

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

**VUYYURU-521165, KRISHNA Dt., A.P.(Autonomous)**

**Accredited by NAAC with "A" Grade**

**2022-2023**



**DEPARTMENT OF CHEMISTRY**

**MINUTES OF BOARD OF STUDIES**

**EVEN SEMESTER**

**29-03-2023**

151

Minutes of the Meeting of Board of Studies in Chemistry for the Autonomous Course  
A.G. & S.G. Siddhartha Degree College of Arts & Science, Vuyyuru held at 11.00 A.M  
on 29-03-2023 in the Department of Chemistry

Sri. K.RAMESH Presiding

Members Present:

- 1).....K. Ramu..... Chairman HOD, Dept. of Chemistry,  
(Sri. K.RAMESH) A.G. & S.G.S.Degree College,Vuyyuru.
- 2)..... University Nominee Assistant Professor,  
(Prof.D.Ramasekhar Reddy) Dept. of Chemistry,Krishna University, MTM.
- 3)..... Academic Council Nominee HOD, Dept. of Chemistry,  
(Dr. S. Kalpana) SDMS M College, Vijayawada.
- 4)..... Academic Council Nominee Lecturer in Chemistry,  
(Dr. A. Indira) G.D.C, Dumpagadapa.
- 5)..... Industrialist Manager, Q.A, Biophore india  
(Dr. G Raja) Pharmaceuticals pvt ltd Hyd.
- 6)..... Student Nominee Lecturer in Chemistry,  
(Smt. M. Sowjanya) ANR College Gudivada.
- 7).....G. Giriprasad..... Member Lecturer in Chemistry,  
(Dr. G.Giri prasad) A.GS.G.S.Degree College,Vuyyuru
- 8).....M. Venkatasubbarao..... Member Lecturer in Chemistry,  
(Smt. M.V.Sanathi) A.G. & S.G.S.Degree College,Vuyyuru.
- 9).....P. Suresh..... Member Lecturer in Chemistry,  
( Sri. P.Suresh) A.G.& S.G.S.Degree College, Vuyyuru.
- 10).....M. Santhi..... Member Lecturer in Chemistry,  
( MS. M:Santhi) A.G. & S.G.S.Degree College,Vuyyuru.
- 11).....J. Nageswara Rao..... Member Rtd.Lecturer in Chemistry,  
(Sri. J.Nageswara Rao) A.G.& S.G.S.Degree College,Vuyyuru.

### Agenda for B.O.S Meeting

1. To recommend the syllabus and model paper for II semester of I Degree B.Sc., Chemistry for the Academic year 2022-2023.
2. To recommend the syllabus and model papers for IV semester of II Degree B.Sc., Chemistry for the Academic year 2022-2023.
3. To recommend the syllabus and model papers for V/VI semester of III Degree B.Sc. Chemistry for the Academic year 2022-2023.
4. To recommend the Blue print of V/VI semesters of B.Sc. Chemistry for the Academic year 2022-2023.
5. To recommend the Guidelines to be followed by the question paper setters in Chemistry for II, IV, V/VI Semester – end exams.
6. To introduce SDC programme
7. To recommend the teaching and evaluation methods to be followed under Autonomous status.
8. Any suggestions regarding certificate course, seminars, workshops, Guest lecture to be organized.
9. Recommend the panel of paper setters and Examiners to the controller of Examinations of
10. Any other matter.

*K. Ramiah*  
Chairman

### RESOLUTIONS

1. It is resolved to follow the **syllabus of APSCHE (theory and practical) for II semesters of I B.Sc.** under Choice Based Credit System (CBCS) for the Academic year 2022--2023.
2. It is resolved to follow the **syllabus of APSCHE (theory and practical) for IV semesters of II B.Sc.** under Choice Based Credit System (CBCS) for the Academic year 2022--2023.
3. It is resolved to change the **syllabus of APSCHE (theory and practical) for V/VI semesters of III B.Sc.** under Choice Based Credit System (CBCS) for the Academic year 2022--2023.
4. It is resolved to follow the **Blue print** as proposed by members of BOS Vsemester of Degree B.Sc. for the Academic year 2022-2023.
5. It is resolved to follow the **guidelines** to be followed by the question paper setters of Chemistry for II, IV & V/VI semesters of Degree B.Sc. for the Academic Year 2022-2023.
6. It is resolved to follow the SDC (FA) syllabus of APSCHE (theory) for II semesters of I B.Sc. under Choice Based Credit System (CBCS) for the Academic year 2022--2023.
7. It is resolved to continue the following teaching and evolution methods for Academic year 2022-23.

#### Teaching Methods:

- Besides the conventional methods of teaching, we use modern technology i.e. using of LCD projector to display on U boards etc, for better understanding of concepts.
  - Evaluation of a student is done by the following procedure:
  - Internal Assessment Examinations:
  - Out of maximum 100 marks in each paper for I B.Sc, 30marks shall be allocated for internal assessment. Out of these 30marks, 20 marks are allocated for announced tests (i.e. IA-1 & IA-2).
  - Out of maximum 100 marks in each paper for II B.Sc, 25 marks shall be allocated for internal assessment. Out of these 25 marks, 15 marks are allocated for announced tests (i.e. IA-1 & IA-2).
  - Out of maximum 100 marks in each paper for IIIB.Sc, 30 marks shall be allocated for internal assessment. Out of these 30 marks, 20 marks are allocated for announced tests (i.e. IA-1 & IA-2).
  - Two announced tests will be conducted and average of these two tests shall be deemed as the marks obtained by the student, 5 marks are allocated on the basis of candidate's percentage of attendance and remaining 5 marks are allocated for the innovative component like assignment/quiz/seminars for I, II, IIIB.Sc.
  - There is no pass minimum for internal assessment for I, II, III B.Sc.
  - Semester – End Examination:
  - The maximum marks for II, IV, VB.Sc Semester – End examination shall be 70/75/70 marks duration of the examination shall be 3 hours. Even though the candidate is absent for two IA exams /obtain Zero marks the external marks are considered (if the candidate gets 40/70/75) and the result shall be declared as "PASS".
  - Semester – End examinations shall be conducted in theory papers at the end of every semester, while in practical papers, these examinations are conducted at the end of II, IV & V/VI semesters for I, II & III B.Sc for 50 marks.
8. Discussed and recommended for organizing certificate course, seminars, Guest lecturers, workshops to upgrade the knowledge of students, for the approval of the academic council.
  9. Discussed and empowered the Head of the department of Chemistry to suggest the panel of paper setters and examiners to the controller of examinations
  10. NIL.

*K. Ramani*  
**Chairman**



**A.G & S.G. SIDDHARTHA DEGREE COLLEGE OF**

**ARTS & SCIENCE**

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**Title of the Paper: ORGANIC AND GENERAL CHEMISTRY Semester: II**

Course Code	CHE-201C	Course Delivery Method	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction :	Year of Offering:	Year of Revision:	Percentage of Revision: 0
2021-22	2022-23	2022-23	

**Course outcomes:**

At the end of the course, the student will be able to;

**CO1.** Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.

**CO2.** Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.

**CO3.** Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.

**CO4.** Understand the concepts of absorption and adsorption, colloidal chemistry and nature of Chemical Bonding.

**CO5.** Correlate and describe the stereo chemical properties of organic compounds and reactions.

**Learning Objectives:**

1. To understand the basic concepts of alkanes & cycloalkanes.
2. To identify the difference between saturated and unsaturated hydrocarbons.
3. To learn the basic concepts of aromatic compounds and its reactivity.
4. To understand the chemistry of adsorption, colloid chemistry, HSAB principle and Molecular Orbital theory.
5. To learn the fundamental aspects of stereo chemistry.

## Syllabus

### Course Details

Unit	Learning Units	Lecture Hours
<b>ORGANIC CHEMISTRY</b>		
I	<p><b>Recapitulation of Basics of Organic Chemistry Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)</b></p> <p><b>1.1</b> General methods of preparation of alkanes- Wurtz and Wurtz - Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Isomerism and its effect on properties.</p> <p><b>1.2</b> Free radical substitutions; Halogenation, concept of relative reactivity v/s selectivity.</p> <p><b>1.3</b> Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane).</p> <p><b>1.4</b> General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of mono substituted cyclohexane.</p>	<b>12h</b>
II	<p><b>Carbon-Carbon pi Bonds (Alkenes and Alkynes)</b></p> <p><b>2.1</b> General methods of preparation, physical and chemical properties.</p> <p><b>2.2</b> Mechanism of E1, E2, E1cB reactions, Saytzeff and Hoffmann eliminations, Electrophilic Additions, mechanism (Markownikoff/Antimarkownikoff addition) with suitable examples, <i>syn</i> and <i>anti</i>-addition; addition of H<sub>2</sub>, X<sub>2</sub>, HX. oxymercuration-9, demercuration, hydroboration-oxidation, ozonolysis, Hydroxylation, Diels alder reaction, 1,2 and 1,4 addition reaction in Conjugated Dienes.</p> <p><b>2.3</b> Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.</p>	<b>12h</b>
III	<p><b>Benzene and its reactivity</b></p> <p><b>3.1</b> Concept of aromaticity, Huckel's rule - application to</p>	12h

	<p>Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropyliumcation)</p> <p><b>3.2</b> Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedel- Craft's alkylation and acylation.</p> <p><b>3.3</b> Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO<sub>2</sub> and Phenolic).</p> <p>Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens</p> <p>(Explanation by taking minimum of one example from each type)</p>	
<b>GENERAL CHEMISTRY</b>		
IV	<p><b>Surface chemistry and chemical bonding</b></p> <p><b>1. Surface chemistry</b></p> <p><b>4.1 Colloids-</b> Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.</p> <p><b>4.2 Adsorption-</b>Physical and chemical adsorption, Langmuir adsorption isotherm, applications of adsorption.</p> <p><b>2. Chemical Bonding</b></p> <p><b>4.3</b> Valence bond theory, hybridization, VB theory as applied to ClF<sub>3</sub>, Ni(CO)<sub>4</sub></p> <p><b>4.4</b> Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N<sub>2</sub>, O<sub>2</sub>, CO and NO).</p> <p><b>3. HSAB</b></p> <p><b>4.5</b> Pearson's concept, HSAB principle &amp; its importance, bonding in Hard-Hard and Soft-Soft combinations.</p>	14h
V	<p><b>Stereochemistry of carbon compounds</b></p> <p><b>5.1</b> Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.</p>	10h



	<p><b>5.2</b> Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation.</p> <p><b>5.3</b> Chiral molecules- definition and criteria(Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.</p> <p><b>5.4</b> D, L, R,S and E,Z- configuration with examples. Definition of Racemic mixture – Resolution of racemic mixtures (any 3 techniques)</p>	
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## Co-curricular activities and Assessment Methods

Continuous Evaluation: Monitoring the progress of student's learning

Class Tests, Worksheets and Quizzes

Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality

Semester-end Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

### List of Text Books

1. A Text book of Organic Chemistry by Lloyd.N.Ferguson
2. A Text book of Organic Chemistry by RakeshK.Parashar&V.K.Ahluwalia
3. Telugu Academy Book
4. Unified Chemistry by O.P.Agarwal-Vol-I

### List of Reference Books

#### Theory:

Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.

Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

**Practical:** 11 Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)

#### Additional Resources:

Solomons, T. W. G.; Fryhle, C. B. & Snyder, S. A. Organic Chemistry, 12th Edition, Wiley.

Bruice, P. Y. Organic Chemistry, Eighth Edition, Pearson.

Clayden, J.; Greeves, N. & Warren, S. Organic Chemistry, Oxford.

Nasipuri, D. Stereochemistry of Organic Compounds: Principles and Applications, Third Edition, New Age International.

Gunstone, F. D. Guidebook to Stereochemistry, Prentice Hall Press, 1975.

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
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<b>SEMESTER – II</b>	<b>PAPER-II</b>	<b>PAPER CODE : CHET-22</b>
<b>PAPER TITLE: ORGANIC &amp; GENERAL CHEMISTRY -I</b>		
<b>ACADEMIC YEAR-2022-23</b>		

**Time: 3 Hours**

**Max. Marks: 70M**

Answer all questions

1. (a) -10M  
(or)  
10M  
(b) – 4M  
(or)  
4M
2. (a) -10M  
(or)  
10M  
(b) – 4M  
(or)  
4M
3. (a) -10M  
(or)  
10M  
(b) – 4M  
(or)  
4M
4. (a) -10M  
(or)  
10M  
(b) – 4M  
(or)  
4M
5. (a) -10M  
(or)  
10M  
(b) – 4M  
(or)  
4M

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**PRACTICAL SYLLABUS.**

<b>Practical Paper – II</b>  <b>Volumetric Analysis</b>	<b>PAPER CODE : CHEP-21A</b> <b>ACADEMIC YEAR-2022-23</b>
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**30 hrs (2h/w)**

**Credits-2**

**Course outcomes:**

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic Equilibria
3. Learn and identify the concepts of a standard solutions, primary and secondary standards
4. Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

**Volumetric analysis 50 M**

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using  $\text{KMnO}_4$  with oxalic acid as primary standard.
3. Determination of Cu (II) using  $\text{Na}_2\text{S}_2\text{O}_3$  with  $\text{K}_2\text{Cr}_2\text{O}_7$  as primary standard
4. Estimation of water of crystallization in Mohr's salt by titrating with  $\text{KMnO}_4$



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**Title of the Paper: INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY**

**Semester: IV**

<b>Course Code</b>	<b>CHE-401C</b>	<b>Course Delivery Method</b>	<b>Class Room / Blended Mode</b>
Credits	<b>3</b>	CIA Marks	25
No. of Lecture Hours / Week	<b>4</b>	Semester End Exam Marks	<b>75</b>
Total Number of Lecture Hours	<b>60</b>	Total Marks	<b>100</b>
Year of Introduction : 2021-22	Year of Offering: 2022-23	Year of Revision: 2022-23	Percentage of Revision: 0

**Course Outcomes:**

At the end of the course, the student will be able to:

1. To learn about the laws of absorption of light energy by molecules and the subsequent photochemical reactions.
2. To understand the concept of quantum efficiency and mechanisms of photochemical reactions

## Syllabus

### Course Details

Unit	Learning Units	Lecture Hours
<b>INORGANIC CHEMISTRY</b>		
<b>I</b>	<p><b>Organometallic Compounds</b></p> <p>Definition and classification of organometallic Compounds on the basis of bond type, Concept of hapticity of organic ligands. Metal carbonyls: 18 electron rule, electron count of mononuclear, poly nuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. P-acceptor behavior of carbon monoxide. Synergic effects (VB approach) - (MO diagram of CO can be referred to for synergic effect to IR frequencies).</p>	<b>8h</b>
<b>ORGANIC CHEMISTRY</b>		
<b>II</b>	<p><b>Carbohydrates</b></p> <p>Occurrence, classification and their biological importance, Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides – Elementary treatment of maltose, lactose and sucrose. Polysaccharides – Elementary treatment of starch.</p>	<b>8h</b>
<b>III</b>	<p><b>1. Amino acids and proteins</b></p> <p><b>6h</b></p> <p>Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated</p>	<b>6h</b>



	<p><b>Diazonium Salts:</b> Preparation and Synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).</p>	
V	<p><b>1.Photochemistry</b>  Difference between thermal and photochemical processes, Laws of photochemistry- Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, Photosensitized reactions- energy transfer processes (simple example).</p> <p><b>Thermodynamics</b>  The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect-coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirchoff s equation, Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non- spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.</p>	<p>5h</p> <p>12h</p>

### List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mareloudan, Purdue Univ
4. Text book of physical chemistry by S Glasstone
5. Concise Inorganic Chemistry by J.D.Lee
6. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
7. A Text Book of Organic Chemistry by Bahl and Arunbahl
8. A Text Book of Organic chemistry by I L Finar Vol I
9. A Text Book of Organic chemistry by I L Finar Vol II



10. Advanced physical chemistry by GurudeepRaj

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
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<b>SEMESTER – IV</b>	<b>PAPER-IV</b>	<b>PAPER CODE : CHE-401C</b>
<b>PAPER TITLE: INORGANIC, ORGANIC &amp; PHYSICAL CHEMISTRY</b>		
<b>ACADEMIC YEAR-2022-23</b>		

Time: 3 hours

Maximum Marks: 75

Time: 3 hours  
75

Maximum Marks:

**PART-A**  
25Marks

5 X 5 =

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

- Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples. **L1-CO1**
- What are epimers and anomers. Give examples. **L1-CO2**
- Discuss about isoelectric point and zwitterion. **L2-CO3**
- Discuss the Paul-Knorr synthesis of five membered heterocyclic compounds. **L2-CO4**
- Explain Tautomerism shown by nitroalkanes **L2-CO5**
- Discuss the basic nature of amines. **L2-CO5**
- Write the differences between thermal and photochemical reactions. **L4-CO6**
- Derive heat capacities and derive  $C_p - C_v = R$  **L1-CO7**

**PART-B**  
50Marks

5 X 10 =

Answer **ALL** the questions. Each carries **TEN** marks

- (a). What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples. **L1-CO1**  
(or)  
(b). Discuss the general methods of preparations of mono & bi-nuclear carbonyls of 3d series. **L2-CO1**
- (a). Discuss the constitution, configuration and ring size of glucose. Draw the Haworth and Conformational

structure of glucose. **L2-CO2**

(or)

- (b). (i) Explain Ruff's degradation.  
(ii) Explain Kiliani- Fischer synthesis. **L2-CO2**

11.(a). What are amino acids? Write any three general methods of preparation of amino acids. **L1-CO3**

(or)

b) Discuss the aromatic character of Furan, Thiophene and Pyrrole. **L2-CO4**

12.(a). Write the mechanism for the following. **L3-O5**

i) Frenkel reaction (ii) Mannich reaction

(or)

- (b). (i) Explain Hinsberg separation of amines.  
(i) Discuss any three synthetic applications of diazonium salts. **L2-CO5**

13.(a). What is quantum yield? Explain the photochemical combination of Hydrogen- Chlorine and Hydrogen - Bromine. **L2-CO6**

(or)

(b). Define entropy. Describe entropy changes in the reversible and irreversible process. **L1-CO7**

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**PRACTICAL SYLLABUS.**

<b>Practical Paper – IV</b> <b>OrganicQualitativeanalysis</b>	<b>PAPER CODE :</b> <b>ACADEMIC YEAR-2022-23</b>
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**30 hrs (2h/w)**

**Credits-2**

**Course outcomes:**

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
2. Determine melting and boiling points of organic compounds
3. Understand the application of concepts of different organic reactions studied in theory part of organic chemistry.

**OrganicQualitativeanalysis**

**50 M**

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.

**SCHEME OF VALUATION**

1. **INTERNAL MARKS- Record-10M**
  2. **EXTERNAL MARKS-40**
    - **Analysis of an organic compound and preparation of suitable derivative-30M**
    - **Viva questions = 10 M**
- TOTAL = 50 M**



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**Title of the Paper: INORGANIC&PHYSICALCHEMISTRY**

**Semester: IV**

<b>Course Code</b>	<b>CHE-402C</b>	<b>Course Delivery Method</b>	<b>Class Room / Blended Mode</b>
Credits	<b>3</b>	CIA Marks	25
No. of Lecture Hours / Week	<b>4</b>	Semester End Exam Marks	<b>75</b>
Total Number of Lecture Hours	<b>60</b>	Total Marks	<b>100</b>
Year of Introduction : 2021-22	Year of Offering: 2022-23	Year of Revision: 2022-23	Percentage of Revision: 0

**Program outcomes:**

**Course outcomes:**

At the end of the course, the student will be able to;

1. Understand concepts of boundary conditions and quantization, probability distribution, most probable values, uncertainty and expectation value
2. Application of quantization to spectroscopy.
3. Various types of spectra and their use in structure determination.

## Syllabus

### Course Details

Unit	Learning Units	Lecture Hours
<b>INORGANIC CHEMISTRY</b>		<b>26h</b>
<b>I</b>	<p><b>Coordination Chemistry</b></p> <p>IUPAC nomenclature of coordination compounds, Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outer orbital complexes. Limitations of VBT, Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry, Factors affecting the magnitude of crystal field splitting energy, Spectro chemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion, square planar coordination.</p>	<b>12h</b>
<b>II</b>	<p><b>1. Inorganic Reaction Mechanism</b> <b>4h</b></p> <p>Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions <math>SN^1</math> and <math>SN^2</math>, Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications</p> <p><b>2. Stability of metal complexes</b></p> <p>Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.</p> <p><b>3. Bioinorganic Chemistry</b></p> <p>Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Sodium K- pump, carbonic anhydrase and carboxy peptidase. Excess and deficiency of some trace metals.</p>	<p><b>4h</b></p> <p><b>2h</b></p> <p><b>8h</b></p>

	Toxicity of metal ions (Hg,Pb,Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cis-platin as an anti-cancer drug. Iron and its application in bio-systems, Hemoglobin, Myoglobin.Storage and transfer of iron.	
<b>PHYSICALCHEMISTRY</b>		<b>34h</b>
<b>III</b>	<p><b>1 .Phase rule</b></p> <p>Concept of phase, components, degrees of freedom. Thermodynamic derivation of Gibbs phase rule. Phase diagram of one component system - water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point , freezing mixtures.</p>	<b>6h</b>
<b>IV</b>	<p><b>Electrochemistry</b></p> <p>Specific conductance, equivalent conductance and molar conductance- Definition and effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only), Application of conductivity measurements- conductometric titrations. Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal- metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations. Fuel cells- Basic concepts, examples and applications</p>	<b>14h</b>
<b>V</b>	<p><b>Chemical Kinetics:</b></p> <p>The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General</p>	<b>14h</b>

<p>methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock &amp; key model. Michaels- Menten equation- derivation, significance of Michaelis-Menten constant.</p>	
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### List of Reference Books

1. Text book of physical chemistry by S Glasstone
2. Concise Inorganic Chemistry by J.D. Lee
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Advanced physical chemistry by Gurudeep Raj
5. Principles of physical chemistry by Prutton and Marron
6. Advanced physical chemistry by Bahl and Tuli
7. Inorganic Chemistry by J.E. Huheey
8. Basic Inorganic Chemistry by Cotton and Wilkinson
9. A textbook of qualitative inorganic analysis by A.I. Vogel
10. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press 10th Ed (2014).
11. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
12. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
13. Barrow, G. M. Physical Chemistry



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<b>SEMESTER – IV</b> <b>PAPER-V</b>	<b>PAPER CODE : CHE-402C</b>
<b>PAPER TITLE : INORGANIC &amp; PHYSICAL CHEMISTRY</b> <b>ACADEMIC YEAR-2022-23</b>	

Time: 3 hours  
75

Maximum Marks:

**PART- A5 X 5 = 25 Marks**

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

1. Write note on Jahn-Teller distortion. **L2-CO1**
2. Explain Labile & inert complexes. **L2-CO2**
3. Explain Job's method for determination of composition of complex. **L2-CO2**
4. Explain Thermodynamic derivation of Gibb's phase rule. **L2-CO4**
5. Explain any two conductometric titrations. **L2-CO5**
6. Write note on Fuel Cells with examples and applications. **L2-CO5**
7. What is enzyme catalysis? Write any three factors effecting enzyme catalysis. **L1-CO6**
8. Derive Michaelis-Menten equation. **L1-CO6**

**PART-B**

5 X 10 = 50

Marks

Answer **ALL** the questions. Each carries **TEN** marks

- 9 (a). Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations of VBT. **L2-CO1**

(or)

- (b). Define CFSE. Explain the factors effecting the magnitude of crystal field splitting energy. **L1-CO1**

- 10 (a). Explain Trans effect. Explain the theories of trans effect

and write any two applications of trans effect. **L2-CO2**

(or)

- (b). (i) Write the biological functions of Haemoglobin and Myoglobin.  
(ii) Write note on use of chelating agents in medicines. **L2-CO3**

11.(a). Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system. **L1-CO4**

(or)

- (b). (i) Explain phase diagram for NaCl-water system.  
(ii) Explain briefly about Freezing mixtures. **L2-CO4**

12.(a). Define Transport number. Write experimental method for the determination of transport number by Hittorf method. **L1-CO5**

(or)

- (b).(i) Define single electrode potential.  
(ii) Explain four types of electrodes with examples. **L1-CO5**

13.(a). Explain general methods for determination of order of a reaction. **L2-CO6**

(or)

(b). Explain Collision theory and Activated complex theory of bimolecular reactions. **L2-CO6**

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**PRACTICAL SYLLABUS**

<b>Practical Paper – V</b> Conductometric and Potentiometric Titrimetry	<b>PAPER CODE : CHE-402P</b> <b>ACADEMIC YEAR-2022-23</b>
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**30 hrs (2 h/W) Credits: 2**

**Practical-Course –V**

**Conductometric and Potentiometric Titrimetry 50 M**

**Course outcomes:**

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Apply concepts of electrochemistry in experiments
3. Be familiar with electro analytical methods and techniques in analytical chemistry which study an analyte by measuring the potential ( volts) and/or current ( amperes) in an electrochemical cell containing the analyte

**Conductometric and Potentiometric Titrimetry 50 M**

2. Conductometric titration- Determination of concentration of HCl solution using standard NaOH solution.
3. Conductometric titration- Determination of concentration of CH<sub>3</sub>COOH Solution using standard NaOH solution.
4. Conductometric titration- Determination of concentration of CH<sub>3</sub>COOH and HCl in a mixture using standard NaOH solution.
5. Potentiometric titration- Determination of Fe (II) using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.  
Determination of rate constant for acid catalyzed ester hydrolysis

**ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION REVISED  
UG SYLLABUS UNDER CBCS**

(Implemented from Academic Year, 2020-21)

**PROGRAMME: FOUR YEAR B.Sc.(Hons)**

**Domain Subject: CHEMISTRY**

**Skill Enhancement Courses (SECs) for Semester V/VI, from 2022-23**

**(Syllabus with Learning Outcomes, References, Co-curricular Activities & Model Q.P. Pattern)**

**Structure of SECs for Semester–V (To choose One pair from the Five alternate pairs of SECs)**

Univ. Code	Course NO. 6&7	Name of Course	Th. Hrs / Week	IE Marks	EE Marks	Credits	Prac. Hrs./Week	Marks	Credits
	6A	Synthetic Organic Chemistry	3	25	75	3	3	50	2
	7A	Analysis of Organic Compounds	3	25	75	3	3	50	2

OR

	6B	Analytical Methods in Chemistry-1	3	25	75	3	3	50	2
	7B	Analytical Methods in Chemistry-1	3	25	75	3	3	50	2

OR

	6C	Industrial Chemistry-1	3	25	75	3	3	50	2
	7C	Industrial Chemistry-2	3	25	75	3	3	50	2

OR

	6D	Environmental Chemistry	3	25	75	3	3	50	2
	7D	Green Chemistry and Nanotechnology	3	25	75	3	3	50	2

OR

	6E	Analytical Methods in Chemistry	3	25	75	3	3	50	2
	7E	Cosmetics and Pharmaceutical Chemistry	3	25	75	3	3	50	2

**Note-1:** For Semester–V/VI, for the domain subject Chemistry, any one of the five pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A&7A or 6B&7B or 6C&7C or 6D&7D or 6E&7E. The pair shall not be broken (ABC allotment is random, not on any priority basis).

**Note-2:** One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the skills embedded in syllabus citing related real field situations



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**Title of the Paper: Analytical Methods in Chemistry-I Semester: V/VI**

Course Code	CHE-501C-6B	Course Delivery Method	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	45	Total Marks	100
Year of Introduction : 2022-23	Year of Offering: 2022-23	Year of Revision: -----	Percentage of Revision: 0

**Course Outcomes:**

**Students after successful completion of the course will be able to:**

- CO1.** Remember the basic concepts of quantitative analysis data treatment, separation techniques and analysis of water (PO7)
- CO2.** Acquire knowledge on the concepts quantitative analysis data treatment, separation techniques and analysis of water (PO1, PO7)
- CO3.** Apply the conceptual knowledge gained in the areas of quantitative analysis data treatment, separation techniques and analysis of water in the chosen job role (PO1)
- CO4.** Analyse that how far the quantitative methods, data treatment methods separation techniques and Analysis of water (PO1).

## Syllabus

### Course Details

Unit	Learning Units
I	<p><b>Quantitative analysis-1</b></p> <p>1. A brief introduction to analytical methods in chemistry</p> <p>2. Principles of volumetric analysis, concentration terms- Molarity, Normality, v/v, w/v, ppm and ppb, and secondary standards.</p> <p>3. Description and use of common laboratory apparatus- volumetric flask, burette, pipette, beakers, etc.</p>
II	<p><b>Quantitative analysis-2</b></p> <p>1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration choice of indicators for the saturations).</p> <p>2. Principles of gravimetric analysis: precipitation, coagulation, peptization, co-precipitation, post precipitation.</p>
III	<p><b>Treatment of analytical data</b></p> <p>Types of errors- Relative and absolute, significant figures and its importance, accuracy – method minimization of errors, precision- methods of expressing precision, standard deviation and confidence limit</p>
IV	<p><b>Separation techniques</b></p> <p>1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction Determination of Iron(III).</p> <p>2. Ion Exchange method: Introduction, action of ion exchange resins, applications</p>
V	<p><b>Analysis of water (Marks weightage 10+5)</b></p> <p>Determination of dissolved solids, total hardness of water, turbidity, alkalinity, Dissolved oxygen, CO</p>

### III References

1. Analytical Chemistry by Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, Seventh edition, Wiley.
2. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

3. Text book of Environmental Chemistry and Pollution Control by S.S.Dara and D.D.Mishra, Revised edition, S Chand & Co Ltd.

**Text Books:**

1. Instrumental methods of chemical analysis by B K Sharma
2. Separation methods MN Sastry

**Reference materials on the web/web links:**

1. [https://chem.libretexts.org/Bookshelves/Analytical\\_Chemistry/Supplemental\\_Modules\\_\(Analytical\\_Chemistry\)/Quantifying\\_Nature/Volumetric\\_Chemical\\_Analysis\\_\(Shiundu\)/14.1%3A\\_Sampling\\_and\\_Statistical\\_Analysis\\_of\\_Data](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.1%3A_Sampling_and_Statistical_Analysis_of_Data)
2. <https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1>

**IV Co-Curricular Activities:**

**a) Mandatory** (Lab/field training of students by teacher (lab: 10 + field: 05) :

**1. For Teacher:** Training of students by the teacher in laboratory and field for not less than 15 hours on the field techniques/skills of calibration of pH meter, Strong acids vs strong base titration using pH meter, determination of chloride ion, estimation of water quality parameters and estimation of Iron(II).

Google classroom created during instruction of course by the teacher concerned for sharing relevant material and conducting exams.

**2. For Student:** Students shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe. Write their observations and submit a hand written fieldwork/project work report not exceeding 10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work: Title page, student details, index page, detail of place visited, observations, findings, and acknowledgements.

5. Unit tests (IE).

**b) Suggested Co-Curricular Activities**

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics).
3. Visits to facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

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**Model Paper**

<b>SEMESTER – V</b>	<b>PAPER-V</b>	<b>PAPER CODE : CHE-501C</b>
<b>PAPER TITLE : Analytical Methods in Chemistry-I Paper 6B</b>		
<b>ACADEMIC YEAR-2022-2023</b>		

Time: 3Hours

Maximum marks: 70

Minimum marks: 28

**Answer any FOUR of the following. Each question carries 5 marks. 4X5=20**

1. Explain the preparation of v/v based with suitable examples
2. Discuss the detail about primary and secondary standards with suitable examples
3. Explain the need of drying the precipitate in gravimetric analysis
4. Define accuracy and explain the methods of expressing accuracy
5. Discuss the principal and theory involved in solvent extraction



6.Explain about resins

7.Explain about COD

### SECTION-B

**Answer any FIVE questions. Each question carries 10 marks. 5X10=50**

8.Describe the role of the following apparatus in analytical chemistry I) Volumetric flask II) Burette III) Pipette

9.Elaborate the theory involved in complexometric and acid base titrations

10.Write a note on the following terms in gravimetric analysis I)Precipitation II) Digestion III) Filtration

11.Define error, discuss in detail about various types of errors encountered in quantitative analysis

12.Elaborate the methods used for minimization of errors

13.Discuss the various factors which effect solvent extraction

14.Explain in detail about role of Ion exchange resins in separation of compounds

15.Explain the following (a) turbidity (b) alkalinity

**The Guidelines to be followed by the question paper setters in chemistry for the V- Semester - end exams**

<b>SEMESTER – V</b>	<b>PAPER-V</b>	<b>PAPER CODE : CHE-501-6B</b>
<b>PAPER TITLE : Analytical Methods in Chemistry-I Paper 6B</b>		
<b>ACADEMIC YEAR-2022-2023</b>		

Weightage for the question paper

syllabus	Section-A (Short answer questions)	Section-B (essay questions)
Unit-1 (20 Marks)	1+1	1
Unit-2 (25Marks)	1	1+1
Unit-3 (25Marks)	1	1+1
Unit-4 (30Marks)	1+1	1+1

Unit-5 ( 15 Marks)	1	1
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- Each Short answer question carries 5 marks in Section –A
- Each Essay question carries 10 marks in Section –B
- The Question papers setters are requested to cover all the topics in the syllabus stipulated as per the weightage given by us.

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**PRACTICAL SYLLABUS**

**Laboratory Course-VI**

<b>Practical Paper – V Analytical methods in chemistry-I Practical syllabus</b>	<b>PAPER CODE : CHE-501 P ACADEMIC YEAR-2022-2023</b>
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**Analytical methods in Chemistry-1-PRACTICAL SYLLABUS**  
(Skill Enhancement Course (Elective), Credits: 02)

Practical Hrs ;45 (3hr/W)

**I Learning Outcomes: On successful completion of this practical course, students shall be able to:**

- CO1.** Estimate Iron (II) using standard Potassium dichromate solution (PO1)
- CO2.** Learn the procedure for the estimation of total hardness of water (PO7)
- CO3.** Demonstrate the determination of chloride using Mohr's method (PO1, PO7)
- CO4.** Acquire skills in the operation and calibration of pH meter (PO1)

## **II Practical(Laboratory) Syllabus :( 30hrs)**

1. Estimation of Iron(II) using standard Potassium dichromate solution (using DPA indicator)
2. Estimation of total hardness of water using EDTA
3. Determination of chloride ion by Mohr's method
4. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid, (ii) Ammonium chloride-ammonium hydroxide.
6. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
7. Determination of dissociation constant of a weak acid.

## **II Lab References:**

1. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

### **SCHEME OF VALUATION**

**INTERNAL MARKS- Record-10M**

#### **1. EXTERNAL MARKS-40**

- **Practical -30M**
- **Viva questions = 10 M**

**TOTAL = 50 M**



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**Title of the Paper: Analytical Methods in Chemistry-2Semester: V/VI**

Course Code	CHE-502C-7B	Course Delivery Method	Class Room / Blended Mode
Credits	3	CIA Marks	30
No. of Lecture Hours / Week	3	Semester End Exam Marks	70
Total Number of Lecture Hours	45	Total Marks	100
Year of Introduction : 2022 - 23	Year of Offering: 2022 - 23	Year of Revision: -----	Percentage of Revision: 0

**Learning Outcomes: Students after successful completion of the course will be able to:**

**CO1.** Remember the basic concepts of Chromatography like paper, TLC, Column, GC & HPLC (PO7)

**CO2.** Understand the significance of paper, TLC, Column, GC & HPLC in separation and identification of compounds (PO1, PO7) .

**CO3.** Apply the conceptual knowledge gained in the techniques of chromatography in separating and identifying the chemical compounds as and when required (PO1).

**CO4.** Analyse that how far one chromatographic technique is much use full in separation and identification of compounds over the other chromatographic technique (PO1,PO7).

## Syllabus

### Course Details

Unit	Learning Units
I	<p><b>Chromatography-Introductionandclassification</b> (Marks weightage 10+5)</p> <p>Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, <math>R_f</math> values, factors affecting <math>R_f</math> values.</p>
II	<p><b>TLC and paper chromatography</b> (Marks weightage 10+10+5+5)</p> <p>1. Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.</p> <p>2. Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.</p>
III	<p><b>Column chromatography</b> (Marks weightage 10+10+5)</p> <p>1. Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications, factors affecting the column efficiency.</p> <p>2. Applications:- Separation of Methylene Blue and Fluorene by column chromatography.</p>
IV	<p><b>Gas chromatography:</b> (Marks weightage 10+5+5)</p> <p>Basic principles. Different types of GC techniques. Selection of columns and carrier gases. Instrumentation. Detectors- Thermal conductivity detector, Flame ionization detector, <math>R_f</math> values. Applications in the separation of amino acids &amp; estrogens</p>
V	<p><b>High Performance liquid chromatography (HPLC)</b> (Marks weightage 10+10+5)</p> <p>Basic principles. Normal and reversed Phases. Selection of column and mobile phase. Instrumentation. Detectors- RID, UV detector <math>R_f</math> values. Applications in the separation, separation of anions, barbiturates, tropane alkaloids.</p>

### III References

1. Fundamental so Analytical Chemistry by F. James Holler, Stanley R Crouch, Donald M. West and Douglas A. Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, Seventh edition, Wiley.
3. Quantitative analysis by R. A. Day Jr. and A. L. Underwood, Sixth edition, Pearson.
4. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition/Pearson.

**Text Books:**

1. Instrumental methods of chemical analysis by B K Sharma
2. Instrumental methods of chemical analysis by Gurudeep & Chatwal Anand

**Reference materials on the web/weblinks:**

1. [https://chem.libretexts.org/Bookshelves/Analytical\\_Chemistry/Supplemental\\_Modules\\_\(Analytical\\_Chemistry\)/Instrumental\\_Analysis/Chromatography/Gas\\_Chromatography](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Instrumental_Analysis/Chromatography/Gas_Chromatography)
2. <https://lab-training.com/hplc-high-performance-liquid-chromatography/>

**VICo-Curricular Activities:**

**a) Mandatory :** ( Lab/field training of students by teacher (lab: 10+ fields: 05):

**1. For Teacher:** Training of students by the teacher in laboratory and field for not less than 15 hours on the field techniques/skills of determination of hardness of water, using the calorimeter and/or Spectrophotometer, preparation of TLC plate, identification of spots in TLC and Paper chromatographic techniques, loading of column, selection of solvent system, separation of amino acids and dyes mixture using chromatographic techniques.

Google classroom created during instruction of course by the teacher concerned for sharing relevant material and conducting exams.

2.

**For Student:** Students shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the chromatographic techniques used for the separation of compounds. Write their observations and submit a handwritten fieldwork/project work report not exceeding 10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work: Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.

5. Unit tests (IE).

**b) Suggested Co-Curricular Activities**

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics).

3. Visits to facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts.

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**Model Paper**

<b>SEMESTER – V</b>	<b>PAPER-V</b>	<b>PAPER CODE : CHE-502-7B</b>
<b>PAPER TITLE : Analytical Methods in Chemistry-2 Paper 7B</b>		
<b>ACADEMIC YEAR-2022-2023</b>		

Time: 3Hours

Maximum marks: 70Minimum marks: 28

**SECTION-A**

**Answer any FOUR of the following. Each question carries 5 marks. 4X5=20**

1. What is the basic principle involved in chromatography, explain nature of adsorbents
2. How to prepare TLC plates
3. Explain Ascending and descending techniques in paper chromatography
4. Explain the classification of column chromatography
5. Explain the schematic diagram of G.C
6. Explain about detectors in G.C
7. Explain schematic diagram of HPLC

**SECTION-B**

**Answer any FIVE questions. Each question carries 10 marks. 5X10=50**

8. How do the chromatographic methods are classified? Explain any one
9. Discuss the applications of TLC
10. Explain the applications of paper chromatography
11. Explain the factors effecting the column efficiency in CC
12. Discuss the separation of methylene blue and fluorescein by CC
13. Explain the separation of Amino acids by G.C
14. Explain the different detectors used in HPLC
15. Explain the separation of Anions and Barbiturates by HPLC



**The Guidelines to be followed by the question paper setters in chemistry for the  
V- Semester - end exams**

<b>SEMESTER – V</b>	<b>PAPER-V</b>	<b>PAPER CODE : CHE-502C-7B</b>
<b>PAPER TITLE : Analytical Methods in Chemistry-2 Paper 7B</b> <b>ACADEMIC YEAR-2022-2023</b>		

Weightage for the question paper

syllabus	Section-A (Short answer questions)	Section-B (essay questions)
Unit-1 (15Marks)	1	1
Unit-2 (30Marks)	1+1	1+1
Unit-3 (25 Marks)	1	1+1
Unit-4 (20Marks)	1+1	1
Unit-5 ( 25 Marks)	1	1+1

- Each Short answer question carries 5 marks in Section –A
- Each Essay question carries 10 marks in Section –B
- The Question papers setters are requested to cover all the topics in the syllabus stipulated as per the weightage given by us.

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**PRACTICAL SYLLABUS**

**Laboratory Course-VII**

<b>Practical Paper – V Analytical methods in chemistry-2 Practical syllabus</b>	<b>PAPER CODE : CHE-502 P ACADEMIC YEAR-2022-2023</b>
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**Analytical methods in Chemistry-2**

**PRACTICAL SYLLABUS**

**(Skill Enhancement Course (Elective), Credits: 02)**

**Practical Hrs./Week: 3**

**Learning Outcomes:**

On successful completion of this practical course, students shall be able to:

**CO1.** Perform the separation of a given dye mixture using TLC (PO1)

**CO2.** Learn the preparation of TLC plates (PO1, PO7)

**CO3.** Demonstrate the separation of a mixture of amino acids using paper chromatography (PO1)

**CO4.** Acquire skills in using column chromatography for the separation of a dye mixture (PO7)

**II Practical (Laboratory) Syllabus: (30 hrs)**

1. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).

2. **Separation of different amino acids using paper chromatography.**

3. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.

4. **Estimation of Fe<sup>+2</sup> by using thiocyanate by calorimeter.**

5. **Separation of sugars using TLC**

6. Verification of Beer Lambert's law. (Using potassium permanganate solution) using colorimeter/spectrophotometer.

**III Lab References:**

1. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

2. Vogel A.I. Practical Organic Chemistry, Longman Group Ltd.

3. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
4. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
5. Mann F.G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

#### **SCHEME OF VALUATION**

**1. INTERNAL MARKS- Record-10M**

**2. EXTERNAL MARKS-40**

- **Practical-30M**
- **Viva questions = 10 M**

**TOTAL = 50 M**

SEMESTER – III (SDC)	PAPERCODE:SDCCHET01
PAPER TITLE : FOOD ADULTERATION	

**UNIT-I:**Total: 30Hrs (2h/week) 02 Credits

**Common Foods and Adulteration(10+10+5+5) 10Hrs**

Common Foods subjected to Adulteration-Adulteration-Definition –Types;Poisonous substances,Foreign matter, cheap substitutes, Spoiled parts.Adulteration through Food Additives –Intentional and incidental.General Impact on Human Health.

**UNIT-II :**

**Adulteration of Common Foods and Methods of Detection (10+10+5+5) 10Hrs**

Means of Adulteration Methods of Detection Adulterants in the following Foods; Milk,Oil, Grain, Sugar,Spices and Condiments, Processed Food, Fruits and Vegetables.Additives and Sweetening agents (at least three methods of detection for each food item).

**UNIT-III:**

**Present Laws and Procedures on Adulteration(10+10) 10Hrs**

Highlights of Food Safety and Standards Act 2006 (FSSA) –Food Safety and Standards Authority of India- Rules and Procedures of Local Authorities.Role of Voluntary Agencies Such as,Agmark, I.S.I. Quality control laboratories of Companies, Private testing laboratories, Quality control laboratories of Consumer co-operatives.

Consumer Education, Consumer's problems, rights and responsibilities, COPRA 2019- Offenses and Penalties-Procedures to Complain –Compensation to Victims.

Reference books and Websites:

1. A first course in Food Analysis – A.Y. Sathe, New Age International (p) Ltd, 1999
2. Food Safety, case studies – Ramesh.V.Bhat, NIN, 1992
3. [https://old.fssai.gov.in/Portals/0/Pdf/ Draft Manuals/ Beverages and Confectionary.pdf](https://old.fssai.gov.in/Portals/0/Pdf/Draft%20Manuals/Beverages%20and%20Confectionary.pdf)
4. <https://www.fssai.gov.in/>
5. <https://indianlegalsolution.com/laws-on-food-adulteration/>
6. <https://fssai.gov.in/dart/>
7. <https://byjus.com/biology/food-adulteration/>

<b>SEMESTER – III (SDC)</b>	<b>COURSE CODE:</b>
<b>PAPER TITLE : FOOD ADULTERATION</b>	

Time: 2 Hours

Maximum marks: 35

Pass marks:16

SECTION-A

Answer any THREE Questions. Each question carries 5 marks 3X5=15Marks

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

SECTION-B

Answer any TWO Questions. Each question carries 10 marks. 2X10=20M

- 7.
- 8.
- 9.
- 10.

**The Guidelines to be followed by the question paper setters in Chemistry for the  
II-Semester - end exams. ACADEMIC YEAR-2022-23**

Weightage for the question paper-FOOD ADULTERATION

syllabus	Section-A (Short answer questions)	Section-B (Essay questions)
Unit-1 (30Marks)	1+1	1+1
Unit-2 (30 Marks)	1+1	1+1
Unit-3 (20 Marks)	-----	1+1

- Each Short answer question carries 5 marks in Section –A
- Each Essay question carries 10 marks in Section –B
- The Question papers setters are requested to cover all the topics in the syllabus stipulated as per the weightage given by us.