), Super phosphate and triple super phosphate, Mix fertilizers	15	50%
2	Insecticide Introduction and importance of insecticides, Types of insecticides- Inorganic, Organic and Natural, Synthesis of some common insecticides – DDT, BHC, Malathion, Parathion, Chloranil (Quinones), Mode of action of insecticides, Natural & Homemade Insecticides.	15	50%

Text Books:

Agricultural Chemistry by Dr. L. Rakesh Sharma

Reference Books:

1. Industrial chemistry by B.K. Sharma.
2. Pesticides John Wiley by R. Cremllyn.

List of Open-Source Software/learning website:

1. www.google.com
2. <http://onlinelibrary.wiley.com/>
3. <https://en.wikipedia.org/wiki>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Have solid foundations in the fundamentals and purpose of current chemical and scientific theories.	1-Remembering 2-Understanding
CLO2	Are capable to design, carry out, record and analyze the results of chemical experiments.	2- Understanding 4-Analyzing
CLO3	Are capable to use current instrumentation and classical techniques, to design experiments, and to properly record the results of their experiment.	3- Applying 4-Analyzing
CLO4	Are skillful in problems solving, significant thinking and analytical reasoning.	3- Applying

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1																	2	1
CLO2	1	2				1											2	2
CLO3						1				1							1	1
CLO4	2	1				2											1	2

3:High, 2:Medium, 1:Low