**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**
**DEPARTMENT OF CHEMISTRY**
**BOS Meeting**

**1. Agenda:**

Agenda for Board of studies in **Chemistry** on 06-02-2025through online mode
At 11:00 A.M.

1. Approval of existing syllabus for II &IV Semesters as per R22 regulations of Krishna University for the batch of students admitted in the year 2023 of semester – IV and batch of students admitted in the year 2024 of semester – II and onwards.
2. Approval of syllabus for IV semester and course outcomes (drafted in line with BTL) for the batch of students admitted in the year 2022-2023as per revised guidelines / curriculum of Krishna University and with no revision of syllabus of II semester for the batch of students admitted in the year 2024-2025 and onwards.
3. Any other with the permission of the chair.

**Members Present:-**

| S.No | **Members** | **Designation** | **Signature** |
|---|---|---|---|
| 1 | **Dr.V.N.V.Kishore** Head, I/C<br>Dept. of Chemistry(P.G)<br>AG & SG S College, Vuyyuru | Chairman | |
| 3 | **Dr. D. Rama Sekhara Reddy**<br>Department of Chemistry<br>Krishna University,Machilipatnam | University Nominee | |
| 4 | **Prof. Koya Prabakar Rao**<br>Department of Chemistry<br>Vignan University, Guntur. | Subject Expert | |
| 5 | **Dr.A.V.D Nagendra Kumar**<br>Associate professor<br>Dept. of Chemistry<br>Githam University | Subject Expert | |
| 6 | **Dr.G.Raja**<br>Manager(Q.A)<br>Biophore India pharamaceuticals.<br>Hyderbad. | Representative from Industry | |
| 7 | **Ms.Nafesunnisa** | One Post Graduate Meritorious Aluminous nominated by the Principal | |
| 8 | **N.V.Srinivasa Rao**<br>Department of Mathematics<br>AG & SG S College, Vuyyuru. | Representative Science Faculty Other Dept<br>. | |
| 9 | **Dr.M Sivanath**<br>Dept. of Chemistry<br>AG & SG S College, Vuyyuru | Member | |
| 10 | **Dr.Giri Prasad**<br>Dept. of Chemistry<br>AG & SG S College, Vuyyuru | Member | |
| 11 | **Smt. Dilshad Begum**<br>Dept. of Chemistry(P.G)<br>AG & SG S College, Vuyyuru | Member | |
| 12 | **Smt. M.Rekha**<br>Dept. of Chemistry(P.G)<br>AG & SG S College, Vuyyuru | Member | |

**Resolutions/ Recommendations**

***Resolution –I***

1. It is resolved and recommended to implement the programme structure for semester- IV as per R22 regulations of Krishna University.

***Resolution -II***

2. Resolved to implement the existing syllabus for both theory and practicals with no revision for Semester-II admitted batch 2024-26 and semester–IV for batch 2023-2025.

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**
**DEPARTMENT OF CHEMISTRY**
**BOS Meeting**

The courses of semesters II & IV are listed below.

**Course Structure for the Batch Admitted Form 2024 onwards**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)-II Semester**

| Course Code | Course Name | Teaching Hours/ week | | | CORE / IDC/DSE/ SEC/ OEC/MOOCS | Internal Marks | External Marks | No. of Credits |
|---|---|---|---|---|---|---|---|---|
| | | Lecture | Practical | Tutorial | | | | |
| 22CHL201 | Advanced Inorganic Chemistry | 4 | 0 | 0 | Core | 30 | 70 | 4 |
| 22CHL202 | Adavanced Organic Chemistry | 4 | 0 | 0 | Core | 30 | 70 | 4 |
| 22CHL203 | Advanced Physical Chemistry | 4 | 0 | 0 | Core | 30 | 70 | 4 |
| **COMPULSORY** 22MBASDL201 | **Research Methodology & IPR** | 3 | 1 | 0 | SEC | 30 | 70 | 3 |
| **DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)** | | | | | | | | |
| 22CHDSL201 | Molecular Spectroscopy | 4 | 0 | 0 | DSE | 30 | 70 | 4 |
| 22CHDSL202 | Instrumental methods of Analysis | 4 | 0 | 0 | DSE | 30 | 70 | 4 |
| 22CHDSL203 | Analysis of foods & Drugs | 4 | 0 | 0 | DSE | 30 | 70 | 4 |
| **LAB PRACTICALS** | | | | | | | | |
| 22CHP201 | Physical chemistry Practical | 0 | 6 | 0 | Core | 30 | 70 | 3 |
| 22CHP202 | Organic chemistry Practical-II | 0 | 6 | 0 | Core | 30 | 70 | 3 |
| **TOTAL FOR SECOND SEMESTER** | | | | | | **210** | **490** | **25** |

.At the end of 2nd semester, every student must undergo summer Internship/ Apprenticeship/Project work/Industrial training/Research based Project work for Six weeks and must prepare a report concerned as per approved project guidelines, and submit the same to the University 14 days before the commencement of third semester end examinations

**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**
**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**
**II SEMESTER(2024-2026)**
**Paper Code & Title: 22CHL201: ADVANCED INORGANIC CHEMISTRY**
**2024-2026 Batch**

| | | | |
|---|---|---|---|
| Course Code | 22CHL201 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Advanced Inorganic chemistry (code 22CHL201)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the fundamental concepts of basic inorganic chemistry | 2,7 | 2 |
| 2 | Comprehend the basic and advanced concepts of inorganic chemistry like clusters, organo metallic chemistry, and bio inorganic chemistry. | 1,2, 7 | 1,2 |
| 3 | Apply the principles of organo metallic chemistry, reaction mechanisms, metallic clusters, electronic spectra in chosen job role. | 1,6 | 1,2,3 |
| 4 | Analyze the significance, similarities and differences of various concepts of inorganic chemistry. | 1,7 | 1,2,3 |
| 5 | Evaluate the role of organo metallic compounds as catalysts in organic synthesis | 1, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE** **22CHL201** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |

**Unit-I: Non-metal cages and metal clusters**:
Structure and bonding in phosphorous-oxygen, phosphorous-Sulphur cages; structure and bonding in higher boranes with (special reference to B12 icosahedra). Carboranes, metalloboranes, metallocarboranes. Classification- LNCs and HNCs**,** Isoelectronic and Isolobal relationships, electron counting rules: Wade's and Lauher's rules. M-M multiple bonding; preparation, structure and bonding in dinuclear [Re2Cl8] 2- ion, trinuclear [Re3Cl9], tetra nuclear W4(OR)16, hexa nuclear [Mo6Cl8]4+ and [Nb6Cl12]2-.

**Unit-II: Organometallic chemistry of transition metals:**

Classification and electron counting rules, hapticity, synthesis, structure and bonding of Olefinic complexes, Acetylene complexes, ferrocene, dibenzene chromium, cyclo heptatriene and tropylium complexes of transition metals. Reactions of organometallic compounds - oxidative addition reductive elimination, insertion and elimination.Applications of organometallic compounds, Catalytic hydrogenation, Hydroformylation, alkene polymerization.

**Unit-III: Reaction mechanism of transition metal complexes:**
Kinetics of octahedral substitution, acid hydrolysis, base hydrolysis-conjugate base (CB) mechanism. Direct and indirect evidences in favour of CB mechanism.Anation reactions. Reactions without metal-ligand bond cleavage. Factors affecting the substitution reactions in octahedral complexes. Trans effect on substitution reactions in square planar complexes. Mechanism of redox reactions, outer sphere mechanism, cross reactions and Marcus –Hush equation, inner sphere mechanism.

**Unit-IV: Term symbols and Electronic spectra: Term symbols:**
Term symbols and their derivation, Microstates, Hunds rules to predict ground terms and ground states. List of ground energy and higher energy terms from d1 to d9 configurations;
**Electronic spectra of transition metal complexes:**
Spectroscopic terms. Selection rules, Slator–Condon parameters, Racah parameters, Term separation energies for dn configurations, Orgel diagrams. Tanabe-Sugano diagrams for d1 to d9 configurations. Calculations of Dq, B and β parameters. Charge transfer spectra.

**Unit-V: Bio-inorganic chemistry and Magnetic properties of complexes:**
Storage and transport of dioxygen by Hemoglobin and Myoglobin, Vitamin B12 and its importance.
**Magnetic properties of transition metal complexes:**
Types of magnetism, factors affecting Para magnetism, anomalous magnetic moments - Orbital and spin contribution, spin-orbit coupling and magnetic moments chiro optical properties, cotton effect and Faraday effect.

**Text books/ Reference books:**
**1.** Inorganic Chemistry by Huheey. Harper and Row.
**2.** Concise inorganic chemistry by J. D. Lee, ELBS.
**3.** Inorganic chemistry, K.F. Purcell and J.C. Kotz, Holt Saunders international
**4.** Organometallic chemistry by R.C. Mehrotra and A. Singh. New Age International.
**5.** Advanced Inorganic Chemistry by Cotton and Wilkinson, Wiley Eastern
**6.** Inorganic reaction mechanism by Basolo and Pearson, Wiley Eastern
**7.** Bioinorganic Chemistry by K. Hussan Reddy
**8.** Biological Aspects of inorganic chemistry by A. W.Addiso, W. R. Cullen, D.Dorphin and G. J. James. Weliey Interscience.
**9.** Photochemistry of coordination compounds by V. Balzaniand V.Carassiti. Academic Press.
**10.** Text book of Coordination chemistry by K. Soma Sekhara Rao and K.N.K. Vani, Kalyani Publishers.

**M.Sc. DEGREE EXAMINATION**
**SECOND SEMESTER**

Paper- :Advanced Inorganic Chemistry

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A (5x4M=20M)**

1 (a). Write a short note on Phosphorous-Sulphur cages. (CO-2, L-2)

**(Or)**

(b).Explain the bonding aspects of $[Nb_6Cl_{12}]^{-2}$. (CO-2, L-2)

2 (a).Define hapticity. (CO-1, L-1)

**(Or)**

(b).Elaborate the classification of organometallic compounds. (CO-1, L-1)

3(a). Derive rate law of Anation reaction. (CO-2, L-2)

**(Or)**

(b). Write note on complementary and non-complementary reactions. (CO-2, L-2)

4(a). Discuss how Hund's rules can be used to predict ground terms. (CO-2, L-2)

**(Or)**

(b). Derive the ground term of $d^3$ and $d^9$ metal ions. (CO-3, L-3)

5(a). Give a short account on Faraday Effect. (CO-2, L-2)

**(Or)**

(b).Deliberate the effect of spin orbital coupling on magnetic moments. (CO-3, L-3)

**SECTION – B (5x10M=50M)**

UNIT - I

6.(a) Describe the bonding and structure in higher boranes and Metalloboranes. (CO-2, L-2)

**(Or)**

(b) Discuss the structure and bonding in $[Re_2Cl_8]^{2-}$ ion. (CO-2, L-2)

UNIT – II

7.(a) Elucidate the applications of organometallic compounds in catalytichydrogenation and hydro formylation. (CO-3, L-3)

**(Or)**

(b) Explain oxidative addition, reductive elimination reactions of organometallic compounds. (CO-2, L-2)

UNIT – III

8.(a) Explain the outer sphere mechanism of redox reactions. (CO-2, L-2)

**(Or)**

(b) Discuss the direct and indirect evidences in favour of conjugate base mechanism. (CO-3, L-3)

UNIT - IV

9.(a) Discuss the calculation of $D_q$ and β parameters. (CO-3, L-3)

**(Or)**

b) Draw the orgel diagram and Tanabe Sugano diagram for $d^2$ and $d^9$configuration and explain. (CO-2, L-2)

UNIT - V

10.(a) Discuss the storage of dioxygen by myoglobin and write its importance. (CO-2, L-2)

**(Or)**

(b) Describe the factors affecting para magnetism. (CO-2, L-2)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**

**II SEMESTER(2024-2026)**

**Paper Code & Title: 22CHL202: ADVANCED ORGANIC CHEMISTRY**

| | | | |
|---|---|---|---|
| Course Code | 22CHL202 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Advanced Organic chemistry (code 22CHL202)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorise the basic concepts of organic chemistry | 2,7 | 1 |
| 2 | Understand the basic and advanced concepts of stereochemistry, conformational analysis green chemistry in establishing the mechanism of the reaction. | 1,2,7 | 1,2 |
| 3 | Apply the concepts related to stereochemistry, conformational analysis, green and nano chemistry in establishing the mechanism of the reaction | 1,6 | 1,2 |
| 4 | Analyse the role of stereochemistry, nano chemistry and green chemistry in understanding the nature of the product | 1,7 | 1,2,3 |
| 5 | Evaluate the role of stereochemistry, green principles and nano chemistry in establishing the mechanism of a reaction as well as in other areas of chemistry. | 1, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHL202** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 3 | 0 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 3 | 1 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 1 |

**Unit-I: Named reactions:**

Aldol condensation, Benzoin condensation, Cannizzaro condensation, claisen condensation, Dieckmann condensation, Perkin condensation, Stobbe condensation, Reformatsky reaction, Mannich reaction, Reimer-Tiemann reaction, Vilsmeier-Haack reaction, Shapiro reaction, McMurray reaction, Michael addition reaction, Wittig reaction, Stork – Enamine reaction, Acyloin condensation, Robinson ring annulation and Simmon-Smith reaction.

**Unit-II: Stereo Chemistry-I:**

Concept of chirality,Recognition of Symmetry elements. Definition and classification of Stereoisomers, Enantiomer, Diastereomer, Homomer, Epimer, Anomer, Configuration and Conformation, Configurational

nomenclature: D,L and R, S nomenclature. Molecular representation of organic molecules: Fischer, Newman and Sawhorse projections and their inter-conversions. Geometrical Isomerism.Cis-trans, E, Z- and Syn and anti nomenclature, Methods of determining configuration of Geometrical isomers using physical, spectral and chemical methods.

**Unit-III: Stereo Chemistry-II:**
Definition of Conformation, Conformational analysis of acyclic molecules – alkanes and substituted alkanes. Conformational analysis of monocyclic molecules – cyclohexane – chair, boat and twist boat - mono and disubstituted cyclohexanes and conformation around carbon hetero atom bonds having C–O & C–N. Confirmation and intramolecular hydrogen bonding.

**Unit-IV: Green chemistry:**
Introduction to Green chemistry, Principles and concepts of Green chemistry, Green Catalysis, Biocatalysis, renewable resources, Green Reagents, examples of green reactions-synthesis of Ibuprofen, Clean Fischer-Indole synthesis comparison of the above with conventional methods. Introduction to Microwave organic synthesis: introduction, advantages and disadvantages. Applications: solvents (water and organic solvents), solvent free reactions (Solid state reactions).

**Unit-V: Chemistry of Nanomaterials**:
Introduction, carbon nanotubes: structure of single and multi-walled carbon nanotubes, synthesis-solid and gaseous carbon source-based production techniques, synthesis with controlled orientation. Growth mechanism of carbon nano tubes-catalyst free growth, catalyst activated growth, general properties and applications.

**Reference Text books:**

**1.** Advanced organic chemistry –Reaction, mechanism and structure, Jerry March, John Wiley.
**2.** A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
**3.** Organic chemistry, I.L. Finar, Vol. I & II, Fifth ed. ELBS, 1975.
**4.** Stereo Chemistry of carbon compounds – E.L. Eliel.
**5.** Nano, The Essentials: T. Pradeep, The Mc. Graw Hill & Co.
**6.** Principles of organic synthesis, R.O.C. Norman and J.M. Coxon, Blakie Academic & Professional.
**7.** Reaction Mechanism in organic chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
**8.** Green chemistry Theory and Practice by Paul T. Anastas and John C. Warner, Oxford University press.
**9.** Methods and reagents for Green chemistry, PietroTundo, Alvise Perosa, Fulvio Zecchini, John Willey& sons Inc.

**M.Sc. DEGREE EXAMINATION**
**SECOND SEMESTER**

Paper-II: Advanced Organic Chemistry

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A(5x4M=20M)**

1(a).Explain Shapiro reaction. (CO-2, L-2)

**(Or)**

(b).Explain Stobbe condensation. (CO-2, L-2)

2(a).Write notes on configuration and conformation. (CO-1, L-1)

**(Or)**

(b).Explain enantiomers with suitable examples. (CO-1, L-1)

3(a).Draw the structures of the cyclohexane boat and twist boat structures. (CO-1, L-1)

**(Or)**

(b).Discuss conformation and intramolecular hydrogen bonding. (CO-2, L-2)

4(a).Discuss Clean Fischer Indole synthesis. (CO-3, L-3)

**(Or)**

(b).Write notes on Biocatalysis. (CO-1, L-1)

5(a).Define nano explain. (CO-1, L-1)

**(Or)**

(b).Writegeneral properties of carbon nano tubes. (CO-1, L-1)

**SECTION – B (5x10M=50M)**

UNIT - I

6.(a) Discuss the mechanism of the following (i)Benzoin condensation.
(ii) Reformatsky reaction. (CO-2, L-2)

**(Or)**

(b) Discuss the definition and mechanism of (i) Wittig reaction (ii) Acyloin condensation. (CO-2, L-2)

UNIT – II

7.(a) Explain the various elements of symmetry with suitable examples. (CO-1, L-1)

**(Or)**

(b) Discuss the various methods for determination of configuration of geometrical isomers with suitable examples. (CO-1, L-1)

UNIT – III

8.(a)Discuss the conformational analysis of cyclohexane and explain the stabilities. (CO-1, L-1)

**(Or)**

(b)Write an account of comformation around C – N and C – O hetero atom bonds. (CO-1, L-1)

UNIT - IV

9.(a) Discuss the principles of green chemistry. (CO-2, L-2)

**(Or)**

(b) Explain the theory, principle and advantages of MicroWave (MW) organic synthesis. (CO-2, L-2)

UNIT - V

10.(a) Explain growth mechanism of carbon nanotubes. (CO-2, L-2)

**(Or)**

(b) Give an applications of carbon nanotubes. (CO-2, L-2)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**

**II SEMESTER(2024-2026)**

**Paper Code & Title: 22CHL203: ADVANCED PHYSICAL CHEMISTRY**

| | | | |
|---|---|---|---|
| Course Code | 22CHL203 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Advanced Physical chemistry (code 22CHL203)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Remember the basic concepts of Physical chemistry. | 1,2, | 2 |
| 2 | Understand the basic and advanced concepts of Physical chemistry like statistical thermodynamics, polymers, chemical kinetics, photochemistry, and radio chemistry | 1,2,7 | 1,2 |
| 3 | Apply the conceptual knowledge of theoretical statistical analysis,electro chemical analysis, polymer science and radio chemistry. | 1,6, | 1,2,3 |
| 4 | Analyze the role and significance of statistical thermodynamics, Polymers, Electro Chemical methods, chemical kinetics, photochemistry and radio chemistry. | 1,7 | 1,2,3 |
| 5 | Evaluate the role of concepts of Physical chemistry in allied subjects. | 1,7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHL203** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 1 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |

**Unit-I: Third law of Thermodynamics and Statistical thermodynamics**:

Nernst Heat theorem - Third law of thermodynamics - Its limitations - Determination of absolute entropy - Thermodynamic probability and most probable distribution, Entropy and probability - Boltzmann-Plank equation. Ensembles, Maxwell-Boltzmann distribution,Fermi-Dirac statistics, Bose Einstein statistics. Partition function - calculation of thermodynamic properties in terms of partition function - Chemical equilibrium and partition function - Translational, rotational and electronic partition function - Entropy of Monoatomic gases (Sackur-Tetrode equation).

**Unit-II: Polymer chemistry and Raman Spectroscopy:**

Classification of polymers - Free radical, ionic and Zeigler -Natta Polymerization - kinetics of free radical polymerization -Techniques of polymerization -Glass transition temperature - Factors influencing the glass

transition temperature. Number average and Weight average, Molecular weights –molecular weights determinations – Membrane Osmometry, Light scattering phenomenon. Classical and quantum theories of Raman effects, pure rotational, vibrationaland Vibrational- rotational Raman spectra, selection rules,mutual exclusion principle.

**Unit-III: Electro Chemistry-II:**

Reference electrode - Standard hydrogen electrode. Calomel electrode -Indicator electrodes: Metal-metal ion electrodes - Inert electrodes -Membrane electrodes - theory of glass membrane potential, potentiometric titrations, advantages of potentiometric titrations, Conductometric titrations. Electrode potentials - Double layer at the interface - rate of charge transfer - Decomposition potential - Over potential - Tafel plots - Derivation of Butler- Volmer equation for one electron transfer - electro chemical potential.

**Unit-IV: Chemical kinetics and Photo chemistry:**

Branching Chain Reactions – Hydrogenoxygen reaction - lower and upper explosion limits - Fast reactions - Study of kinetics by flow methods - Relaxation methods - Flash photolysis. Acid base catalysis –protolytic and prototropic mechanism.Enzyme catalysis - Michelis-Menten kinetics.

**Photochemistry:**

Quantum yield and its determination, Actinometry, Reactions with low and high quantum yields, Photo sensitization, Exciplexes and Excimers, Photochemical equilibrium, Kinetics of collisional quenching - Stern- Volmer equation.

**Unit-V:**

**Radioactivity and Isotopes:** Introduction to radioactivity, properties of alpha rays, beta rays and gamma rays, theory of radioactive disintegration, rate of disintegration, Geiger – Nuttal rule, radioactive equilibrium. Isotopes - radioactive and non-radioactive isotopes, group displacement law. Analysis of isotopes – Aston's mass spectrograph, Dempster's method, Bainbridge's method.Separation methods of isotopes.Applications of Radio isotopes in Industry and medicine.

**Text books/ Reference books:**


**1.** Physical chemistry, G.K. Vemulapalli (Prentice Hall of India).

**2.** Physical chemistry, P.W. Atkins. ELBS**.**

**3.** Chemical kinetics - K.J. Laidler, McGraw Hill Pub.

**4.** Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.

**5.** Statistical Thermodynamics - M.C.Gupta.

**6.** Polymer Sceince, Gowriker,Viswanadham, Sreedhar.

**7.** Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.

**8.** Physical Chemistry by G.W.Castellan, Narosa Publishing House, Prentice Hall.

**9.** Physical Chemistry by W.J. Moore, Prentice Hall.

**10.** Polymer Chemistry by Billmayer.

**11.** Fundamentals of Physical Chemistry by K K. Rohatgi-Mukherjee. Wiley Eastern Ltd publications.

**12.** Statistical Thermodynamics by M.Dole.

13. Fundamentals of photochemistry by Rohatgimukherjee, New Age international Publications.

14. Essentials of Nuclear chemistry by H.J.Armikar, New Age international Publications.

**M.Sc. DEGREE EXAMINATION**
**SECOND SEMESTER**

Paper-IV:Advanced Physical Chemistry

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A (5x4M=20M)**

1 (a).Explain briefly Nernst Heat theorem. (CO-2, L-2)

**(Or)**

(b).Discuss Third law of thermodynamics in short. (CO-2, L-2)

2 (a).Demonstrate Classification of polymers. (CO-3, L-3)

**(Or)**

(b).Describe the Free radical polymerization with appropriate mechanism. (CO-2, L-2)

3(a).Explain Branching Chain Reactions in short. (CO-2, L-2)

**(Or)**

(b).Discuss briefly Hydrogen oxygen reaction with appropriate mechanism. (CO-2, L-2)

4(a).Discuss briefly Double layer at the interface. (CO-2, L-2)

**(Or)**

(b).Expalin over potential in short. (CO-2, L-2)

5(a).What is radioactivity? Describe the properties of alpha rays. (CO-2, L-2)

**(Or)**

(b).Discuss briefly the theory of radioactive disintegration.(CO-2, L-2)

**SECTION – B (5x10M=50M)**

UNIT - I

6.(a) Derive Fermi-Dirac statistics. (CO-3, L-3)

(b) Derive Bose Einstein statistics. (CO-3, L-3)

**(Or)**

(c) Derive Chemical equilibrium interms of partition function.(CO-3, L-3)

(d) Derive Entropy of Monoatomic gases (Sackur-Tetrode equation). (CO-3, L-3)

UNIT – II

7.(a)Illustrate Zeigler -Natta Polymerization with suitable example. (CO-3, L-3)

**(Or)**

(b) Differentiate between Number average and Weight average weight of a polymer in detail. (CO-3, L-3)

UNIT – III

8.(a)Discuss with a neat labelled diagram Standard hydrogen electrode and Calomel electrode in detail. (CO-2, L-2)

**(Or)**

(b)Demonstrate the conductometric titrations in detail with a neat labelled graphs. (CO-3, L-3)

UNIT - IV

9.(a) What are Fast reactions ? Discuss the Study of kinetics by flow methods andRelaxation methods With a neat labeled diagram. (CO-3, L-3)

**(Or)**

(b) Differentiate between protolytic and prototropic mechanisms of Acid Base catalysis. (CO-3, L-3)

UNIT - V

10.(a) Explain the rate of disintegration in detail. (CO-2, L -2)

(b) Discuss the Geiger – Nuttal rule. (CO-2, L -2)

**(Or)**

(c) Discuss the radioactive equilibrium. (CO-2, L -2)

(d) What are isotopes? Illustrate radioactive and non-radioactive isotopes in detail.(CO-3,L-3)

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**A G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE**
**DEPARTMENT OF CHEMISTRY**
**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**
**II SEMESTER**

**Paper Code & Title: 22MBASDL201: RESEARCHMETHODOLOGY&INTELLECTUAL PROPERTY RIGHTS (IPR)**

**No. of hours per week: 04** **Total credits: 03**
**Total marks: 100** **(Internal: 30 M & External: 70M)**

| **Course: Research Methodology & Intellectual Property Rights (IPR) (code 22PG201)** | | |
|---|---|---|
| S.No | COURSE OUTCOMES | PO`S |
| | The student will be able to | |
| 1 | Memorize the basic concepts of research and its methodologies. | 2,7 |
| 2 | Understand some basic and advanced concepts of research and its Methodologies. | 1,4,7 |
| 3 | Demonstrate the ability to choose methods appropriate to research aims and objectives. | 1,3,6 |
| 4 | Analyze the role of research methodologies in designing the new strategies. | 1,4,5 |

**UNITI**

**Foundations of Research**

MeaningofResearch–DefinitionsofResearch–MotivationinResearch–General Characteristics of Research–Criteria of Good Research–Types of Research– Research Process–Research Methods vs .Methodology–Defining and Formulating the Research Problem – Review of Literature – Approaches to Critical Literature Review – Importance of Literature Review in Identifying Research Gaps and Defining a Problem – Development of Working Hypothesis.

**UNITII**

**Research Design, Sampling Concepts, and Data Collection Methods**

Meaning, Significance and Characteristics of Good Research Design–Types of Research Design: Exploratory, Conclusive Research and Experimental – Sampling Theory: Types of Sampling and Errors in Sampling – Data Collection: Types of Data – Data Collection Methods and Techniques for Primary and Secondary Data.

**UNITIII**

**Measurement & Scaling Techniques, Hypothesis Formulation and Testing, Overview of Data Analysis and Report Writing**

Basic measurement scales – Reliability & Validity – Definition and Types of Hypothesis –Hypothesis Formulation and Testing Procedure – Overview of Data Analysis: Methods, Process and Types – Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing research Report, Precautions for Writing Research Reports–How to Write a Research Proposal, Research Ethics, Conflict of Interest and Plagiarism.

**UNITIV**

**Intellectual Property Rights (IPR)**

Definition and Nature and Features of Intellectual Property Rights (IPR)–Types of Intellectual Property Rights – Procedure for Grants of Patents–Rights of a Patent –Scope of a Patent Rights – LicensingandTransferofTechnology–Whyprotectionofintellectualpropertyisimportant? – Enforcement of IPR–Infringement of IPR.

**UNITV**

**Indian and International Scenario and New Developments in IPR**

IPR Developments in India for the past Five Years – Development of IPR Laws in India –International Cooperation on IPR– New Developments in IPR– Administration of Patent System–International Patent protection– Case Studies in Indian and Global Contexts.

**REFERENCEBOOKS:**


1. Garg,B.L.,Karadia,R.,Agarwal,F.andAgarwal,U.K.,2002,AnintroductiontoResearchMethodology,RBSA Publishers.
2. Cohen, L. Lawrence,M.,&Morrison,K.(2005),ResearchMethodsinEducation(5thedition).Oxford: Oxford University Press.
3. Kothari, C.R.,1990,Research Methodology:Methods and Techniques ,New Age International.
4. Dornyei,Z.(2007).ResearchMethodsinAppliedLinguistics.Oxford:OxfordUniversityPress.
5. Anthony, M., Graziano,A.M.and Raulin,M.L.,2009,ResearchMethods:AProcessofInquiry,Allynand Bacon.
6. Fink, A., 2009, Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications.
7. Day, R.A., 1992, How to Write and Publish Scientific Paper, Cambridge University Press.
8. Wadehra, B.L.2000,Law relating to patents, trademarks, copyright designs and geographical indications .Universal Law Publishing.
9. Coley,S.M.and Scheinberg,C.A.,1990,ProposalWriting,SagePublications.
10. Carlos,C.M.,2000.Intellectualpropertyrights,theWTOanddevelopingcountries:theTRIPSagreement and policy options, Zed Books ,New York.
11. Leedey, P.D.and Ormrod,J.E.,2004,PracticalResearch:Planning and Design, Prentice Hall.
12. Satarkar, S.V., 2000. Intellectual property rights and Copyright .EssEss Publications

**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**

**II SEMESTER**

**Paper Code & Title: 22CHDSL201: MOLECULAR SPECTROSCOPY**

| | | | |
|---|---|---|---|
| Course Code | 22CHDSL201 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Molecular Spectroscopy (code 22CHDSL201)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the basic principles and theory involved in molecular absorption spectroscopy. | 2,7 | 2 |
| 2 | Comprehend the advanced concepts of molecular absorption spectroscopy. | 1,2,7 | 1,2 |
| 3 | Apply the knowledge of spectroscopy in calculating the bond length, identifying the functional group present in molecules. | 1,6 | 1,2,3 |
| 4 | Identify the role UV – visible spectroscopy in the determination of absorption maximum and ESR spectroscopy in studying the properties of paramagnetic substances. | 1,7 | 1,2,3 |
| 5 | Evaluate the principles involved in molecular absorption spectroscopy. | 1, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| **COURSE CODE 22CHDSL201** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 1 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |

## UNIT- I

**Introduction to Molecular Spectroscopy:** Motion of molecules-Degrees of freedom – Energy associated with the degrees of freedom-Type of spectra**.**

**Microwave spectroscopy**: Classification of molecules, rigid rotator model, effect of isotopic substitution on the transition frequencies, Intensities non-rigid rotator-Microwave spectra of polyatomic molecules.

## UNIT – II

**Infrared spectroscopy:**
Harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths, anhormonicity Morse potential energy diagram. Vibration – rotation spectroscopy. PQR braches, Born – oppenheimer approximation, Break down Born – openheimer approximation, normal modes of vibration group frequencies, overtones, hot bands, application of IR spectra to polyatomic molecules.

**UNIT – III**

**Unit-II: Raman Spectroscopy:**
Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational- rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent antistrokes Raman Spectroscopy (CARS).

**UNIT – IV**

**UV- Visible Spectroscopy:**
Electronic Spectra of diatomic molecules, vibrational structure of an electronic transition, classification of bands, rotational fine structure of electronic vibrational transition. Electronic Spectra of Polyatomic Molecules.

**UNIT – V**

Electron Spin Resonance Spectroscopy:
Basic Principles, zero field splitting and kranners's degeneracy, factors affecting the 'g' value. Istropic and anisotropic hyperfine coupling constants, spin hamiltenia, spin densities measurement techniques - simple applications like methyl radical, ethyl radical etc.,

**Text books/ Reference books:**
**1.** Introduction to Spectroscopy – D. L. Pavia, G.M. Lampman, G. S. Kriz, 3rd Ed. (Harcourt college publishers).
**2.** Absorption spectroscopy of organic molecules – V. M. Parikh
**3.** Nuclear Magnetic Resonance – Basic Principles- Atta-Ur-Rehman, Springer-Verlag (1986).
**4.** Molecular spectroscopy by Kalidas & B.K.Sharma
**5**. Vibrational Spectroscopy by D.N.Sathyanarayana New Age Int. Pub.
**6.** Spectroscopy by Aruldas.
**7**. Symmetry & Spectroscopy of molecules by K.Veerareddy

**M.Sc. DEGREE EXAMINATION**

**SECOND SEMESTER**

Elective Paper: Molecular Spectroscopy

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A (5x4M=20M)**

1 (a). Write a short note on Degrees of Freedom of a rigid body (CO-2, L-2)

**(Or)**

(b).Explain the effect of Isotopic substitution on the transition frequencies. (CO-2, L-2)

2 (a).Define Zero point Energy and force constant. (CO-1, L-1)

**(Or)**

(b).Elaborate the importance of Morse Potential in vibration spectroscopy. (CO-1, L-1)

3 (a).State the Mutual Exclusion Principle (CO-2, L-2)

**(Or)**

(b). Write note on Classical theory of Raman effect. (CO-2, L-2)

4(a). Discuss electronic Spectra of Diatomic molecules. (CO-2, L-2)

**(Or)**

(b). Explain the classification of bands in Electronic spectroscopy. (CO-2, L-2)

5(a). Give a short account ofKrammers degenracy. (CO-2, L-2)

**(Or)**

(b).Deliberate the spin Hamiltonian in ESR spectroscopy. (CO-2, L-2)

**SECTION – B (5x10M=50M)**

UNIT - I

6.(a) Describe the Non-rigid rotator of rotational spectrum.(CO-2, L-2)

**(Or)**

(b) Discuss the Microwave spectra of polyatomic molecules. (CO-2, L-2)

UNIT – II

7.(a) Elucidate the importance of Born-oppenheimer approximation in vibrational spectroscopy. (CO-2, L-2)

**(Or)**

(b) Explain PQR Branches, Overtones and Hot bands in IR spectroscopy. (CO-2,L-2)

UNIT – III

8.(a) Explain the CARS. (CO-2, L-2)

**(Or)**

(b) Write aboutResonance Raman spectroscopy. (CO-3, L-3)

UNIT - IV

9.(a) Discuss in detail Electronic spectra of ployatomic molecules. (CO-3, L-3)

**(Or)**

(b) Write a note on electronic transtitions and electronic spectra of diatomic molecules. (CO-2, L-2)

UNIT - V

10.(a) Discuss in detail hyper fine splitting in methyl and ethyl radicals . (CO-2, L-2)

**(Or)**

(b) Describe the factors affecting the 'g' value in ESR spectroscopy. (CO-2, L-2)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**

**II SEMESTER**

**Paper Code & Title: 22CHDSL202: INSTRUMENTALMETHODSOFANALYSIS**

| | | | |
|---|---|---|---|
| Course Code | 22CHDSL202 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Instrumental Methods of Analysis (code 22CHDSL202)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the basic principles of the modern methods of analysis. | 2,7 | 2 |
| 2 | Understand the basic and advanced concepts of modern Methods(i.e Instrumental methods) of analysis. | 1,2,7 | 1,2,3 |
| 3 | Apply the instrumental methods of analysis in any chosen job role. | 1,6 | 1,2,3 |
| 4 | Interpret the role of these instrumental methods in the quantitative determination of constituents. | 1,7 | 1,2,3 |
| 5 | Evaluate the results of the analysis in assessing the nature and properties of molecules. | 1,7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| **COURSE CODE 22CHDSL202** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 1 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |

## UNIT-I

**Spectro-analyticalmethodsofanalysis**:**Flamephotometry:**
Theory,instrumentation, combustion flames, detectors and analysis of Na, K, Ca, Mg.

**Atomic AbsorptionSpectrometer:** theory, instrumentation, flame and non-flame techniques, resonancelinesources,hollowcathodelamp,chemicalandspectral interferences, applications with specialreference to analysis of trace metalsin oils,alloysandtoxic metals in drinking waterandeffluents.

**Inductively coupled plasma spectrometer (ICP-AES,ICP-MS):**
Principles,
instrumentation,plasma,AESdetectors,quadrupolemassspectrometers,differencebetweenthetwodetectors,applications.

## UNIT-II

**ThermalmethodsofAnalysis:Thermo gravimetry**:Theory,instrumentation,applicationswith special reference to $CuSO_4.5H_2O$, $CaC_2O_4.2H_2O$, $CaCO_3$, $(COOH)2.2H2O$

**Differential thermal analysis:** Principle, instrumentation, difference betweenTGandDTA-applicationswithspecialreferencetotheclaysandminerals,coals(fuels).

**Differential scanningcalorimetry :**Principle, instrumentation, applications to inorganic materials like chlorates and per chlorates, ammonium nitrate, organic compoundsand drugs.

## UNIT-III

**Electro analytical Methods-1:Polarographicanalysis**:

Principle and Instrumentation, Dropping mercury electrode (DME),advantages and disadvantages of DME, qualitative and quantitative analysis of inorganic ions-Cu, Bi,Pb,Cd,Zn,ACpolarography,pulsepolarography.

**Anodestrippingvoltametry**:Principle,instrumentation,Hangingmercurydropelectrode,applicationinthean alysisofPbandCdinenvironmentalsamples,principle ofcathode stripping voltametry.

## UNIT-IV

**Electro analytical methods -2Electro gravimetric analysis**: Principle, importanttermsin electrogravimetry, decomposition voltage or decomposition potential, over voltage and their importance,instrumentation,electrolysis at constant current, determination of $Cu^{2+}$by constant current electrolysis, electrolysis at controlled potentials, determination of Cu, Pb,Sn in brass and bronze by controlled potential electrolysis.

**Coulometricanalysis**: Principles of coulometric analysis with constant current and controlled potential, coulometric analysiswithcontrolledpotential,applicationsofcoulometricmethodsforthe analysis of cations-As(III), Fe(II) and $I^-$and $S^{2-}$by using $I_2$ liberations and $Ce^{4+}$ liberation in solutions.

## UNIT-V

**Electro analytical methods-3 Amperometry:**Introduction, principle, conditionsfor performing amperometric titrations, advantages, titrations with rotating platinum electrode,applications.

**Biamperometry:**Principle,biamperometrictitrationsanditscurves,applications.

**Cyclicvoltametry:** Basic principles,applications.

**Referencebooks:**


1. Instrumentalmethodsof analysis- H.HWillard,MerittJr.andJ.ADean.
2. Principlesofinstrumentalanalysis-SkoogandWest.
3. Vogel's Textbook of Quantitative Inorganic analysis - J. Basset, R.C. Denney, G.H. Jeffereyand J.Madhan.
4. Instrumentalmethodsof analysis-B.KSarma,GoelPublishingHouse,Meerut.
5. Instrumentalmethodsof Analysis-ChatwalandAnand.
6. InstrumentalmethodsofAnalysis-EwingW.Wendtland.
7. ThermalAnalysis,John WileySons, NewYork.

**M.Sc. DEGREE EXAMINATION**

**SECOND SEMESTER**

Elective Paper: Instrumental Methods of Analysis

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A (5x4M=20M)**

1 (a).Explain briefly the analysis of Na, K, Ca, Mg by using Flame photometry.(CO-2, L-2)

**(Or)**

(b).Discuss the theory involved in AAS. (CO-2, L-2)

2 (a).Elaboratethe theory in TG. (CO-2, L-2)

**(Or)**

(b).Describe the principle involved in Differential Scanning Calorimetry. (CO-2, L-2)

3(a).Explain instrumentation of dropping mercury electrode.(CO-2, L-2)

**(Or)**

(b). Write about Cathode Stripping Voltametry. (CO-2, L-2)

4(a).Discuss briefly the important terms in electro gravimetry. (CO-2, L-2)

**(Or)**

(b).Explain determination of Cu, Pb by controlled potential electrolysis. (CO-2, L-2)

5 (a).What are amperometric titrations? Describe the advantages of amperometric titrations. (CO-2, L-2)

**(Or)**

(b).Discuss briefly the theory of Cyclic Voltametry.(CO-2, L-2)

**SECTION – B (5x10M=50M)**

UNIT - I

6.(a) Elucidate the instrumentation& Principle of AAS in detail. (CO-2, L-2)

**(Or)**

(b) Discuss the instrumentation of ICP-AES, ICP-MS in detail. (CO-2, L-2)

UNIT – II

7.(a)Illustrate Themo gravimetry applications of $CuSO_4.5H_2O$,$CaC_2O_4.2H_2O$,$CaCO_3$.(CO-3, L-3)

**(Or)**

(b) Write a note on applications of DSC to inorganic materials. (CO-3, L-3)

UNIT – III

8.(a) Discuss the principle and instrumentation of Anode stripping voltametry (CO-2, L-2)

**(Or)**

(b) Explain the advantagesanddisadvantagesofDME.(CO-2, L-2)

UNIT - IV

9.(a) What is the importance of decomposition potential, over voltage.(CO-2, L-2)

(b) Explain the instrumentation of Electro gravimetry. (CO-2, L-2)

**(Or)**

(c) Write a note oncoulometric analysisofcations-As(III),Fe(II), $I^-$and$S^{2-}$byusing$I_2$ Liberationand$Ce^{4+}$liberationin solutions. (CO-2, L-2)

UNIT - V

10.(a) What are the conditionsfor performing amperometric titrations,biamperometrictitrations. (CO-2, L-2)

**(Or)**

(b) Discuss the advantages and applications of amperometric titrations(CO-2, L -2)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**
**II SEMESTER**

**Paper Code & Title: 22CHDSL203: ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIOCHEMICALANALYSIS**

| | | | |
|---|---|---|---|
| Course Code | 22CHDSL203 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Analysis Of Drugs, Foods, Diary Products & BiochemicalAnalysis (code 22CHDSL203)** | | | |
|---|---|---|---|
| S. | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the basic principles of analysis drugs. Food, dairy products and biological analysis. | 2,7 | 2 |
| 2 | Understand the basic and advanced concepts of drugs. Food, dairy products and biological analysis. | 1,2,7 | 1,2,3 |
| 3 | Apply the analysis of drugs, foods, dairy products and biological analysis in any chosen job role. | 1, 6 | 1,2,3 |
| 4 | Interpret the role of the analysis of drugs, foods and biological analysis, quantitatively. | 1, 7 | 1,2,3 |
| 5 | Evaluate the results of then analysis of drugs, foods, dairy products and to assess their quality. | 1,7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHDSL203** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 1 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |

## UNITI

**Analysisofthefollowingdrugsandpharmaceuticalspreparations:**(Knowledgeofmolecularformula, structure and analysis) Analysis of analgesics and antipyretics like aspirin and paracetamolAnalysisof antimalerialslikecholoroquine.Analysisof drugsinthetreatmentofinfectionsandinfestations: Amoxycillin, chloramphenicol, metronidazole, penicillin, tetracycline. Anti tuberculousdrug-isoniazid.

## UNITII

**Analysisofthefollowingdrugsandpharmaceuticalspreparations**:(Knowledgeofmolecularformula,structureandanalysis)Analysisofantihistaminedrugsandsedativeslike:allegra,zyrtec(citirizine),alprazolam,trazodone,lorazepem.

## UNITIII

Analysis of anti epileptic and anti convulsant drugs like phenobarbital and phenacemide. Analysis ofdrugsusedincaseofcardiovasculardrugs:atenolol,norvasc(amlodipine),AnalysisofLipitor(atorvastatin)adrugforthepreventinofproductinofcholesterol.

Analysis of diuretics like: furosemide (Lasix), triamterene Analysis of prevacid (lansoprazole) a drugusedforthepreventionofproductionofacidsinstomach.

## UNITIV

**Analysis of Milk and Milk Products:** Acidity, total solids, fat, total nitrogen, protenines, lactose,phosphate activity,casein,chlorideAnalysis offoodmaterials.

**Preservatives:** Sodium carbonate, sodium benzoate sorbic acid Flavoring agents - Vanilla, diacetyl,isoamyl acetate, limonene, ethylpropionate, allyl hexanoate and Adulterants in rice and wheat, wheatflour,sago,coconutoil,coffeepowder,teapowder,milk.

## UNITV

**ClinicalAnalysisofBlood:**Compositionofblood,clinicalanalysis,traceelementsinthebody.Estimationofblood chlolesterol,glucose,enzymes,RBC &WBC,Bloodgasanalyser.

ReferenceBooks:


1) F.J.Welcher-Standardmethodsofanalysis,
2) A.I.Vogel-AtextbookofquantitativeInorganicanalysis-ELBS,
3) F.D.Snell&F.M.Biffen-Commercialmethodsofanalysis-D.B.Taraporavala&sons,
4) J.J.ElvingandI.M.Kolthoff- Chemicalanalysis-Aseriesofmonographson
5) Analyticalchemistryanditsapplications--InterScience-VolItoVII.,
6) AanalyticalAgricultrualChemistrybyS.L.Chopra&J.S.Kanwar-KalyaniPublishers
7) Quantitativeanalysisofdrugsinpharmaceuticalformulationsby P.D.Sethi,CBSPublishersandDistributors, NewDelhi.
8) G.Ingram-Methodsoforganicelementalmicroanalysis-ChapmanandHall.
9) H.WincciamandBobbles(HenryJ)-Instrumentalmethodsofanalysisoffood additives.,
10) H.Edward-TheChemicalanalysisoffoods;Practicaltreatiseontheexaminationoffoodstuffsandthe detectionofadulterants,
11) Thequantitativeanalysisofdrugs- D.C.Garratt-Chapman&Hall,
12) AtextbookofpharmaceuticalanalysisbyK.A.Connors-Wiley-International,
13) Comprehensivemedicinalchemistry-EdCorwinHanschVol5,PergamonPress.

**M.Sc. DEGREE EXAMINATION**
**SECOND SEMESTER**

Elective Paper:**Analysis of Drugs, Foods, Dairy Products & Biochemical Analysis**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** **(5x4M=20M)**

1 (a).Discuss the analysis of Aspirin. (CO-2, L-2)

**(Or)**

(b). Explain the analysis of Paracetamol. (CO-2, L-2)

2 (a). Discuss the analysis of Allegra. (CO-2, L-2)

**(Or)**

(b).Explain the analysis of Citrizine. (CO-2, L-2)

3(a). Discuss the analysis of Phenobarbital. (CO-2, L-2)

**(Or)**

(b). Explain the phenacemide. (CO-2, L-2)

4(a).Discuss the acidity of milk shortly. (CO-2, L-2)

**(Or)**

(b).Explain the total solid fat of milk. (CO-2, L-2)

5 (a). Discuss the composition of blood. (CO-2, L-2)

**(Or)**

(b). Explain the chemical analysis of blood.(CO-2, L-2)

**SECTION – B** **(5x10M=50M)**

UNIT - I

6.(a) Discuss the analysis of (i)choloroquine and (ii) Amoxycillin (CO-2, L-2)

**(Or)**

(b) Explain the analysis of chloramphenicol and metronidazole. (CO-2, L-2)

UNIT – II

7.(a) Discuss the analysis of alprazolam andtrazodone. (CO-3, L-3)

**(Or)**

(b) Explain the analysis of lorazepem. (CO-3, L-3)

UNIT - III

8.(a) Discuss the analysis of atenolol and norvasc.(CO-2, L-2)

**(Or)**

(b) Explain the analysis of Lipitor and Furosemide in detail. (CO-2, L -2)

UNIT – IV

9.(a) Discuss the analysis of protenines and lactose. (CO-2, L-2)

**(Or)**

(b) Explain the analysis of phosphate activity and chloride analysis of food materials. (CO-2, L-2)

UNIT - V

10.(a) Give an account of chemical estimation of blood glucose.(CO-2, L-2)

**(Or)**

(b) Discuss in detail estimation of blood cholesterol in detail. (CO-2, L-2)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**
**II SEMESTER**

**Paper Code & Title: 22CHP201: PHYSICAL CHEMISTRY PRACTICAL**

| | | | |
|---|---|---|---|
| Course Code | 22CHP201 | I A Marks | 30 |
| No. of Lecture Hours / Week | 3 | End Exam Marks | 70 |
| Total Number of Lecture Hours | - | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: Physical chemistry (code 22CHP201)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO‘s |
| | The graduate will be able to | | |
| 1 | Memorise the basic principles involved in various physical and chemical methods of determination | 2,7 | 2 |
| 2 | Comprehend the principles and theory involved in the determinations by physical and chemical methods | 1,2,7 | 1,2,3 |
| 3 | Exercise the procedural concepts in the determination of unknowns by physical and chemical methods | 1,4, 6 | 1,2,3 |
| 4 | Interpret the data obtained in the determinations by physical and chemical methods | 1,5, 7 | 1,2,3 |
| 5 | Evaluate the accuracy of results obtained in the determinations by physical and chemical methods. | 1, 3, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHP201** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 3 | 1 | 1 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 2 | 0 | 2 | 0 | 2 | 3 | 1 |
| | CO4 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 2 | 0 | 0 | 0 | 2 | 2 | 1 | 3 |

**List of experiments:**

**1.** Relative strengths of acids by studying the hydrolysis of ethyl acetate / methyl acetate.

**2.** Determination of equilibrium constant of KI3 KI + I2 by partition coefficient.

**3.** Determination of unknown concentration of potassium iodide by partition coefficient method.

**4.** Distribution coefficient of Benzoic acid between Benzene and water.

**5.** Determination of critical solution temperature of phenol-water system.

**6.** Study of the effect of electrolyte on the miscibility of phenol-water system.

**7.** Determination of Coordination number of cuprammoniumcation.

**8.** Potentiometric determination of Fe(II) with Cr (VI).

**9.** Potentiometric determination of Fe(II) with Ce (IV).

**10.** pH-metric determination of strong acid with strong base.

**11.** Conductometric titration of strong acid with strong base.

**12.** Conductometric titration of strong acid + Weak acid with strong base.

**13.** Dissociation constant of weak acid (CH3COOH) by conductometric method.

**14.** Determination of cell constant.

**15.** Verification of Beers Law using potassium permanganate/Potassium dichromate.

**Text books/ Reference books:**

**1.** Experimental Physical chemistry by V.D. Athawale, Parul Mathur, New Age International publishers.
**2.** Physical chemistry experiments by V. P. Kudesia, Pragati Prakasan publishers.
**3.** Advanced practical Physical chemistry by J.B. Yadav, Krishna's educational publishers.

**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**
**II SEMESTER**

**Paper Code & Title: 22CHP202: ORGANIC CHEMISTRY PRACTICAL-II**

| | | | |
|---|---|---|---|
| Course Code | 22CHP202 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | - | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: ORGANIC CHEMISTRY PRACTICAL-II - 22CHP202** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorise the basic principles involved in organic compound analysis and synthesis. | 2,7 | 2 |
| 2 | Understand the importance of organic compound synthesis and identify various functional groups in the given organic compound. | 1,2,7 | 1,2,3 |
| 3 | Apply the systematic procedure in identifying the functional groups in an unknown organic compound. | 1,4,6 | 1,2,3 |
| 4 | Analyse the results obtained in compound analysis and mechanisms involved in synthesis. | 1,5,7 | 1,2,3 |
| 5 | Evaluate the role of intermediates in compound synthesis. | 1,7,3 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHP202** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 1 |
| | CO3 | 3 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 3 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 | 2 |
| | CO5 | 3 | 0 | 2 | 0 | 0 | 0 | 2 | 2 | 3 | 1 |

**List of experiments:**

1. Preparation of organic compounds: Single stage preparations by reactions involving Nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement.

(A student is expected to prepare at least 5 different organic compounds by making use of the reactions given above).

2. Preparation of organic compounds: Two stage preparations by reactions involving nitration,halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement.

(A student is expected to prepare at least 5 different organic compounds by making

use of the reactions given above).

3. Systematic qualitative analysis of organic compounds with different functional groups (5different compounds)

**Text books/ Reference books:**

1. A.I.Vogel, "A Text Book of Practical Organic Chemistry", Longman
2. A.I.Vogel, "Elementary Practical Organic Chemistry", Longman
3. Practical Organic Chemistry, F.G.Mann and B.C.Saunders, Longman.
4. Reaction and Synthesis in Organic Laboratory, B.S.Furniss, A.J.Hannaford, Tatchell, University Science Books Mills valley.
5. Purification of Laboratory chemicals, manual, W.L.F. Armarego EDD Perrin.
6. Reaction and Synthesis in Organic Chemistry Laboratory, Lutz-Friedjan-Tietze, TheophilEicher, University Science Book.

A.G&S.G..Siddhartha College of Arts & Science: : Vijayawada – 520 010

Department of Chemistry

CIA Practicals

Total Marks – 30 M

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**M.Sc. DEGREE EXAMINATION**

External Practical Model Paper
**(Regulation 2017-2018)**

**Time: 6 hours** **Maximum Marks: 70**

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1. To write the principle and procedure / mechanism related to practical as listed in the practical syllabus – 5 M

2. Record – 10 M

3. Experiment (Procedure / Tabulation / calculation etc.,) – 50 M

4. Result / Graphs / Yield / Report – 5 M

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**
**DEPARTMENT OF CHEMISTRY**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY) Sem IV(2022-2024)**

## Course Structure

| Course Code | Core/DSE EIDC/Moocs/lab/project work | Title of the Paper | Instruction Hours Per Week | | | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | CIA MARKS | SEE MARKS | SEE DURATION |
| 22CHL401 | Core | Advanced Organic Spectroscopy | 4 | -- | -- | 4 | 30 | 70 | 3 hours |
| 22CHDSL401 | DSE | Green Chemistry | 4 | -- | -- | 4 | 30 | 70 | 3 hours |
| 22CHDSL402 | DSE | Techniques for Modern Industrial Applications | 4 | -- | -- | 4 | 30 | 70 | 3 hours |
| 22CHDSL403 | DSE | Nano Chemistry | 4 | -- | -- | 4 | 30 | 70 | 3 hours |
| 22CHDSL404 | DSE | Antibiotics ,drugs, vitamins and steroid harmones | 4 | - | - | 4 | 30 | 70 | 3hrs |
| 22CHDSL405 | DSE | Seperation and Electro analytic techniques | 4 | - | - | 4 | 30 | 70 | 3hrs |
| 22CHDSL406 | DSE | Analytical Chemistry | 4 | | | 4 | 30 | 70 | 3hrs |
| 22CHSEL401 | SEC | Energy environment and Soil chemistry | 4 | | | 4 | 30 | 70 | 3hrs |
| 22CHSEL402 | SEC | Organo Metallic Reagents | 4 | -- | -- | 4 | 30 | 70 | 3 hours |
| 22CHSEL403 | SEC | Hetero Cyclic Chemistry | 4 | - | - | 4 | 30 | 70 | 3hrs |
| 22CHMOL401 | MOOCs | Chemistry of Main Group elements | 4 | | | 4 | 30 | 70 | 3hrs |
| 22CHP401 | Pract-I | Organic Estimations | -- | -- | 6 | 3 | 30 | 70 | 6 hours |
| 22CHPW401 | Project Work | Project Work | -- | -- | 12 | 6 | 50 | 150 (100 + 50) (Project + Viva Voce) | --- |

**Note:** Highlighted papers are being taught.

**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**

**22CHL401: ADVANCED ORGANIC SPECTROSCOPY**

| | | | |
|---|---|---|---|
| Course Code | **22CHL401** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:** Advanced Organic Spectroscopy **(code 22CH4T1)** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the basic concepts of advanced organic spectroscopy | 2,7 | 2,3 |
| 2 | To Summarize the principle, theory and advanced aspects of $^{1}$HNMR, $^{13}$C NMR, 2D NMR, ORD & CD spectroscopic techniques. | 1,2,7 | 1,2,3 |
| 3 | Display the knowledge gained in the areas of $^{1}$HNMR, $^{13}$C NMR, 2D NMR, ORD & CD spectroscopic techniques in chosen job role. | 1, 6 | 1,2,3 |
| 4 | Interpret the spectral data of $^{1}$HNMR, $^{13}$C NMR, 2D NMR, ORD& CD in elucidating the structure of the molecule. | 1, 7 | 1,2,3 |
| 5 | Assess that how far the spectral data of $^{1}$HNMR, $^{13}$C NMR, 2D NMR, ORD & CD are useful in establishing the structure of the molecule. | 1, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHL401** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 1 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 2 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 2 | 3 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 3 |

**UNIT – I**

**Proton NMR Spectrscopy**:

Determination of structure of organic compounds using PMR data. Spin system, Nomenclature of spin system, spin system of simple and complex PMR spectrum (Study of AB – $A_2$ – $AB_2$. ABX – ABC – AMX interactions)

Simplification of complex spectra- nuclear magnetic double resonance, chemical shift reagents, solvent effects on PMR Spectrum . Nuclear Overhauser Effect (NOE).

**UNIT-II**

**13C-NMR spectroscopy:**

Similarities and Difference between PMR and CMR-CMR recording techniques -BBC-BBD-SFORD-Gate pulse CMR spectrum.

General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonylcarbon), coupling constants.Typical examples of CMR spectroscopy – simple problems.

**UNIT-III**

**ORD& CD Curves:**

Optical rotatory dispersion : Theory of optical rotatory dispersion – Cotton effect –CD curves-types of ORD and CD curves-similarities and difference between ORD and CD curves. α- Halo keto rule, Octant rule – application in structural studies.

**UNIT-IV**

**2D NMR spectroscopy:**

Definitions and importance of COSY, DEPT, HOMCOR, HETCOR,INADEQUATE, INDOR, INEPT, NOESY, HOM2DJ, HET2DJ.

Study of COSY ,DEPT, HOMCOR, HETCOR, INADEQUATE INDOR INEPT ,NOESY HOM2DJ, HET2DJ, taking simple organic compounds as examples.

**UNIT –V**

**Structural Elucidation** of Organic compounds Using UV, IR, 1H-NMR, 13C-NMR and Mass spectroscopy.

**References :**


1. Introduction to Spectroscopy – D. L. Pavia, G.M. Lampman, G. S. Kriz, 3rd Ed. (Harcourt College publishers).
2. Spectrometric identification of organic compounds R. M. Silverstein, F. X. Webster, 6th Ed.John Wiley and Sons.
3. Spectroscopic methods in organic chemistry - D. H. Williams and I Flemming McGraw Hill
4. Absorption spectroscopy of organic molecules – V. M. Parikh
5. Nuclear Magnetic Resonance – Basic Principles- Atta-Ur-Rehman, Springer- Verlag (1986).
6. One and Two dimensional NMR Spectroscopy – Atta-Ur-Rehman, Elsevier (1989).
7. Organic structure Analysis- Phillip Crews, Rodriguez, Jaspars, Oxford University Press (1998)
8. Organic structural Spectroscopy- Joseph B.Lambert, Shurvell, Lightner, Cooks, Prentice-Hall (1998).
9. Organic structures from spectra –Field L.D., Kalman J.R. and Sternhell S. 4th Ed. John Wiley and sons Ltd.

**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**
**ADVANCED ORGANIC SPECTROSCOPY**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** (5x4M=20M)

1. (a) Explain the effect of solvent on PMR spectrum. (CO – 2,L-2)

(Or)

(b) Differentiate between first order and non-first order PMR spectrums with examples. (CO – 4,L-4)

2. (a) What is the importance of off resonance decoupling CMR spectrum? (CO – 2,L-2)

(Or)

(b) A compound of MF $C_4H_{10}$ in its CMR Spectrum show 17.1(q) 67.4(T). Determine the structure of compound by using CMR data. (CO – 2,L-2)

3. (a) Define Cotton effect with examples. (CO – 1,L-1)

(Or)

(b) Explain the applications of Octant rule. (CO -3, L-3)

4. (a) Write explanatory note on INDOR. (CO – 2, L-2)

(Or)

(b) Discuss the importance of NOESY technique with suitable example.(CO – 2, L-2)

5. (a) Write the chemical shifts of carbonyl compounds and carboxylic acids.(CO – 2, L-2)

(Or)

(b) An inorganic compound exhibits peaks in PMR spectrum at 1.6(T,3H), 2.4(M,2H), 9.6 (T,1H). (CO -3, L-3)

**SECTION – B** **(5x10M=50M)**

UNIT – I

6. a) Explain the following:I) Double irradiation II)AMX Spectra for styrene oxide.(CO–2,L-2) **(Or)**
b) How can you interpret complex PMR Spectrum. (CO – 2, L-2)

UNIT – II

7. a) Explain with the suitable examples the α, β & γ effects in 13 C NMR.(CO -3, L-3) **(Or)**
b)Discuss some important applications of 13C NMR spectroscopy. (CO– 2, L-2)

UNIT – III

8. a) Predict the sign of cotton effect in 3-methyl cyclo haxanone when substituent is in equatorial position. (CO -3, L-3) **(Or)**
b) Explain the following i) Axial halo ketone rule ii) Types of optical rotatory dispersion curves. (CO – 2, L-2)

UNIT – IV

9. a) What information is available from the COSY experiment? (CO – 2, L-2)

**(Or)**

b) What information about a compound can be obtained from the 2D INADEQUATE experiment? (CO – 2, L-2)

UNIT - V

10.a) Deduce the structure of the compound consistent with the following data Elemental analysis: C=32.14%H 5.35% and Cl 62.5% UV: No absorption above 210 nm IR ($CCl_4$) 2940, 1265 and 690cm-1 and PMR δ 3.5(2H,D),3.3(1H,m) and 1.25(3H,d). (CO -3, L-3)

**(Or)**

b) Deduce the structure of the compound consistent with the following data. Elemental analysis: C=32.14%H 5.35% and Cl 62.5% UV: No absorption above 210 nm, IR ($CCl_4$) 2941,2265 and 1460cm-1PMR δ 2.72(septet,J=6.7,1H),1.33 (doublet, J=6.7,6H). (CO–3, L - 3)

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**A.G&S.G..SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**

**22CHDSL401: GREEN CHEMISTRY**

| | | | |
|---|---|---|---|
| Course Code | **22CHDSL401** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:GREEN CHEMISTRY - 22CH4D1** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO‘s |
| | The graduate will be able to | | |
| 1 | Memorize the principles of green chemistry and concepts related to green organic synthesis. | 2,7 | 1,2 |
| 2 | Understand the role and significance of green organic synthesis. | 1,2,7 | 1,2 |
| 3 | Exercise the basic and advanced knowledge gained in green organic synthesis in chosen job role. | 1, 6 | 1,2,3 |
| 4 | Analyse how far green methods are environmentally benign over conventional methods of synthesis. | 1, 7 | 1,2,3 |
| 5 | Evaluate the principles of green chemistry in organic synthesis. | 1, 7 | 1,2 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| **COURSE CODE 22CHDSL401** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 3 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 3 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |

## Unit-I

**Principles of Green Chemistry:** Prevention of waste / by-products, atom economy, Hazardous products-Designing of safer chemicals-energy requirements Selection of appropriate solvents and starting materials-Use of protecting groups and catalysis-Designing of biodegradable products. green organic synthesis of paracetamol, catechol, adipic acid, urethane and ibuprofen.

## Unit-II

**Microwave assisted reactions:** Theory ofMicrowave, advantages, disadvantages, applications- water as solvent: Hoffmann elimination, hydrolysis, oxidation of Toluene, oxidation of alcohols, hydrolysis of methyl benzoate to benzoic acid.

Organic solvents: Esterification reactions, Fries rearrangement, Ortho ester Claisen rearrangement, DielsAlder reactions, synthesis of chalcones, decarboxylation.

Solid state reactions (solvent free): De acetylation, deprotection, saponification of esters, synthesis of anhydrides from dicarboxylic acid, synthesis of nitriles from aldehydes.

**Unit-III**

**Phase Transfer Catalysis**: Definition, Mechanism, Types, advantages and applications of PTC – C-alkylation, N-alkylation, Darzen's reaction, Wittig reaction, Benzoyl cyanides from benzoyl chloride, alcohols from alkyl halides, Crown ethers – Introduction,synthetic applications: esterfication, saponification, Anhydride formation, $KMnO_4$ oxidation, aromatic substitution, elimination.

**Unit-IV**

**Ultrasound assisted green synthesis:** Introduction, instrumentation, types of sono chemical reactions – Homogeneous reactions – Curtius rearrangement of Benzoyl azide to phenyl isocyanate. Heterogeneous Liquid-Liquid reactions - Esterification, saponification, Hydrolysis, substitutions, additions. Heterogeneous Solid – Liquid Reactions–oxidation, reduction, hydroboration, coupling, Bouveault reaction, Strecker reaction.

**Unit-V**

**Ionic liquids:** Definition-Types of Ionic Liquids- properties- Application in organic synthesis- alkylation, allylation, oxidation, hydrogenation, hydroformylation, alkoxycarbonylation, carbon-carbon bond forming reactions-suzuki coupling, Heck reaction, stille coupling.

**Textbooks/Referencebooks:**

1. New Trends in Green Chemistry by V.K.Ahluwalia, M.Kidwai.

2. Green Chemistry: Environment Friendly Alternatives by Rashmi Sanghi, M.M.Srivastava

3**.** Green Solvents for Organic Synthesis by V.K.Ahluwalia, RajenderS.Varma.

4. Organic synthesis – special Techniques, V.K.Ahluwalia, Renu Aggarwal.

5.Green Chemistry - V.K.Ahluwalia, Ane Books Pvt. Ltd.,

**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**

**GREEN CHEMISTRY**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** (5x4M=20M)

1. (a)Write the green synthesis of urethane. (CO – 2,L-2)

(Or)

(b)Define atom economy. Explain atom economy in rearrangement reaction with a suitable example. (CO – 2, L-2)

2. (a) Explain the synthesis of nitriles from aldehydes. (CO – 2,L-2)

(Or)

(b) Give the disadvantages of microwave assisted organic synthesis. (CO -1,L-1)

3. (a) Discuss the various types of phase transfer catalysts. (CO – 2,L-2)

(Or)

(b) Write the mechanism of phase transfer catalysis. (CO – 2,L-2)

4. (a)Write notes on ultrasound assisted homogeneous reactions. (CO – 2,L-2)

(Or)

(b) Write notes on ultrasound assisted strecker reaction. (CO – 2,L-2)

5. (a) Write notes on hydroformylation. (CO – 2,L-2)

(Or)

(b) Write an account of oxidation with ionic liquids. (CO -2, L-2)

**SECTION – B** **(5X10M=50M)**

UNIT – I

6. (a) Write a brief account of twelve principles of green chemistry. (CO – 1,L-1)

**(Or)**

**(**b) Out line the green synthesis of the following compounds:

(i) Ibuprofen (ii) paracetamol (iii) catechol. (CO – 2, L-2)

UNIT – II

7. (a) Discuss microwave assisted reactions in organic solvents. (CO – 2,L-2) **(Or)**

(b) Discuss the theory and advantages of microwave. (CO – 2,L-2)

UNIT – III

8 (a) Define phase transfer catalyst. Write notes on C – alkylation and N – alkylation using PTC. (CO -3, L-3)

**(Or)**

(b) Discuss the synthetic applications of crown ethers. (CO -3,L-3)

UNIT - IV

9. (a)What is ultrasound assisted green synthesis. Discuss the instrumentation.(CO–2,L-2)

**(Or)**

(b) Write an account of the heterogeneous solid-liquid reactions. (CO – 2,L-2)

UNIT - V

10. (a) Define ionic liquids. Mention the types of ionic liquids and properties.(CO – 2,L-2) **(Or)**

(b) Write the application of ionic liquids with respect to carbon – carbon bond Formation (i) Suzuki coupling (ii) stille coupling(CO – 3,L-3) ******

**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**

**22CHDSL402:TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS**

| | | | |
|---|---|---|---|
| Course Code | **22CHDSL402** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:- TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS 22CH4D2** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorise the concepts of purification and chromatographic methods. | 2,7 | 1,2 |
| 2 | Understand the concepts of purification methods and chromatographic methods. | 1,2,7 | 1,2,3 |
| 3 | Apply the knowledge gained in purification and chromatographic techniques in their chosen job role. | 1, 6 | 1,2,3 |
| 4 | Analyse that how far the purification and chromatographic techniques are useful in assessing the purity of the compound. | 1, 7 | 1,2,3 |
| 5 | Evaluate that how far a compound is purified / separated using purification and chromatographic techniques. | 1, 7 | 1,2,3 |

**CO-PO MATRIX**

| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHDSL402** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 2 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 3 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 3 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 3 |

## UNIT-I

**Classical Methods of purification**

**Recrystallization**: Basic principles, choice of solvent, seeding, filtration and centrifugation and drying. Concepts of fractional crystallization.

**Distillation: Basic principles**. Distillation types- continuous distillation, batch distillation, fractional distillation, vacuum distillation and steam distillation.

## UNIT-II

**Thin Layer chromatography:**

Basic Principles. Common stationary phases, Methods of preparing TLC plates, Selection of mobile phase, Development of TLC plates, Rf value. Application of TLC in monitoring organic reactions. identification and quantitative analysis.

## UNIT-III

**Paper chromatography:**

Basic Principles. Ascending and descending types. Selection of mobile phase, Development of chromatograms, One and two dimensional paper chromatography, Applications of paper chromatography.

## UNIT-IV

**Gas chromatography:**

Basic Principles. Different types of GC techniques. Selection of columns and carrier gases.Instrumentation.detectors; Rf values. Applications in the separation, identification and quantitative analysis of organic compounds.

## UNIT-V

**High Performance liquid chromatography(HPLC):**

Basic Principles.Normal and reversed Phases.Selection of column and mobile phase.Instrumentation. Detectors; Rf values. Applications in the separation, identification and quantitative estimation of organic compounds.

**SUGGESTED BOOKS:**

1. Principles of Instrumental Analysis by D. A. Skoog, F. J. Holler and T. A. Nieman, Harcourt College Pub.
2. Separation Techniques by M. N. Sastri, Himalaya Publishing House (HPH), Mumbai.
3. Bio Physical Chemistry by A. Upadhyay, K. Upadhyay and N. Nath,(HPH) , Mumbai.
4. A Hand Book of Instrumental Techniques for Analytical Chemistry- Ed-F. A. Settle, Prearson Edn, Delhi.27
5. Introduction to Organic Laboratory Techniques-D. L. Pavia, G. M. Lampman,G. S. Kriz and R. G. Engel, Saunders College Pub (NY).
6. Instrumental methods of Chemical Analysis by B. K. Sharma, Goel Publish House, Meerut.
7. Instrumental methods of Chemical Analysis by H. Kaur, Pragati Prakasan, Meerut.
8. Protein Purification-Principles and practice, III Edn- R. K. Scopes, Narosa Publishing House , Delhi.

**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**

## TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** (5x4M=20M)

1.(a)Discuss the role of recrystallisation in purification of compounds.(CO–2,L-2)

(Or)

(b)Explain the principle involved in batch distillation. (CO – 2,L-2)

2.(a) Write the basic principle involved in TLC. (CO – 2,L-2)

(Or)

(b) Give an account on selection of mobile phase in TLC. (CO – 2,L-2)

3.(a) Elaborate the basic principle involved in paper chromatography.(CO – 2,L-2)

(Or)

(b) Describe in brief about two dimensional paper chromatography.

4.(a) Explain the basic principle involved in Gas chromatrography. (CO -2,L-2)

(Or)

(b) List out various types of carrier gases used in Gas chromatrography. (CO -2, L-2)

5.(a) What are normal phase and reverse phase techniques in HPLC?(CO–2,L-2)

(Or)

(b) Write a short note on selection of mobile phase in HPLC. (CO – 2,L-2)

**SECTION – B (10x5=50M)**

UNIT – I

6.(a) Explain the following (i) seeding (ii) filtration (iii) centrifugation (iv) drying (CO – 2,L-2)

**(Or)**

**(**b) Explain the following (i) continuous distillation (ii) steam distillation. (CO – 2,L-2)

UNIT – II

7. (a) What are the methods that are involved in the preparation of TLC plates?(CO–3, L-3) **(Or)**

(b) Write a note on applications of TLC. (CO -2,L-2)

UNIT – III

8.(a) Elaborate Ascending and Descending paper chromatrography. (CO -2, L-2)

**(Or)**

(b) Write applications of paper chromatography. (CO–3,L-3)

UNIT - IV

9.(a) Discuss about different types of columns used in gas chromatography.(CO–3,L-3)

**(Or)**

(b) Explain few applications of gas chromatography. (CO – 3,L-3)

UNIT - V

10.(a) Describe instrumentation of HPLC and explain the selection of the column.(CO–3,L-3) **(Or)**

(b) Give a detailed account on applications of HPLC. (CO – 3,L-3)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**

**22CHDSL403:NANO CHEMISTRY**

| | | | |
|---|---|---|---|
| Course Code | **22CHDSL403** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:- NANO CHEMISTRY - 22CH4D3** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO‘s |
| | The graduate will be able to | | |
| 1 | Memorize the basic concepts of nanochemistry and nano materials. | 2,7 | 1,2 |
| 2 | Understand the basic and advanced concepts of nanochemistry and nano materials | 1,2,7 | 1,2,3 |
| 3 | Apply the knowledge gained in the field of nanochemistry as and when required. | 1, 6 | 1,2,2 |
| 4 | Analyse the role of surface characterization methods in the study of nanomaterials and their properties. | 1, 7 | 1,2,3 |
| 5 | Evaluate the role and signifigance of nanochemistry in various interdisciplinary sciences. | 1, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHDSL403** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 1 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 2 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 3 |

## Unit-I

**Introduction to Nano chemistry:** Definition of terms-nanoscale, nanomaterials, nanoscience, nanotechnology-scale of materials natural and manmade-nanoscience practiced during ancient and modern periods-contributors to the field of Nanochemistry.

## Unit-II

**Synthesis of Nanomaterials:** Top down and bottom- up approaches-synthesis of carbon nanotubes, quantumdots, gold and silver nanoparticles.

## Unit-III

**Characterization of Nano materials:** Electron microscopy techniques-scanning electron microscopy, transmission electron microscopy and atomic force microscopy.

## Unit-IV

**Application of Nanomaterials:** Solar cells-smart materials-molecular electronics-biosensors-drug delivery and therapy-detection of cancerous cells.

## Unit-V

**NanochemistryinNature:** The science behind the nanotechnology in lotuseffect-self-cleaning property of lotus-gecko foot climbing ability of geckos-water strider-anti wetting property of water striders-spider silk mechanical properties of the spidersilk.

**Textbooks/ Referencebooks:**


1. Nano: The Essentials: Understanding Nanoscience and Nanotechnology, T.Pradeep, McGraw-Hill Professional Publishing,2008.
2. Introduction to Nanoscience, J.Dutta, H.F.Tibbals and G.L.Hornyak, CRCpress, BocaRaton, 2008.


**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**

**NANO CHEMISTRY**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** (5x4M=20M)

1. (a) What is bottom down approach? (CO – 1,L-1)

**(Or)**

(b) Explain the term nanoscale and nano material? (CO -2,L-2)

2. (a) Discuss the basic principle involved in TEM. (CO- 1,L-1)

**(Or)**

(b) Write a short note on natural and manmade nano particles. (CO -2,L-2)

3. (a) What are quantum dots? Explain. (CO -1,L-1)

**(Or)**

(b)List out the various types of techniques used in characterization of nanomaterials. (CO -1,L-1)

4. (a) Enumerate the role of nanomaterials in drug delivery. (CO -2,L-2) **(Or)**

(b) Give an account on biosensors. (CO -2,L-2)

5. (a) Explain in short about water strider. (CO -2,L-2)

**(Or)**

(b) What is gecko foot climbing? (CO -1,L-1)

**SECTION – B** **(10x5=50M)**

UNIT – I

6.(a) Define the following terms

(i) Nanoscale (ii) Nanomaterials (iii) Nanoscience (iv) Nanotechnology(CO–1,L-1) **(Or)**

**(**b) Write a note nanoscience practiced during ancient and modern periods.(CO-2,L-2)

UNIT – II

7.(a) Explain top down and bottom-up approaches for the synthesis of nanotubes.(CO-2,L-2) **(Or)**

(b) Write various methods for the synthesis of gold nanoparticles. (CO-2,L-2)

UNIT – III

8.(a) Write the principle and applications of scanning electron microscopy. (CO – 2,L-2)

**(Or)**

(b)Write the principle and applications of atomic force microscopy. (CO- 3, L-3)

UNIT - IV

9.(a)Write the applications of nanomaterials in solar cells and smart materials. (CO-3,L-3)

**(Or)**

(b) Explain the applications of detection of cancerous cells. (CO–3,L-3)

UNIT - V

10.(a) Write a note on lotus effect-self-cleaning property of lotus. (CO-2,L-2) **(Or)**

b) Write a note on spider silk mechanical properties of the spider silk. (CO -2,L-2)

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**A.G&S.G..SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**

**IV SEMESTER(2023-2025)**

## 22CHSEL402: ORGANO METALLIC REAGENTS

| | | | |
|---|---|---|---|
| Course Code | **22CHSEL402** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:ORGANO METALLIC REAGENTS - 22CH4E1** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the synthetic roots and applications of organo metallic reagents. | 2,7 | 1,2 |
| 2 | Appreciate the methods of synthesis and reactivity of various organo metallic reagents | 1,2,7 | 1,2 |
| 3 | Investigate the conceptual knowledge in various organo metallic reagents in organic synthesis | 1, 6 | 1,2 |
| 4 | Interpret the role of organo metallic reagents in organic synthesis | 1, 7 | 1,2 |
| 5 | Assess the role of specific of organic metallic reagents as catalysts in organic synthesis | 1, 7 | 1,2,3 |

**CO-PO MATRIX**

| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHSEL402** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 2 | 0 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 2 | 3 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 3 |

### UNIT-I

**Organo Magnesium and Lithium compounds:** Preparation of Grignard reagents with alkyl, allyl, and propargyl halides, alkylation reaction with carbonyl compounds, esters, imines and nitriles, epoxides, acids, acid chlorides, carbondioxide, carbondisulfide, sulfurdioxide. Preparation of alkyllithium reagents, Lithium Di isopropyl amide (LDA) and its synthetic applications.

### Unit-II

**Organo Copper and Nickel compounds:** Organo copper reagents - preparation, reactions, organo cuprates, lithium organo cuprates (Gilmanreagents). Organonic kel compounds: π-allylnickel complexes, preparation of 1,5 cyclic dienes, nickelcarbonyl.

### Unit-III

**Organo Palladium compounds:** Preparation of palladium reagents, π-allyl palladium complexes – formations, reactions – prenylation, formation of conjugated dienes, synthesis of macro cyclic nitrogen hetero cyclic. Heck reaction, Stille coupling reaction, Sonogashira coupling reaction, suzuki coupling reaction.

## Unit-IV

**Organoboranes:** Preparation of Organobornaes viz hydroboration with $BH_3$-THF, dicylohexyl boranes, disiamylborane, thexylborane, 9-BBN and catechol boranes .protonolysis, oxidation, isomerization and cyclization. Free radical reactions of organoboranes, reactions with α-bromoketones, α-bromoesters, carbonylation, the cyanoborate process and the reaction of alkenyl boranes and trialkyltrialkynyl borates.

## Unit-V

**Organosilanes:** Synthetic applications of organo silicon compounds, protection of functional groups, trimethylsilly ethers, sillylenolethers, trimethylsilyliodide, trimethylsilyl triflate, Peterson olefination. Synthetic applications of α-silylcarbanion and β-silylcarbonyl compounds, alkenylsilanes, Allylsilanes, the β-effect - control of rearrangement of carbonium ions by silicon.

**Referencebooks:**


**1.** Organometallic in Synthesis AManualby MSchlosser, L.Hegedus, B.Lipshutzetal, JohnWily&sons.

**2.** Modern methods of organic synthesis by W.Carruthers (Cambridge).

**3.** Organic synthesis by H.O.House.

**4.** Organo metallics: Aconcise introduction, ChristophElschenbroich, 3rdedition,Willey-VCH.

**5.** Advanced Organic Chemistry, F.ACarey and R.J.Sundberg.Plenum.

**6.** Transition metals in the synthesis of complex organic molecules, Hegedus, L.S,secondedition, University Science, Book ,CA,1999.

**7.** Organo metallic Chemistry and Catalysis, Astruc, D,Springer Verlag, 2007.

**8.** Organo transition metal chemistry: Applications to organic synthesis, Davies, S.G,Pergamon Press, NewYork, 1986.


**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**
**Organo Metallic Reagents**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A**(5x4M=20M)

1. (a)Explain the reaction of Grignard reagent with carbondioxide. (CO -2,L-2)

**(Or)**

(b) Explain the preparation of grignard reagent with alkyl and allyl halide.(CO-2,L-2)

2. (a)What are Gilman reagents. Write any two reactions. (CO – 2,L-2)

**(Or)**

(b)Write the reactions of α,β – unsaturated carbonyl compounds with organocopper reagents. (CO- 2,L-2)

3. (a) Write an account of suzuki coupling. (CO -2,L-2)

**(Or)**

(b) Explain formation of π-allyl palladium complexes. (CO-2,L-2)

4. (a) Discuss the cyanoborate reaction. (CO -2,L-2)

**(Or)**

(b) Write notes on isomerisation of organoboranes. (CO-2,L-2)

5. (a) Write an account of Peterson olefination. (CO -2,L-2)

**(Or)**

(b) Write short notes of alkenyl silanes. (CO -2,L-2)

**SECTION – B** **(10x5=50M)**

UNIT – I

6. (a) Explain the reaction of Grignard reagent with carbonyl compounds and Esters. (CO -2, L-2)

**(Or)**

**(**b) Write the preparation and uses of Lithium Di isopropyl amide (LDA). (CO-2,L-2)

UNIT – II

7. (a) Explain synthesis and reactions oflithium organo cuprates. (CO-2,L-2) **(Or)**

(b) Write the synthesis and properties of π-allyl nickel complexes.(CO-2,L-2)

UNIT – III

8.(a) Explain the following reactions with mechanisms

(i) Heck reaction (ii) Still coupling reaction. (CO-2,L-2)

**(Or)**

(b) Explain the reactions of π – allyl palladium complexes. (CO-2,L-2)

UNIT - IV

9. (a) Write an account of Hydroboration. (CO-2,L-2)

**(Or)**

(b) Explain the protonolysis, oxidation, isomerisation reactions of organoboranes. (CO-2,L-2)

UNIT - V

10.(a) Write the synthetic applications of trimethyl silyl ethers and sillyl enol ethers. (CO – 3, L-3)

**(Or)**

(b) Write the synthetic applications of α-silylcarbanion and β-silyl carbonyl compounds. (CO -3,L-3)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**

**IV SEMESTER(2023-2025)**

## 22CHDSL404: ANTIBIOTICS, DRUGS, VITAMINS & STEROID HARMONES

| | | | |
|---|---|---|---|
| Course Code | **22CHDSL404** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:ANTIBIOTICS, DRUGS, VITAMINS & STEROID HARMONES - 22CH4E5** | | | |
|---|---|---|---|
| S. | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | To Memorise the basic concepts of Antibiotics, drugs, vitamins, steroid harmones | 2,7 | 1,2 |
| 2 | Understand the role of Antibiotics, drugs, vitamins, harmones in human life. | 1,2,7 | 1,2,3 |
| 3 | Apply the knowledge gained about antibiotics, drugs, vitamins and steroids in their chosen fields. | 1, 6 | 1,2,2 |
| 4 | Analyse that how far antibiotics, drugs, vitamins, harmones are useful in enhancing the health of the humans. | 1, 7. | 1,2,3 |
| 5 | Evaluate that how various compounds can function as antibiotics, drugs as anticancer agents | 1, 7 | 1,2,2 |

**CO-PO MATRIX**

| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHDSL404** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 1 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 2 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 3 |

### UNIT-I

**Antibiotics:**

Cell wall biosynthesis, inhibitors, β-lactam rings, antibiotics inhibiting protein syntheis, structure elucidation of ampicillin, amoxicillin, chloramphenicol and gramidin.

### UNIT-II

**Drugs and Medicinal chemistry:**

(I) Chemotherapy : Methodology for structure – activity relationship determination.

(II) Drugs: Structure synthesis & Activity of the following : Anticancer Agents: Taxol, Vinblastine, Vincristine, Campothecin.

### UNIT-III

Chemotherapy of Brain: Introduction – neurotransmitters

CNS stimulants : Strychnine, Picrotoxin ( CNS activity only ) nikethemide caffeine

CNS depressants: General anesthetics, mode of action of Sedatives & Hypnotics.

**UNIT-IV**

(I) Antimalarials: Paludrin – quinacrin – chloroquin – camoquin – pamaquin – sontoquine.
(II) Antiamoebic agents : Chiniofon – Resotren – Iodochlorohydroxyquin.
(III) Sulpha drugs: Sulphanilamide – Dihydrocurprine – Prontosil
(IV)Antiseptics: Diphenyl – Chlorophene-2,4,4-trichloro-2'-hydroxydiphenyl ether – aminocerine hydrochloride.

**UNIT-V**

**Fat Soluble Vitamins**: Chemistry, Synthesis of vitamin A1, and vitamin K
**Water soluble Vitamins**: Chemistry, Synthesis of B1 and C
**Steroid Hormones**:
Chemistry & synthesis of progestrone, testosterone.

**Non steroid hormones:** Chemistry & synthesis of thyroxin, epinephrine.

**TEXT BOOKS:**

1. Introduction to Medicinal Chemistry – Wiley VCH
2. Text Book of Organic Medicinal and Pharmaceutical Chemistry, Wilson and Gisvild, (ed Robert F. Dorge)
3. An introduction to drug design by SS Pandeya
4. Buger's Medicinal Chemistry and drug discovery Vol.I by (Ed) ME Wolff – John – Wileyby A. Burger
5. The Organic Chemistry of drug design and drug action by RB Silverman, Academic press
6. Principles of Medicinal Chemistry by William O. Foye, Lea & Febiger, Philadelphia/London,1989.

**22CHDSL405:SEPARATION TECHNIQUES AND ELECTRO ANALYTICAL TECHNIQUES**

| | | | |
|---|---|---|---|
| Course Code | 22CH4E6 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:- SEPARATION TECHNIQUES AND ELECTRO ANALYTICAL TECHNIQUES 22CHDSL405** | | | |
|---|---|---|---|
| S.N o | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the theory and principles of separation techniques in chemical analysis | 2,7 | 1,2 |
| 2 | Understand the significance of chromatography in separation of components and quantitative determination | 1,2,7 | 1,2,3 |
| 3 | Exercise theconceptual knowledge of chromatography in chemical analysis | 1,6 | 1,2,3 |
| 4 | Analyze the role of the analytical techniquesin quantitative and qualitative analysis | 1,7 | 1,2,3 |
| 5 | Assess the data obtained in the instrumental analysis of chemical compounds. | 1,7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| **COURSE CODE 22CHDSL405** | CO1 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 3 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 3 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 3 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 3 |

## UNIT-I

SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS: Introduction,principle,techniques,factors affecting solvent extraction, quantitative treatment of solvent extraction equilibria-chelate and ion association systems-synergism., ION EXCHANGE : Introduction,action of ion exchange resins, separation of inorganic mixtures, applications.

## UNIT – II

CHROMATOGRAPHY: Introduction-Column, paper chromatography-Thin layer chromatography and HPLC and Gas chromatography: Introduction, equipment. Gas liquid chromatography. Exclusion chromatography.-Applications

## UNIT III

Electrogravimetry: - Theory of electro analysis–Polarisation–Over voltage–Principles involved in electrogravimetric analysis–current – voltage curves – separation of metals by electrolysis – constant current – controlled potential electrolysis.

## Unit IV

Coulometry: - Coulometry at controlled potential – separation of Nickel and Cobalt – coulometres – types of coulometric analysis – constant current coulometry of coulometric titrations.

**UNIT –V**

Voltametry, Polarography and Amperometric titrations: - Voltametry – Principle of Polarography – dropping mercury electrode; working; factors effecting the limiting current; residual current, migration current – diffusion current – kinetic current – polarographic maximum – Half wave potential – Organic Polarography, Rapid Scan polarography – cyclic voltametry – qualitative and quantitative polarographic analysis – Amperometric titrations – its advantages and disadvantages – Bi Amperometric titrations – Chrono potentiometry

SUGGESTED BOOKS:,

1. B.K.Sharma -- Instrumental methods of chemical analysis,Goel Publishers,
2 .G.Chatwal and S.Anand --Instrumental methods of chemical analysis,,
3. J.J.Lingane- Electroanalytical Chemistry- Inter Science,
4. A.I.Vogel -- A text Book of Quantitative Inorganic Analysis-ELBS,
5 .H.H.Willard,LL Merrit and JA Dean -- Instrumental Methods of Analysis.,
6. Peace-Instrumental Methods of Analysis,
7. J.W.Robbinson- Under graduate Instrumental Analysis,
8. R.A.Day and A.L.Underwood- Quantitative Analysis,
9. G.W Eving- Instrumental Methods of Chemical Analysis.,
10.D.A.Skoog,D.M.West and F.J.Holler--Fundamentals of Analytical Chemistry ,
11. H.Kaur-- Instrumental methods of chemical analysis,Pragathi Prakasan,
12 .D.A.Skoog,F.J.Holler and Neman-- Instrumental Methods of Analysis.,
13.G.H.Morrison and H.Frieser- Solvent extraction in Analytical Chemistry,
14. Chemical Separation methods- JA Dean, D.Vannostrand Company, New York
15. Physical and Chemical Methods of Separation by E.W.Berg, MC Graw Hill Book Company, New York

## 22CHDSL406: ANALYTICAL CHEMISTRY

| | | | |
|---|---|---|---|
| Course code | **22CHDSL406** | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:- ANALYTICAL CHEMISTRY - 22CH4E7** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize basic concepts of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry. | 2,7 | 1,2 |
| 2 | Understand the principle, theory and advanced aspects of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry. | 1,2,7 | 1,2,3 |
| 3 | Display the knowledge gained in the areas of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry in chosen job role. | 1, 6 | 2,3 |
| 4 | Analyse the role of analytical chemistry, chemical equilibrium, absorption spectrometry, thermal methods of analysis and potentiometry as and when required. | 1, 7 | 1,2 |
| 5 | Evaluate the role and significance of principles of analytical chemistry in other allied fields | 1, 7 | 1,2,3 |

| **CO-PO MATRIX** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHDSL406** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 2 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 3 |

### UNIT – 1

**Basic introduction to nature of analytical chemistry** Quantitative methods Qualitative methods , Flow diagrams ,Chemistry in toxicology ,Examples for quantitative and qualitative methods, real life examples ROLE : sample preparation basic techniques for analysis physical separation , separation in liquids ,micro analytical balance ,filtration techniques ,wet washing ,dry Ashing , crucibles, filter paper uses of crucibles and filter papers stereo chemical modes are applied [supra +supra] : supra-anta Antra, supra Antra- anta.

### UNIT - 2

**Chemical equilibria,** Chemical equilibria in nature chemical equilibria in analytical chemistry, equilibria between strong and week acids , equilibrium state, different acids, types of equilibria as basis of chemical analysis, equilibria and equilibria constants , importance in analytical chemistry, salt hydrolysis, titration

curves , common ion effect , formation constant for complex ions, Introduction from different titrimetric methods, henderson hesselbalch equation, spectro chemical methods , acid base titrations, acid base titration indicators.

**UNIT- 3**

**Absorption Spectrometry** , instruments , beers law, different transitions , chromophores , d-d , f-f, C-T transitions and applications, chromophoric reagents , analysis of mixture , applying beers law to mixtures , applications – photometric titrations, spectro photometric titrations, A) complexing agent B) complex ion in solution , infrared absorption spectroscopy A)theory B) principle C) instrumentation for IR, FTIR techniques A) theory B) principle, instrumentation of FTIR , uses and interterometer.

**UNIT – 4**

**Thermal method of analysis**, Introduction ,dynamic measurement, thermo gravimetric analysis, differential thermal analysis , differential scanning calorimerty, thermo balance, thermal techniques and uses , thermal analysis – solids , Standardisation, geometric estimation, water content, TG-plot , thermo gravimetry – example, mixture of solids in TG, introduction of DTG, samples , furnaces and crucibles, DT, uses of DTG data, food analysis, introduction to DTG, DTA , instruments, uses and applications, DSC, instruments uses and applications, Introduction, electron transfer reactions, electrodes, electrode potential, standard electrode potential, nernest equation, applications of nernest equation, precipitaion /complex ions in nernest equation, electro chemical method of analysis, potentiometry, reference electrode

**UNIT 5**

**Potentiometers**, cells, potentiometric titrations, Use of oxidising and reducing agents , redox potential, potentiometric titrations, uses of oxidising and reducing agents, electrode potentials, IR drop In electrochemical cells, ohmic potential electro gravimetric method , controlled potential coulrometry, Its uses in synthesis , colorimetric titrations Applications, electrochemical methods, volumetric methods, analytical method , voltametry, cyclic voltametry – waveforms , CV plot, CV and its application to identity, potential pulses, Differential pulses.

**Reference Books:**


**1.** Physical chemistry, G.K. Vemulapalli (Prentice Hall of India).

**2.** Physical chemistry, P.W. Atkins. ELBS**.**

**3.** Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.

**4.** Quantitative Analysis, A.I.Vogel, Addison Wesley Longmann Inc.

5. Fundamentals of Analytical Chemistry, Skoog & West

6. Quantitative Analysis, Day & Underwood.

7. Instrumental Methods of Analysis, H.H.WAILLARD, Merritt.Jr and J.A.D.Can

8. Instrumental Methods of Analysis, Ewing W.Wend & Pand

9. Instrumental Methods of Analysis, B.K.Sharma

10. Instrumental Methods of Analysis, Chatwel & Anand.

11. Analytical Chemistry, An introduction, D.A.Skoog, D.M.West & F.J.Holler, Sanders college Publishing, Newyork.

## 22CHSEL401:ENERGY, ENVIRONMENT AND SOIL CHEMISTRY

| | | | |
|---|---|---|---|
| Course Code | 22CH4E8 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:- ENERGY, ENVIRONMENT AND SOIL CHEMISTRY-22CHSEL401** | | | |
|---|---|---|---|
| S.No | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the basic theory related to sources of energy,water resources,air and soil pollution. | 2,7 | 1,2 |
| 2 | Comprehend the significance of sources of energy, water resources,air and need for good quality of soil. | 1,2,7 | 1,2,2 |
| 3 | Apply the theoretical aspects of sources of energy, water resources,air and soil quality parameters` | 1, 6 | 1,2,3 |
| 4 | Analyse the functioning of sources of energy water resources,pollutants in air and soil. | 1,7 | 1,2,3 |
| 5 | Evaluate the quality parameters of sources of energy, water,air and soil | 1, 7 | 1,2,3 |

**CO-PO MATRIX**

| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHSEL401** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 1 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 2 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 3 |

### UNIT-I

**Sources of Energy** : Fossil fuels- Nuclear fission and fusion- Solar energy-use of solar energy in space heating and waterheating- production of electricity using solar energy- solar trough collectors- power tower-solar pond- solarenergy for driving vehicles- power from indirect solar energy – Hydropower- wind power-Biomass energy-production of ethanol from biomass- production of methane from biomass- photosynthesis-photo electrochemistryGeothermal energy.

### UNIT-II

**Water Resources Hydrological cycle**: physical and chemical properties of watercomplexation in natural and waste water, Anomalous properties-water pollutants-TypesSources- Heavy metals- metalloids- organic –Inorganic –Biological and Radioactive-Types of reactions in various water bodies including marine environment-Eutrophication- Ground waterPotable water standards. Treatment for portable water.

### UNIT-III

**Air**: Chemical reactions in the atmosphere – Aerosols types- Production and distribution – Aerosols andRadiation – structure and composition of atmosphere- temperature inversion – Global warning- Ozone depletion– Green house effect, "CFC"s- Acid rain.

## UNIT-IV

**Soil :** Composition of soil- lithosphere- inorganic and organic contaminants in the soil- Biodegradation- Nondegrdable waste and its effect on the environment- Bioremediation –of surface soils- Fate and transport of contaminants on soil system– Bioindicators- Soil parameterssoil destruction- Erosion- Soil conservation – Nitrogen pathways and NPK in soil

## UNIT-V

**Soil pollution**: Introduction – soil pollution by industrial wastes. soil pollution byurban wastes, Radioactive pollutants andAgricultural waste- chemical and metallic pollutantsBiological agents – mining - Detrimental effects of soilpollutants – Effects of industrial pollutants- Effects of sewage and domestic wastes- Effects of heavy metals-Effects of radioactive pollutants- Effects of modern agro- technology – Diseases caused by soil pollution – solidwaste management – sources and classification -public Health Aspects – methods of collection- Disposalmethods – potential methods of disposal.

**Reference Books**:

1. Daniel D.Chiras (1994), Environmental Science, 4th Ed.
2. Environmental Chemistry by W. Moore and J.Moore
3. Environmental chemistry by J.O.M. Bockariss
4. Environmental by BK Sharma
5. Environmental chemistry by SS Dara
6. Environmental chemistry by Mahajan

**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**
**22CHSEL403: HETERO CYCLIC CHEMISTRY**

| | | | |
|---|---|---|---|
| Course Code | 22CH4E9 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:- HETERO CYCLIC CHEMISTRY-22CHSEL403** | | | |
|---|---|---|---|
| S.N o | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the synthetic routes and reactions related to three, four, five, six membered and fused heterocyclic compounds. | 2,7 | 1,2 |
| 2 | Understand the concepts of synthesis and reactions of three, four, five, six membered and fused heterocyclic compounds. | 1,2,7 | 1,2,3 |
| 3 | Apply the conceptual knowledge gained in the synthesis and reactions of organic synthesis three, four, five, six membered and fused heterocyclic compounds as and when required. | 1,6, | 1,2,2 |
| 4 | Analyse and categorize the various reactions involved in the synthesis of three, four, five, six membered and fused heterocyclic compounds | 1, 7 | 1,2,3 |
| 5 | Evaluate the role of heterocyclic compounds in theraupetic and industrial usage | 1, 7 | 1,2,2 |

| **CO-PO MATRIX** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHSEL403** | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| | CO1 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 1 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 2 | 3 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 3 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 3 |

## UNIT-I

Definition, Classification and Nomenclature (Hantzsch Widman System) of hetero cycles.

**Three membered Heterocyclic Compounds:** Synthesis, reactivity, and importance of the following ring systems: Aziridines, Oxiranes, Thiiranes, azirine.

## UNIT-II

**Four membered Heterocyclic Compounds:** Synthesis, reactivity, and importance of the following ring systems : Azitidines, oxetanes, Thietanes.

Fused systems: Synthesis and reactivity of Penicillins G and V.

## UNIT-III

**Five membered Heterocyclic Compounds with two hetero atoms:** Synthesis, reactivity, aromatic character, and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Isoxazole, Thiazole. Fused systems: Synthesis and reactivity of Indoles and Benzimidazoles.

**UNIT-IV**

**Six-membered Heterocyclic Compounds with two hetero atoms:** Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyridazines, Pyrazine, Oxazine, Thiazine.
Fused systems: Acridines and Benzodiazines.

**UNIT- V**

**Larger ring and other Heterocycles:** Synthesis and reactivity of Azepines, Oxepines and Thiepines. Synthesis and reactivity of Benzodiazepines.

**Reference books:**


1. Some Modem Methods of Organic Synthesis W.Caruthers, Cambridge University Press, Cambridge.
2. Organic Synthesis viz Boranes, HerbetC. BrownGray, W.KramerAlan B.Levy and M.MarkMidland John Willy&Sons, NewYork.
3. Heterochemistry, T.L.Gilchrist, Longman science and tech.
4. Anintroduction to the Chemistry of Heterocyclic Compounds, R.M.Acheson, Interscience Publishers, NewYork
5. Principle of Organic Chemistry, RocNorman, J.M.Coxon, Nelson Throms
6. Advanced Organic Chemistry, F.ACarey and R.J.Sundberg. Plenum.
7. Heterocyclic chemistry by Jai JackLie, Springer publications.

**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**

**Hetero Cyclic Chemistry**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** (5x4M=20M)

1. (a) Write any one method of synthesis of Thiirane. (CO – 1, L – 1) (Or)
   (b) Write any one method of synthesis of azirine. (CO – 2, L – 2)
2. (a) Discuss the synthesis of oxetane. (CO – 1, L – 1)
   (Or)
   (b) Discuss the reactivity of pencillin. (CO – 1, L – 1)
3. (a) Write down the structures of pyrazole and imidazole. (CO – 1, L – 1)
   (Or)
   (b) Write the structure of Indole & Benzimidazole. (CO – 1, L – 1)
4. (a) Write one synthesis method of pyrazine. (CO – 2, L – 2)
   (Or)
   (b) Discuss the reactivity of Benzodiazine. (CO – 2, L-2)
5. (a) Write the synthesis of azepine. (CO – 2, L-2)
   (Or)
   (b) Write the structure of Benzodizepine. (CO -1, L-1)

**SECTION – B** **(10x5=50M)**

UNIT – I

6. (a) Write the synthesis and reactivity of Aziridines and oxiranes. (CO – 2, L-2)
   **(Or)**
   **(**b) Discuss the classifications and nomenclature (Hantzsch Widman system) of heterocycles. (CO-1, L - 1)

UNIT – II

7. (a) Write the synthesis and reactivity of Azitidines and Thietanes.(CO–2,L-2) **Or)**
   (b) Write the synthesis of Pencillin G and V. (CO – 2,L-2)

UNIT – III

8. (a) Write the synthesis and reactivity of Oxazole and Thiazole. (CO -2,L-2)
   **(Or)**
   (b) Write the synthesis and reactivity of Indole. (CO – 2,L-2)

UNIT - IV

9. (a) Write the synthesis and reactivity of Pyridazines and Oaxazine.(CO–2,L-2)
   **(Or)**
   (b) Write the synthesis and reactivity of acridine. (CO–2,L-2)

UNIT - V

10. (a) Write the synthesis and reactivity of Oxepines and Thiepines.(CO -2,L-2)
    **(Or)**
    (b) Write the synthesis and reactivity of Benzodiazepines.(CO – 2,L-2)

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**M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**

**22CHMOL401:MOOCs – CHEMISTRY OF MAIN GROUP ELEMENTS**

| | | | |
|---|---|---|---|
| Course Code | 22CH4M3 | I A Marks | 30 |
| No. of Lecture Hours / Week | 4 | End Exam Marks | 70 |
| Total Number of Lecture Hours | 60 | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course: MOOCs – CHEMISTRY OF MAIN GROUP ELEMENTS- 22CHMOL401** | | | |
|---|---|---|---|
| S.N | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the fundamental concepts of chemistry of main group elements. | 2,7 | 1,2 |
| 2 | Comprehend the basic and advanced Concepts of chemistry of main group elements. | 1,2,7 | 1,2,3 |
| 3 | Apply the Conceptual knowledge gained in the study of chemistry of main group elements as and when required. | 1, 6 | 1,2,2 |
| 4 | Analyze the role of chemistry of main group elements in establishing the structure and bonding, chemical properties, characteristics of group elements. | 1, 7 | 1,2,3 |
| 5 | Assess the scope and need of chemistry of main group elements in understanding the other concepts of chemistry in allied fields. | 1, 7 | 1,2,3 |

**CO-PO MATRIX**

| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHMOL401** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 1 |
| | CO3 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 2 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 3 | 2 |
| | CO5 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 2 | 3 |

## Unit -1

**Classification of Elements and Periodic Properties** : periodic trends, classifications of main group elements, Effective Nuclear Charge, Structure and Bonding aspects, VSEPR theory, valency Bond theory, (Mo)Molecular orbital theory, Hybridization, Homonuclear diatomic molecules, heteronuclear diatomic molecules, Molecular orbital theory for poly atomic molecules.

## Unit – 2

**Chemistry of Hydrogen** : Hydrides and Hydrogen Bonding, Hydrates and Clathrates, covalent hydrides, salane hydrides, transition metal hydrides, chemistry of Group-I elements (Li,Na,K,Ru,& Ce),Binary compounds, Hydroxides, Ionic salts, complexation of cations by crown and cryptates, Chemistry of Group – II elements, electro negativity, physical and chemical properties, Electronic configurations.

**Unit – 3**

**Chemistry of Group 13 Elements** : Occurance,isolation and properties of the elements, oxides, coordination compounds, lower valent compounds. Introduction to chemistry of Group-14 Elements, physical properties of diamond, Graphite, Fullerenes and Carbides, carbon monoxide cyanides and related compounds, compounds with C-S bond, chemistry of group –I elements.(Al,Ga,Ta & Si,Ge,Sn,Pb)

**Unit - 4**

**Chemistry of Group-15 Elements** : Multiple bonding stereochemistry, Isolation and properties of the elements,complex compounds, Hydrides, Halides, oxohalides ,Oxides, Sulfides, Phosphorous-Nitrogen compounds, Compounds with Element-Element double bond, Nitrides, Nitrogen Hydrides, Nitrogen oxides,Hydrazine,Physical and chemical properties of $15^{th}$,$16^{th}$ and $17^{th}$ group elements.

**Unit - 5**

**Organo metallic compounds** : Preparation of organometallic compounds, Lithium Alkyl and Aryls, Organo sodium and organo potassium compounds, Mercuration and oxomercuration, Alkyl and Arylsilicon Halides, Transition metals, Alkene complexes, Notation and electron counting in Alkene and relatedcomplexes, other pi-donar ligands, types of ligands, Cyclopentadienyls,Benzenoid – metal complexes, Alkyne complexes, Allyl Complexes.

**Books & References**


- Advanced Inorganic chemistry, 6th addition 1999, F. A Cotton G.wilkinson, C.A Murillo, M. Boch mann, John Wiley and Sons, NewYork.
- Inorganic Chemistry, 3rd addition, 1999, D.F. Shriver, P.W Atkins, oxford university press oxford.
- Inorganic Chemistry $2^{nd}$,$3^{rd}$& $4^{th}$ Edition, C. E HouseCroft and A.G Sharpe pearson pentice Hall.
- Main group Chemistry, 2000 W. Henderson Royal Society of Chemistry, publication Cambridge.


**M.Sc. DEGREE EXAMINATION**
**FOURTH SEMESTER**

**MOOCS**

**Time: 3 hours** **Maximum Marks: 70**

**SECTION – A** (5x4M=20M)

1. (a) What is toxicology and explain with a suitable example. (CO – 2, L-2)

**(Or)**

(b) Discuss any one method of quantitative analysis. (CO – 1,L-1)

2. (a) Explain equilibria between strong and weak acids. (CO – 2,L-2)

**(Or)**

(b) Discuss salt hydrolysis in detail. (CO -2, L-2)

3. (a) Explain Beers law in detail. (CO -2, L-2)

**(Or)**

(b) Discuss chromophores in detail. (CO–2,L-2)

4. (a) Explain uses of oxidizing and reducing agents. (CO – 1,L-1)

**(Or)**

(b) Discuss IR drop in electrochemical cells. (CO–2,L-2)

5. (a) Explain thermo gravimetric analysis. (CO – 3,L-3)

**(Or)**

(b) Discuss differencial thermal analysis. (CO – 2,L-2)

**SECTION – B** **(10x5=50M)**

UNIT – I

6. (a) Explain flow diagrams in detail. (CO–2,L-2)

**(Or)**

(b) Explain (i) Micro analytical balance (ii) Filtration techniques. (CO–2,L-2)

UNIT – II

11. (a) Explain the types of equilibria on basis of chemical analysis. (CO–2, L-2)

**(Or)**

(b) Discuss in detail (i) Titration curves (ii) Common ion effect. (CO–2,L-2)

UNIT – III

8. (a) Explain d – d, f – f transitions and its applications in detail. (CO–2,L-2)

**(Or)**

(b) Discuss chromophoric reagents and applying Beers law to mixtures. (CO–2,L-2)

UNIT – IV

9. (a) Discuss the (i) differential scanning calorimetry (ii) TG – plot. (CO – 3,L-3)

**(Or)**

(b) Discuss (i) Geometric estimation (ii) Furnaces and crucibles(CO–2,L-2)

UNIT - V

10. (a) Discuss in detail potentiometric titrations with a neat labeled diagram.(CO–2,L-2)

**(Or)**

(b) Explain controlled potential caulirometry with a neat labeled diagram.(CO-3,L-3)

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**A.G&S.G.SIDDHARTHA COLLEGE OF ARTS & SCIENCE**
**M.Sc. – CHEMISTRY (ORGANIC CHEMISTRY)**
**IV SEMESTER(2023-2025)**

## 22CHP401: ORGANIC ESTIMATIONS

| | | | |
|---|---|---|---|
| Course Code | **22CHP401** | I A Marks | 30 |
| No. of Lecture Hours / Week | 3 | End Exam Marks | 70 |
| Total Number of Lecture Hours | - | Total Marks | 100 |
| Seminar | - | Exam Hours | 03 |

| **Course:ORGANIC ESTIMATIONS - 22CH4L1** | | | |
|---|---|---|---|
| S. | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the fundamental concepts of chemistry of main group elements. | 2,7 | 1 |
| 2 | Comprehend the basic and advanced Concepts of chemistry of main group elements. | 1,2,7 | 1,2 |
| 3 | Apply the Conceptual knowledge gained in the study of chemistry of main group elements as and when required. | 1, 6 | 1,2,3 |
| 4 | Analyze the role of chemistry of main group elements in establishing the structure and bonding, chemical properties, characteristics of group elements. | 1, 7 | 1,2,3 |
| 5 | Assess the scope and need of chemistry of main group elements in understanding the other concepts of chemistry in allied fields. | 1, 7 | 1,2,3 |

**CO-PO MATRIX**

| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COURSE CODE 22CHP401** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 2 |
| | CO3 | 3 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 3 | 2 |
| | CO4 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 2 | 3 |
| | CO5 | 3 | 0 | 2 | 0 | 0 | 0 | 2 | 3 | 2 | 3 |

**xpt. 1:** Estimation of phenol (bromination method)
**Expt. 2:** Estimation of aniline (Bromination method)
**Expt.3:** Estimation of sugars –glucose and sucrose by using Fehlings solution
**Expt. 4:** Determination of iodine value of oil or fat
**Expt. 5:** Determination of saponification value of oil or fat
**Expt. 6:** Estimation of vitamin 'C' in lime juice.
**Expt. 7:** Estimation of Nitro group
**Expt. 8:** Estimation of formaldehyde
**Expt. 9:** Isolation of caffeine from tea/coffee sample.

**22CHPW401: PROJECT WORK**

| Course:PROJECT WORK - 22CHPW401 | | | |
|---|---|---|---|
| S.N o | COURSE OUTCOMES | PO`S | PSO's |
| | The graduate will be able to | | |
| 1 | Memorize the basic concepts related to chosen area of internship. | 2,7 | 1,2 |
| 2 | Understand the need of effective communication in drafting and presentation of project data. | 1,2,3 | 1,2 |
| 3 | Apply the knowledge of theoretical aspects to carry out project Work. | 1,6,7 | 1,2,3 |
| 4 | Interpret the data obtained in form of graphs and figures into verbal form. | 1,4,7 | 1,2,3 |
| 5 | Evaluate the results obtained in the project work to provide valuable conclusions of the research. | 1,5,7 | 1,2,3 |

| CO-PO MATRIX | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CO-PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
| **COURSE CODE 22CHPW401** | CO1 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| | CO2 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 |
| | CO3 | 3 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 2 | 3 |
| | CO4 | 3 | 0 | 0 | 0 | 3 | 0 | 2 | 2 | 2 | 3 |
| | CO5 | 3 | 0 | 3 | 0 | 0 | 0 | 2 | 3 | 2 | 3 |

The project will be assigned in the final semester. The project will be performed at the established industry (or) in the department under the supervision of the faculty or research institutes. It may involve experimental and/or theoretical work as well as critical review of the literature. Each of the students has to carry out original research in a topic in accordance with the work chosen under the guidance and supervision of a teacher in the concerned Department of the college.

Dissertation must be submitted at the end of the semester which will be assessed by the external examiners. Dissertation must be prepared with introduction, Review of the literature, Experimental Session, Results and Discussion, Conclusion and References.

The final dissertation should have at least 40 – 60 pages typed in Times New Roman 12 font except Headings and side headings with 1.5 line spacing.