

**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**

**ODD SEMESTER**

**27-10-2022**

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 27-10-2022 in the Department of Chemistry

*Sri. K.RAMESH* *Presiding*

Members Present:

- 1) *K. Ramesh* ..... 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,  
(Smt. 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. Giri Prasad* ..... Member Lecturer in Chemistry,  
(Dr. G.Giri prasad) A.GS.G.S.Degree College, Vuyyuru
- 8) *M. V. Santhi* ..... Member Lecturer in Chemistry,  
(Smt. M.V.Santhi) 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 I semester of I Degree B.Sc., Chemistry for the Academic year 2022-2023.
2. To recommend the syllabus and model papers for III semester of II Degree B.Sc., Chemistry for the Academic year 2022-2023.
3. To recommend the syllabus and model papers for V semester of III Degree B.Sc. Chemistry for the Academic year 2022-2023.
4. To recommend the Blue print of I,III,V 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 I,III,V Semester – end exams.
6. To recommend the teaching and evaluation methods to be followed under Autonomous status.
7. Any suggestions regarding certificate course, seminars, workshops, Guest lecture to be organized.
8. Recommend the panel of paper setters and Examiners to the controller of Examinations of
9. Any other matter.

K. Ramani  
Chairman

## RESOLUTIONS

1. It is resolved to follow the **syllabus of APSCHE (theory and practical) for I 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 III semesters of II B.Sc.** under Choice Based Credit System (CBCS) for the Academic year 2022--2023.
3. It is resolved to follow the **syllabus of APSCHE (theory and practical) for V 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 prints** as proposed by members of BOS I,III & V semester 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 I,III & V semesters of Degree B.Sc. for the Academic Year 2022-2023.
6. 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, 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).
  - 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 III B.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,III B.Sc.
  - There is no pass minimum for internal assessment for I, II, III B.Sc.
  - **Semester – End Examination:**
  - The maximum marks for I,III,V B.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 I,III & V semesters for I, II & III B.Sc for 50 marks.
7. Discussed and recommended for organizing certificate course, seminars, Guest lecturers, workshops to upgrade the knowledge of students, for the approval of the academic council.
  8. Discussed and empowered the Head of the department of Chemistry to suggest the panel of paper setters and examiners to the controller of examinations
  9. NIL.

  
**Chairman**

## RESOLUTIONS

1. It is resolved to follow the **syllabus of APSCHE (theory and practical) for I 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 III semesters of II B.Sc.** under Choice Based Credit System (CBCS) for the Academic year 2022--2023.
3. It is resolved to follow the **syllabus of APSCHE (theory and practical) for V 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 prints** as proposed by members of BOS I,III & V semester 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 I,III & V semesters of Degree B.Sc. for the Academic Year 2022-2023.
6. 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, 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).
- 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 III B.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,III B.Sc.
- There is no pass minimum for internal assessment for I, II, III B.Sc.

#### ➤ Semester – End Examination:

- The maximum marks for I,III,V B.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 I,III &V semesters for I, II & III B.Sc for 50 marks.
7. Discussed and recommended for organizing certificate course, seminars, Guest lecturers, workshops to upgrade the knowledge of students, for the approval of the academic council.
  8. Discussed and empowered the Head of the department of Chemistry to suggest the panel of paper setters and examiners to the controller of examinations
  9. NIL.

  
**Chairman**



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

## ARTS & SCIENCE

Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

**Title of the Paper: Inorganic & Physical Chemistry**

**Semester: I (60 Hr)**

Course Code	CHET11A	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 : 2021 - 22	Year of Offering: 2022 - 23	Year of Revision: -----	Percentage of Revision: 0

### Course outcomes:

- At the end of the course, the student will be able to;
- **CO1.** Understand the basic concepts of p-block elements.
- **CO2.** To compare the periodic properties of d and f block elements and explain the bonding and structures of metal carbonyls.
- **CO3.** To understand the properties and structure of Solid state.
- **CO4.** To understand the properties of gaseous and liquid states.
- **CO5.** To explain the properties of Solutions.

### Learning Objectives:

- To understand the preparation and structure of complex compounds.
- To explain the properties and structure of d and f block elements and understand the theories of bonding in metals
- To understand the symmetry in crystals and properties and structure of Solid state.
- To understand the properties and structure of gaseous and liquid states.
- To understand the properties of solutions.

## Syllabus

### Course Details

Unit	Learning Units	Lecture Hours
<b>INORGANIC CHEMISTRY</b>		<b>24h</b>
<b>I</b>	<p><b>Chemistry of p-block elements</b> <b>8h</b></p> <p>1.1 Group 13: Preparation &amp; structure of Diborane, Borazine 1.2 Group 14: Preparation, classification and uses of silicones 1.3 Group 15: Preparation &amp; structures of Phosphonitrilic halides {<math>(PNCl_2)_n</math> where <math>n=3, 4</math> 1.4 Group 16: Oxides and Oxoacids of Sulphur (structures only) 1.5 Group 17: Pseudohalogens, Structures of Interhalogen compounds.</p>	<b>8h</b>
	<p><b>d-block elements</b> <b>6h</b></p> <p>2.1 Characteristics of d-block elements with special reference to electronic configuration, 2.2 variable valence, magnetic properties, catalytic properties 2.3 and ability to form complexes. Stability of various oxidation states.</p>	<b>6h</b>
<b>II</b>	<p><b>f-block elements</b> <b>6h</b></p> <p>2.4 Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, 2.5 Magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, 2.6 actinide contraction, comparison of lanthanides and actinides.</p>	<b>6h</b>
	<p><b>Metals</b> <b>4h</b></p> <p>2.7 Valence bond theory and free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, 2.8 Band theory- formation of bands, 2.9 Explanations of conductors, semiconductors and insulators.</p>	<b>4h</b>
<b>Physical Chemistry</b>		<b>36h</b>
<b>III</b>	<p><b>Solid State</b></p> <p>3.1 Symmetry in crystals. Law of constancy of interfacial angles. 3.2 The law of rationality of indices. The law of symmetry. Miller indices, 3.3 Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. 3.4 X-ray diffraction and crystal structure. Bragg's law. Powder method. Defects in crystals.</p>	<b>10h</b>

	<b>3.5</b> Stoichiometric and non-stoichiometric defects.	
<b>IV</b>	<b>Gaseous state</b> <b>4.1</b> van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. <b>4.2</b> Critical phenomena. Relationship between critical constants and vander Waal's constants. <b>4.3</b> Law of corresponding states. Joule- Thomson effect. Inversion temperature.	<b>6h</b>
	<b>Liquid state</b> <b>4.4</b> Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid. <b>4.5</b> Classification of liquid crystals into Smectic and Nematic. <b>4.6</b> Application of liquid crystals as LCD devices.	<b>4h</b>
<b>V</b>	<b>Solutions, Ionic equilibrium &amp; dilute solutions</b> <b>Solutions</b> <b>5.1</b> Azeotropes-HCl-H <sub>2</sub> O system and ethanol-water system. Partially miscible liquids-phenol- water system. <b>5.2</b> Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. <b>5.3</b> Calculation of the partition coefficient. Applications of distribution law.	<b>6h</b>
	<b>Ionic equilibrium</b> <b>5.4</b> Ionic product, common ion effect, solubility and solubility product. <b>5.5</b> Calculations based on solubility product.	<b>3h</b>
	<b>Dilute solutions</b> <b>5.6</b> Colligative properties- RLVP, Osmotic pressure, Elevation in boiling point and depression in freezing point. <b>5.7</b> Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, <b>5.8</b> Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.	<b>7h</b>



## Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. Semester- end Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

## List of Reference Books

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E.Huheey
7. Basic Inorganic Chemistry by Cotton and Wilkinson
8. A textbook of qualitative inorganic analysis by A.I. Vogel
- 9.

Atkins, P.W. & Paula, J. de Atkin's Physical Chemistry Ed.,  
Oxford University Press 10th Ed (2014).

10. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
11. Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).
12. Barrow, G. M. Physical Chemistry

## WEB Links:

<https://ncert.nic.in/ncerts/l/kech204.pdf>

<https://www.askiitians.com/iit-jee-chemistry/general-properties-of-the-transition-elements-d-block/>

<https://www.nptel.ac.in/courses/104/104/104104101/>

<https://physicscatalyst.com/chemistry/vander-waals-equations.php>

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.  
(Accredited at "A" Grade by NAAC, Bangalore)**

**MODEL PAPER**

**FIRST YEAR B.Sc., DEGREE EXAMINATION**

**SEMESTER-I**

**CHEMISTRY Course-I: INORGANIC & PHYSICAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 75

**PART- A**

5 X 5 = 25 Marks

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

1. Explain the preparation & structures of Phosphonitrilic compounds.-L1
2. Explain in brief, catalytic properties & stability of various oxidation states of d- block elements.-L1
3. Write short note on Bravais lattices and crystal systems.-L2
4. What are Smectic & Nematic liquid Crystals? Explain.-L1
5. Write account on Common ion effect & Solubility product.-L1
6. Describe Andrew's isotherms of carbon dioxide. -L2
7. Explain Actinide Contraction. -L2
8. Explain the structure of Borazine. -L2

**PART- B**

5 X 10 = 50 Marks

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

9 (a). Explain Classification, Preparations & uses of Silicones.-L1  
(or)

- (b). (i) What are Pseudohalogens. -L1  
(ii) Explain the Structures of any one AX<sub>3</sub>& AX<sub>5</sub> interhalogen compounds. -L1

10 (a). What is Lanthanide Contraction? Explain the Consequences of Lanthanide Contraction. -L1  
(or)

- (b). (i) Explain the magnetic properties of d- block elements.

(ii) Explain about Conductors, Semi-Conductors & Insulators using Band Theory. **-L1**

11.(a). Write an essay on Crystal defects. **-L2**

(or)

(b). What is Bragg's Law. Explain the determination of structure of a crystal by powder method. **-L2**

12.(a). Derive the relationship between Critical constants & Vanderwaal constants **-L2**

(or)

(b).(i) Write any 5 differences between liquid crystals & liquids, solids

(ii) Write the applications of Liquid crystals. **-L2**

13.(a). Explain Nernst distribution Law. Explain its applications **-L2**

(or)

(b). What are colligative properties. Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point & depression in freezing point. –

**A.G. & S.G.SIDDHARTHA DEGREE  
COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.  
(Accredited at “A” Grade by NAAC, Bangalore)**

**MODEL PAPER**

FIRST YEAR B.Sc., DEGREE EXAMINATION

**SEMESTER-I**

**CHEMISTRY Course-I: INORGANIC & PHYSICAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 70

Answer all questions

1. (a) -10M L1  
(b) – 4M L2  
(or)  
(c) -10M L1  
(d) – 4M L2
2. (a) -10M L3  
(b) – 4M L2  
(or)  
(c) -10M L2  
(d) – 4M L3
3. (a) -10M L1  
(b) – 4M L2  
(or)  
(c) -10M L1  
(d) – 4M L2
4. (a) -10M L3  
(b) – 4M L1  
(or)  
(c) -10M L1  
(d) – 4M L3
5. (a) -10M L2  
(b) – 4M L2  
(or)  
(c) -10M L2  
(d) – 4M L2

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.  
(Accredited at “A” Grade by NAAC, Bangalore)**

**MODEL PAPER**

FIRST YEAR B.Sc., DEGREE EXAMINATION

**SEMESTER-I**

**CHEMISTRY Course-I: INORGANIC & PHYSICAL CHEMISTRY**

Time: 3 hours

Maximum Marks: 70

Section-A

Answer all questions .Each question carries 4 marks .....5 X 4 =20M

1. 4M  
(OR)  
4M
2. 4M  
(OR)  
4M
3. 4M  
(OR)  
4M
4. 4M  
(OR)  
4M
5. 4M  
(OR)  
4M

Section-B

Answer all questions .Each question carries 10 marks ..... 5 X 10 =50M

6. 10M  
(OR)  
10M
7. 10M  
(OR)  
10M
8. 10M  
(OR)  
10M
9. 10M  
(OR)  
10M
10. 10M  
(OR)  
10M

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.**

**(Accredited at “A” Grade by NAAC, Bangalore)**

**LABORATORY COURSE –I**

**Practical-I          ANALYSIS OF SALT MIXTURE      (At the end of Semester-I)**  
(Minimum of Six mixtures should be analyzed)

Credits:2

30 hrs (2 h / w)

10M+40M =50M

**Course outcomes:**

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

2. Understand the basic concepts of qualitative analysis of inorganic mixture
3. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
4. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

**Analysis of Salt Mixture**

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate.

Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Potassium and Ammonium.

**Co-curricular activities:**

1. To attain skill in semi-micro inorganic qualitative analysis students are made to analyze the same on chemicals used in everyday life.

**Reference Books :**

1. Dr. V.V. Ramanujan inorganic semi micro qualitative analysis, The National publishing company.
2. Vogel's text book of qualitative inorganic analysis, addition Wesley longman 7<sup>th</sup> edition 2001.



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

## ARTS & SCIENCE

Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

**Title of the Paper: ORGANIC CHEMISTRY & SPECTROSCOPY**

**Semester: III (60 Hr)**

Course Code	CHET31A	Course Delivery Method	Class Room / Blended Mode
Credits	3	CIA Marks	25
No. of Lecture Hours / Week	4	Semester End Exam Marks	75
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2021 - 22	Year of Offering: 2022 - 23	Year of Revision: -----	Percentage of Revision:

### Course outcomes:

Topics will include structure, stereochemistry, nomenclature, synthesis, properties, and reactions of the major classes of organic compounds. A mechanistic approach is used in the course to explain the reactions of these compounds.

Spectroscopy is general term used for the instrumental process by which information about molecular structure is obtained through careful analysis of absorption, scattering or emission of electromagnetic radiation by compounds.

### Learning Objectives:

1. Student will know the preparation, properties and reactions of halo alkanes, halo arenes and oxygen containing functional groups

2. Student Use the synthetic chemistry learnt in this course to do functional group transformations.
3. Will know the different types of carboxylic acids their preparations & properties
4. Knowing various applications of spectroscopy methods
5. Learn to apply spectroscopy to simple organic compounds

**Course Outcomes:**

At the end of this course, students should be able to:

CO1: Remember the preparations, properties and reactions of halo alkanes, halo arenes and oxygen containing functional groups.-**PO1**

CO2: Understand preparation, properties and reactions of carbonyl compounds -**PO1**

CO3: Apply preparation methods for carboxylic acids and their derivatives-**PO1**

CO4: Analyze various molecules and polyatomic molecules using different spectroscopy methods-**PO1, PO7**

CO5: Evaluate the functional groups of different organic compounds- **PO1, PO7**

CO6: Create applications of spectroscopy for various organic molecules- **PO1, PO7**



## Syllabus

### Course Details

Unit	Learning Units	Lecture Hours
I	<p><b>Chemistry of Halogenated Hydrocarbons</b></p> <p>Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions– SN<sup>1</sup>, SN<sup>2</sup> and SN<sup>i</sup> mechanisms with stereo chemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination, Williamson’s synthesis. Arylhalides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; S<sub>N</sub>Ar, Benzyne mechanism. Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.</p> <p><b>Alcohols &amp; Phenols</b></p> <p>Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt Blanc Reduction; Oxidation of diols by periodic acid and lead tetra acetate, Pinacol- Pinacolone rearrangement; Lucas Reagent</p> <p>Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe’s–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;</p>	<b>12 Hrs</b>
II	<p><b>Carbonyl Compounds</b></p> <p>Structure, reactivity, preparation and properties; Nucleophilic additions, with NaHSO<sub>3</sub>, Formation of alcohols, HCN, Grignard’s Reagent(RMgX), hemiacetals, Fehling’s, Tollen’s, 2,4-Di Nitro Phenyl hydrazine (2,4-DNPH) and formation of oximes Nucleophilic addition-elimination reactions with ammonia derivatives Mechanisms of Aldol and Benzoin condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann halo form reaction and Baeyer Villiger oxidation, α-substitution reactions, oxidations and reductions (Clemmensen, Wolff – kishner, with LiAlH<sub>4</sub> &amp; NaBH<sub>4</sub>). Addition reactions of α,β-unsaturated carbonyl compounds: Michael addition.</p> <p>Active methylene compounds: Keto- Enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.</p>	<b>10 hrs</b>
	<b>Carboxylic Acids and their Derivatives</b>	

III	<p>General methods of preparation, physical properties and reactions of mono carboxylic acids, effect of Substituents on acidic strength. Typical reactions of dicarboxylic acids, hydroxyl acids and unsaturated acids. Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group-Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Reform at sky reactions and Curtius rearrangement Reactions involving H, OH and COOH groups-salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, de carboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction.</p>	12 hrs
IV	<p><b>Molecular Spectroscopy:</b> Interaction of electromagnetic radiation with molecules and various types of spectra;</p> <p><b>Rotation spectroscopy:</b> Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.</p> <p><b>Vibrational spectroscopy:</b> Classical equation of vibration, computation of force constant, Harmonic and an harmonic oscillator, Morse potential curve,vibrational degrees of freedom molecules, modes of vibration. Selection rules for vibrational transitions, Fundamental frequencies, overtones and hot bands.</p> <p><b>Electronic spectroscopy:</b> Energy levels of molecular orbitals (<math>\sigma</math>, <math>\pi</math>, <math>n</math>). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore. Bathochromic and hypsochromic shifts.Beer-Lambert's law and its limitations.</p> <p><b>Nuclear Magnetic Resonance (NMR) spectroscopy:</b> Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.</p>	18 hrs
	<p><b>Application of Spectroscopy to Simple Organic Molecules</b> Application of visible, ultraviolet and Infrared</p>	

V	<p><b>spectroscopy in organic molecules.</b></p> <p>Application of electronic spectroscopy and Woodward rules for calculating <math>\lambda_{\text{max}}</math> of conjugated dienes and <math>\alpha, \beta</math> – unsaturated compounds.</p> <p>Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on <math>&gt;C=O</math> stretching absorptions).</p>	<b>8 hrs</b>
---	--	--------------

**Textbook:**

1. B.S.Bhal, Arun Bhal Advanced Organic Chemistry, Ramnagar, New Delhi 2001
2. P K Bruice. Organic Chemistry by Bruice, Pearson Education, Patparganj, Delhi-2001
3. Jonathan Clyden, Nick Greaves, Organic Chemistry by Clyden, Oxford University press
4. William Kempf, Spectroscopy by William Kemp, Palgrave, USA-3<sup>rd</sup> edition
5. Y R Sharma, Elementary Organic Spectroscopy, S Chand, 4<sup>th</sup> revised edition.

**Recommended Reference book:**

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)
3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

**Course Delivery method:** Face-to-face / Blended

**Course has focus on:**

Employability / Entrepreneurship

**Websites of Interest:**

1. <https://www.sydney.edu.au/science/chemistry/~george/halides.html>
- 2.

[https://chem.libretexts.org/Bookshelves/Organic\\_Chemistry/Organic\\_Chemistry\\_\(McMurry\)/17%3A\\_Alcohols\\_and\\_Phenols/17.00%3A\\_Introduction](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Organic_Chemistry_(McMurry)/17%3A_Alcohols_and_Phenols/17.00%3A_Introduction)

3.

<https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%2010.pdf>

4. <https://www.khanacademy.org/science/organic-chemistry/carboxylic-acids-derivatives/formation-carboxylic-acid-derivatives-sal/v/fisher-esterification?modal=1>
5. <https://byjus.com/chemistry/infrared-spectroscopy/>
6. <https://www.lehigh.edu/~kjs0/carey-13.PDF>

**Co-curricular Activities:**

Continuous Evaluation: Monitoring the progress of student's learning Class Tests Work sheets and Quizzes Presentations, Assignments and Group Discussions.

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.  
(Accredited at "A" Grade by NAAC, Bangalore)  
SEMESTER-III  
CHEMISTRY COURSE-III: ORGANIC CHEMISTRY &  
SPECTROSCOPY**

Time: 3 hours

Maximum Marks: 75

**PART- A**

**5 X 5 = 25 Marks**

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

1. Tell any two methods for preparation of aryl halides- **L1-CO1**
2. Summarize the mechanism for Pinacol-Pinacolone rearrangement-**L2-CO2**
3. Interpret the mechanism for Bayer-villiger oxidation reaction.-**L2-CO2**
4. Explain the effect of substituents on acidic strength of mono-carboxylic acids.-**L1-CO3**
5. Interpret the mechanism for Claisen Condensation reaction. **L2-CO3**
6. Tell the selection rules in rotational spectroscopy.-**L1-CO4**
7. Explain Spin – Spin coupling and Coupling Constant.-**L1-CO4**
8. Classify types of electronic transitions in UV spectroscopy.**L2- CO4**

**PART- B**

**5 X 10 = 50 Marks**

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

9 (a). Explain the mechanism & stereochemistry of SN1& SN2 reactions of alkyl halides with suitable example.**L1-CO1**

(or)

(b). Explain the following reactions with mechanism. **L1-CO1**

(i) Reimer-Tiemann reaction (ii) Fries rearrangement.

10 (a). Interpret the mechanism for following reactions.**L2-CO2**

(i) Perkin reaction. (ii) Cannizaro reaction

(or)

(b). Summarize the preparation and any three synthetic applications of diethyl malonate. **L2-CO2**

11. (a). Explain acid and base hydrolysis reaction of esters with mechanism. **L1-CO3**

(or)

(b). Explain the mechanisms of Curtius rearrangement & Arndt –Eistert reaction. **L1-CO3**

12. (a). (i) Tell a note on vibrational degrees of freedom for polyatomic molecules. **L1-CO4**

(ii) Explain different modes of vibrations & selection rules in IR spectroscopy.

(or)

(b). (i) Define Bathochromic shift. Explain the effect of conjugation in U.V. spectroscopy. **L1-CO4**

(ii) Describe the principle of NMR spectroscopy.

13. (a). Relate Woodward-Fieser rules for calculating  $\lambda_{\max}$  for conjugated dienes and  $\alpha,\beta$  – unsaturated carbonyl compounds , and apply them for one example each. **L2-CO5**

(or)

(b). (i) Summarize Fingerprint region and its significance with an example. (ii) Write IR spectral data for any one alcohol, aldehyde and ketone – **L2-CO5**

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.**

**(Accredited at “A” Grade by NAAC, Bangalore)**

**Title of the Paper**

**(ORGANIC PREPARATIONS AND IR SPECTRAL ANALYSIS)**

**Laboratory Course-III**

**Semester: III**

**Credits: 1**

**Hours Taught: 30 hrs. (2hr/W)**

**Max.Time : 2 Hours**

**Course Prerequisites (if any):** Basics of Organic Preparations and IR Spectroscopy

**Course Description:** Preparation of different organic compounds using conventional, Green approach methods and IR spectral analysis for different functional groups

**Course Objectives:**

1. Student will know the safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately.
2. Dispose of chemicals in a safe and responsible manner
3. Create and carry out work up and separation procedures

**Course Outcomes:** At the end of this course, students should be able to:

CO1: How to calculate limiting reagent, theoretical yield, and percent yield

CO2: How to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.

CO3: How to critically evaluate data collected to determine the identity, purity, and percent yield of products and to summarize findings in writing in a clear and concise manner

## Syllabus

### Course Details

Unit	Learning Units	Practical Hours
I	<b>Organic preparations:</b> i. Acetylation of one of the following compounds: amines (aniline, o-, m-, ptoluidines and o-, m-, p-anisidine) and phenols ( $\beta$ -naphthol, vanillin, salicylic acid) by any one method: a. Using conventional method. b. Using green approach ii. Benzoylation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) iii. Nitration of any one of the following: a. Acetanilide/nitrobenzene by conventional method b. Salicylic acid by green approach (using ceric ammonium nitrate).	20 Hr
II	<b>IR Spectral Analysis</b> IR Spectral Analysis of the following functional groups with examples a) Hydroxyl groups b) Carbonyl groups c) Amino groups d) Aromatic groups	10Hr

### Text Book

Laboratory Manual

**Course Delivery method:** Demonstration of Practical

**Course has focus on:**

Employability / Entrepreneurship

**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, 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./ Wk	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, 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





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

## ARTS & SCIENCE

Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

**Title of the Paper: Analytical Methods in Chemistry-I**

**Semester: V**

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	Lecture Hours
I	<p><b>Quantitative analysis-1</b> (Marks Weightage-10+5+5)</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, preparing solutions- Standard solution, primary standards and secondary standards.</p> <p>3. Description and use of common laboratory apparatus- volumetric flask, burette, pipette, beakers, measuring cylinders.</p>	<b>10 Hr</b>
II	<p><b>Quantitative analysis-2</b> (Marks Weightage-10+10+5)</p> <p>1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complexometric, iodometric and precipitation titrations-choice of indicators for the saturations.</p> <p>2. Principles of gravimetric analysis: precipitation, coagulation, peptization, co-precipitation, post precipitation, digestion, filtration, and washing of precipitate, drying and ignition.</p>	<b>12 Hr</b>
III	<p><b>Treatment of analytical data</b> (Marks Weightage-10+10+5)</p> <p>Types of errors- Relative and absolute, significant figures and its importance, accuracy – methods of expressing accuracy, errors- Determinate and indeterminate and minimization of errors, precision-methods of expressing precision, standard deviation and confidence limit.</p>	<b>8 Hr</b>
IV	<p><b>Separation techniques</b> (Marks Weightage-10+10+5+5)</p>	<b>5 Hr</b>

	<p>1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application-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, COD, determination of chloride using Mohr's method</p>	<b>10Hr</b>

### III References

1. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA.Schug,Seventh edition, Wiley.
2. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
3. Text book of Environmental Chemistry and Pollution Control by S.S.Dara andD.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 acid 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:** Student 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, 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.

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

**(AUTONOMOUS), VUYYURU.**

**(Accredited at "A" Grade by NAAC, Bangalore)**

**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

- 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.

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE (AUTONOMOUS),  
VUYYURU.**

**(Accredited at "A" Grade by NAAC, Bangalore)**

**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>
---	---

### **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, student 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. Text book 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\_**





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

Vuyyuru-521165

NAAC reaccredited at "A" level

Autonomous -ISO 9001 – 2015 Certified

**Title of the Paper: Analytical Methods in Chemistry-2**

**Semester: V**

<b>Course Code</b>	<b>CHE-502C-7B</b>	<b>Course Delivery Method</b>	<b>Class Room / Blended Mode</b>
Credits	<b>3</b>	CIA Marks	30
No. of Lecture Hours / Week	<b>3</b>	Semester End Exam Marks	<b>70</b>
Total Number of Lecture Hours	<b>45</b>	Total Marks	<b>100</b>
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	Lecture Hours
I	<p><b>Chromatography-Introduction and classification</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>	7 hr
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>	12 hr
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>	10 Hr
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>	8 hr

V	<b>High Performance liquid chromatography (HPLC)</b> <b>(Marks weightage 10+10+5)</b> Basic principles. Normal and reversed Phases. Selection of column and mobile phase. Instrumentation. Detectors- RID, UV detector $R_f$ values. Applications in the separation, separation of anions, barbiturates, tropane alkaloids.	<b>8 Hr</b>
---	---	-------------

### III References

1. Fundamental so Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M. Westand Douglas A.Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA.Schug, Seventh edition, Wiley.
3. Quantitative analysis by R.A.Day Jr. and A.L.Underwood, Sixth edition, Pearson.
4. Text book 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/web links:

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/>

### VI Co-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:** Student 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 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, 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.

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

**(AUTONOMOUS), VUYYURU.**

**(Accredited at “A” Grade by NAAC, Bangalore)**

**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: 70

Minimum 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 C C
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.

**A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS), VUYYURU.**

**(Accredited at “A” Grade by NAAC, Bangalore)**

**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>
---	---

**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, student 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 mixture of amino acids using paper chromatography (PO1)

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

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

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. Text book 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.Gand 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**



<b>SEMESTER – III (SDC)</b>	<b>PAPERCODE:SDCCHET01</b>
<b>PAPER TITLE : FOOD ADULTERATION</b>	

**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 Suchas, 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, COPRA2019- 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/](https://old.fssai.gov.in/Portals/0/Pdf/Draft%20Manuals/Beverages%20and%20Confectionary.pdf) Draft Manuals/ Beverages and Confectionary.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/>

A.G. & S.G.SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE (AUTONOMOUS), VUYYURU.  
ACADEMIC YEAR-2022-23

<b>SEMESTER – III (SDC)</b>	<b>COURSE CODE:SDCCHET01</b>
<b>PAPER TITLE : FOOD ADULTERATION</b>	

Time: 2 Hours

Maximum marks: 40

Pass marks:

SECTION-A

Answer any TWO Questions. Each question carries 5 marks. 2X5=10Marks

- 1.
- 2.
- 3.
- 4.

SECTION-B

Answer any THREE Questions. Each question carries 10 marks. 3X10=30M

- 5.
- 6.
- 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 (30 Marks)	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.