

Dr. V. S. Krishna Govt. Degree College
(Autonomous)
Visakhapatnam-13

(Affiliated To Andhra University, Visakhapatnam)

Department of Chemistry
Revised Syllabus For Courses in Chemistry under
CBCS

Board of Studies
2022-23

Dr. V. S. Krishna Govt. Degree College (Autonomous), Visakhapatnam

Recommended Composition of the Board of Studies of chemistry and its functions

(Academic year 2022 – 2023)

Department: Chemistry

Subject: Chemistry

I Composition

MEMBER	NAME & DESIGNATION
Head of the Department (Chairman)	Dr. A V RAMESH
Faculty Members	1. Dr. Ch. S. Anuradha 2. Dr. M. Gopi 3. Smt. D. S. L. Prasanna 4. Sri. K. Nageswara Rao 5. Dr. N. Sankara Rao 6. Sri. T. Appa Rao 7. Dr. G. Lakshmana Rao 8. Sri. Ch. V. SaiKrishna 9. Sri. Y. Venkatesh 10. Dr. B. Sudhamsa Prabhakar
Subject Expert (University Nominee)	Dr. P. Srinivasa Rao, Associate Professor, School of chemistry, A.U.
Subject Experts (from outside the parent university)	Sri D Adi Narayana Lecturer in Chemistry GDC, Srikakulam (men)
	Sri S Dilleswara rao Lecturer in Chemistry GDC, Tuni
Member from Industry	Sri I. Bhaskara Reddy, Plant Head, Admiron Life Sciences, Visakhapatnam.
Member from Alumni	Dr. Dr. Sathish Mohan Botsa, Research Scientist B, NCAOR, Goa
Coordinator, IQAC	Dr. Ch. Lalitha, Lecturer in Micro Biology
Coordinator, Academic Council	Dr. P. Latha, Lecturer in Physics
Chairperson, Academic Council	Dr. I. Vijaya Babu Principal

II. Term.

The term of the nominated members shall be two years.

III. Meeting

The Principal of the College shall draw the schedule for meeting of the Board of Studies for different Departments. The meeting may be scheduled as and when necessary but at least once a year.

IV. Functions

The Board of Studies of a Department in the College shall:

- a) Prepare syllabus and various courses keeping in view the objectives of the College interest of the stakeholders and national requirement for consideration and approval of the Academic Council.*
- b) Suggest methodologies for innovative teaching and evaluation techniques.*
- c) Suggest panel of names to the Academic Council for appointment of examiners.*
- d) Coordinate research, Teaching, Extension and other academic activities in the Department / College.*

Dr. V. S. Krishna Govt. Degree College (A)

Department of Chemistry

Minutes of board of studies (BOS) meeting 2021-22 on 30.09.2022 at 3.00 PM

In pursuance of conferment of Autonomous status to Dr. V. S. Krishna Govt. Degree College (A), Visakhapatnam by the UGC vide letter No. F22-1/2011(AC) dated 20.07.2011 from Dr. Manju Singh, Joint Secretary, UGC, New Delhi and Proceedings No. C-II (1) / Dr. V S Krishna College (A)/ 2022 dt.03.08.2022 of The Vice-Chancellor, Andhra University, Visakhapatnam, the 8th Board of Studies in Chemistry Subject is conducted on 30.09.2022 through offline at Dr. V. S. Krishna Govt. Degree College (A), at 3.00 PM.

Venue: Conference Hall, Dt: 30. 10. 2022, Friday – 3.00 PM.

Dr. A. V Ramesh, H O D Dept. of chemistry, University Nominee Dr. P. Srinivasa Rao, Associate Professor, School of chemistry, A.U., Subject Experts i) Sri D Adi Narayana, Lecturer in Chemistry, GDC, Srikakulam (men), ii) Sri S Dilleswara Rao, Lecturer in Chemistry, GDC, Tuni, **Member from Industry** Sri I. Bhaskara Reddy, Plant Head., Admiron Life Sciences Pvt. Ltd., Visakhapatnam., **Member from Alumni** Dr. Dr. Sathish Mohan Botsa, Research Scientist B, NCAOR, Goa, Coordinator- IQAC, Dr. Ch. Lalitha, Lecturer in Micro Biology, **Coordinator, Academic Council** Dr. P. Latha, Lecturer in Physics, **Chairperson, Academic Council** Dr. I. Vijaya Babu, Principal, and all the faculty members of Chemistry Department attended the meeting.

Agenda:

- To discuss the Semester System and Choice Based Credit System (CBCS) being implemented for the past 07 years, i.e., w.e.f. 2015-16.
- To discuss and approve the Continuation/Modifications of the syllabus for the Odd & Even Semesters of I, II & III Years for 2022-23.
- Grant of Extra credits for Online SWAYAM MOOCs etc.
- Syllabus, Model Question Papers and Model Blue Prints for I, II, III, IV, V and VI Semesters.
- Teaching learning methodology by 75:25 (External: Internal) ratio for the present I, II- and III-Year Students w.e.f. 2022-23 as per C I A SOP issued by APCCE.
- Panel of paper setters and examiners.
- Proposals for Community Service Projects/Extension activities for the benefit of the society.
- Department action plan for 2021-22.
- To discuss and resolve the minor modifications/refinement if any, in the Chemistry cluster electives CI, CII & CIII as majority of the students opting this cluster as their choice.

Any Other Proposal with the Permission of the Chairman.

Resolutions:

The following agenda items are discussed and resolutions are made:

- 1) To continue the Revised Choice Based Credit System as per the staff council proceedings for the academic year 2022 – 2023 for Semester I, II, III, IV, V and VI of B. Sc. students.*
- 2) To implement guidelines of academic council and adopt NEP – 2020.*
- 3) To approve and implement the newly framed syllabus approved by the B.O.S. for the B. Sc. Degree course in Chemistry with effect from academic year 2022 – 2023. The newly framed syllabus is oriented in such a way that it caters the needs of the students and to meet the present-day employability and to develop professionalism and enhance skills in the field of chemistry.*
- 4) To approve and ratify the syllabus of B. Sc. Degree Chemistry for the 2021-22 admitted batch.*
- 5) To approve and ratify the 5th 6th semester syllabus of B. Sc. Degree Chemistry for the 2020-21 admitted batch.*
- 6) To continue the semester mode pattern of examinations for Semester I, II, III, IV, V and VI students of the existing groups M.P.C., CBZ, M.C. IC, MBBTC, MBBC, BTBC, BTBCC & B.SC CHEMISTRY(HONORS). Further it is approved and ratified syllabus, blue print and the model question papers submitted by the concerned faculty members for Semester I, II, III, IV, V and VI.*
- 7) To approve the continuous internal assessment pattern in accordance with SOP issued by APCCE.*
- 8) To approve and ratify value-added certificate course for the academic year 2022-23.*
- 9) To approve and ratify new employable and skill-based programs from 2022-23.*
- 10) To approve and ratify life skill courses, skill development courses for the 1st and 2nd year students (B.A., B.Com. and B.Sc.) Chem. (hons.) and Chemistry minors for Physics (hons.).*
- 11) To approve and ratify Community Services Project at the end of II semester and internship -I at the end of IV semester for 2022-23. And also approve and ratify the internship during 6th semester.*
- 12) To approve and ratify question paper blue print which is prepared based on bloom's taxonomy, model question papers for 75 external marks and 25 internal marks for core courses.*
- 13) To approve and ratify blue print which is prepared based on bloom's taxonomy and the model question papers for 50 external marks for life skill and skill development courses.*
- 14) To approve and ratify list of external examiners.*
- 15) To approve suggestions for innovative teaching based on pedagogy and evaluation techniques.*
- 16) To approve suggestions for students' seminars, workshops and student- centered activities.*
- 17) To approve suggestions for research and extension activities or start-up.*
- 18) To encourage students to take up independent research projects at their level by providing facilities.*

- 19) To adopt NAAC norms by introducing quality circles among student communities.
- 20) To develop infrastructure facilities, lab facilities in the department and implement guidelines of the academic council.
- 21) To take up ICT mode of teaching and evolve techniques that are easily understood by the students and conduct remedial coaching to the below average students.
- 22) To encourage students to join JKC to equip with communication skills and improve their personality development.
- 23) To encourage students to participate in the community development activities such as Haritha Krishna Eco Club, NCC and NSS.

Signatures of the members

MEMBER	NAME & DESIGNATION	SIGNATURE
Head of the Department (Chairman)	Dr. A V RAMESH	A.V. Ramesh
Faculty Members	1. Dr. Ch. S. Anuradha 2. Dr. M. Gopi 3. Smt. D. S. L. Prasanna 4. Sri. K. Nageswara Rao 5. Dr. N. Sankara Rao 6. Sri. T. Appa Rao 7. Dr. G. Lakshmana Rao 8. Sri. Ch. V. SaiKrishna 9. Sri. Y. Venkatesh 10. Dr. B. Sudhamsa Prabhakar	Ch. S. Anuradha M. Gopi S.L. Prasanna N. Sankara Rao T. Appa Rao G. Lakshmana Rao Ch. V. SaiKrishna Y. Venkatesh B. Sudhamsa Prabhakar
Subject Expert (University Nominee)	Dr. P. Srinivasa Rao, Associate Professor, School of chemistry, A.U.	P. Srinivasa Rao
Subject Experts (from outside the parent university)	Sri D Adi Narayana Lecturer in Chemistry GDC, Srikakulam (men)	D. Adi Narayana
	Sri S Dilleswara Rao Lecturer in Chemistry, GDC, Tuni	S. Dilleswara Rao
Member from Industry	Sri I. Bhaskara Reddy, Plant Head, Admiron Life Sciences, Visakhapatnam.	I. Bhaskara Reddy
Member from Alumni	Dr. Sathish Mohan Botsa, Research Scientist B, NCAOR, Goa	S. Mohan Botsa
Coordinator, IQAC	Dr. Ch. Lalitha, Lecturer in Micro Biology	Ch. Lalitha
Coordinator, Academic Council	Dr. P. Latha, Lecturer in Physics	P. Latha
Chairperson, Academic Council	Dr. I. Vijaya Babu Principal	I. Vijaya Babu

**DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (AUTONOMOUS),
VISAKHAPATNAM**

**REVISED SYLLABUS OF B. Sc. CHEMISTRY
UNDER CBCS FRAMEWORK WITH EFFECT FROM 2022-2023**

Programme: B. Sc. with Chemistry as one of the Core Subjects.

Discipline: Chemistry

Structure of Chemistry

YE AR	SEMES TER	COU RSE	COURSE CODE	TITLE	MARK S	CRE DITS
I	I	I		Inorganic and Physical Chemistry	100	04
				Practical-I	50	01
	II	II		Organic and General Chemistry	100	04
				Practical-II	50	01
II	III	III		Organic Chemistry and Spectroscopy	100	04
				Practical-III	50	01
	IV	IV		Inorganic, Organic and Physical Chemistry	100	04
				Practical-IV	50	01
	IV	V		Inorganic and Physical Chemistry	100	04
				Practical-V	50	01

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

(To choose one pair from the three alternate pairs of SECs)

Code	Course NO.	Name of Course	Th/ Wee k	I E Ma rks	E E Mar ks	Cre dits	Prac. Hrs. /Wk	Mar ks	Cred its
	6A	Unit Processes in Organic Synthesis – I	4	25	75	4	2	50	1
	7A	Unit Processes in Organic Synthesis – II	4	25	75	4	2	50	1

Or

	6B	Electro Chemistry	4	25	75	4	2	50	1
	7B	Corrosion and Its Prevention	4	25	75	4	2	50	1

Or

	6C	Medicinal Chemistry	4	25	75	4	2	50	1
	7C	Pesticides and Green Chemistry	4	25	75	4	2	50	1

Or

	6C	Medicinal Chemistry	4	25	75	4	2	50	1
	7C	Pesticides and Green Chemistry	4	25	75	4	2	50	1

Note-1: For Semester–V, for the domain subject Chemistry, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A&7A or 6B&7B or 6C&7C. 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.

ANNEXURE - II CBCS CURRICULAR FRAMEWORK (2020 - 21 ONWARDS) - BACHELOR OF SCIENCES														
Subjects		SEM I		SEM II		SEM III		SEM IV		SEM V		SEM VI		
		Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	Hrs/W	Credits	
Languages														
English		4	3	4	3	4	3							
Language (H/T/S)		4	3	4	3	4	3							
Life Skill Courses		2	2	2	2	2+2	2+2							
Skill Development Courses		2	2	2+2	2+2	2	2							
Major 1	Core 1,2,3,& 4	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1					
Major 2	Core 1,2,3,& 4	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1					
Major 3	Core 1,2,3,& 4	4+2	4+1	4+2	4+1	4+2	4+1	4+2	4+1					
Major 1	Core -5							4+2	4+1					
Major 2	Core -5							4+2	4+1					
Major 3	Core -5							4+2	4+1					
Major 1	Skill Enhancement Courses (6 & 7)									4+2	4+1			
Major 2	Skill Enhancement Courses (6 & 7)									4+2	4+1			
Major 3	Skill Enhancement Courses (6 & 7)									4+2	4+1			
Hrs/W (Academic Credits)		30	25	32	27	32	27	36	30	36	30		12	
Project Work														
Extension Activities (Non														
NCC/NSS/Sports/Extra Curricular								2						
Yoga						1		1						
Extra Credits														
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30		12	

THIRD PHASE of APPRENTICESHIP
Entire 5th / 6th Semester

FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).

DEPARTMENT OF CHEMISTRY

DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM

SYLLABUS FOR B. Sc. Chemistry SEMESTER – 1

(w.e.f. Academic Year 2022-2023) Credits: 4

Course I (Inorganic & Physical Chemistry) 60 hrs. (4h/w)

Learning objectives:

1. To learn the structures the concepts of p – block elements and to understand the importance of inter halogen compound.
2. Student learn the various properties of d & f – block elements.
3. To understand the classification of solids and to study the crystal structures.
4. The conceptual study of real gases, continuity of states, liquification of gases.
5. Student learn the concept of liquid crystals and their applications.
6. To learn the nature of solutions and the principle involved in distillation process,
7. Students can able to learn the abnormal molecular weights of some solutes.

Course outcomes:

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

1. Understand the basic concepts of p-block elements
2. Understand the uses silicones and inter halogen compounds.
3. Differentiate solid, liquid and gases in terms of intermolecular Interactions.
4. Students can able to understand the concept of conductors and insulators.
5. Classify the differences and similarities between various d block elements and similarly are able to compare and differentiate 4f & 5f block elements.
6. Learnt the structures of various types of crystals.
7. Understand the concept of critical phenomenon and deviations from ideal behaviour.
8. Understand the abnormal molecular weights of solutes are corrected by using Van't Hoff factor.

MODULE I

Chemistry of p-block elements

8h

General study on classification of hydrides as ionic, covalent, interstitial.

Group 13: Preparation & structure of Diborane, Borazine

Group 14: Preparation, classification and uses of silicones, Silanes, Graphitic compounds.

Group 15: Preparation & structures of Phosphonitrilic halides $\{(PNCl_2)_n\}$, where $n=3, 4, \dots$

Group 16: Oxides and Oxoacids of Sulphur (structures only)

Group 17: Pseudo halogens, Structures of Interhalogen compounds.

MODULE II

1. Chemistry of d-block elements: 6h

Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes Stability of various oxidation states.

2. Chemistry of f-block elements: 6h

Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides -electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4h

Valence bond theory and Free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.

MODULE III

Solid state 10h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. X-ray diffraction and crystal structure. structure of ZnS, CaF₂, Bragg's law. Powder method. Defects in crystal. Stoichiometric and non-stoichiometric defects. Tetrahedral and octahedral voids.

MODULE IV

1. Gaseous state 8h

van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Other equations of states-The Kamerlingh-Onnes, The Berthelot Equation (equations only). Relationship between critical constants and Vander Waal's Constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

2. Liquid state 4h

Liquid crystals, mesomorphic state. Differences between liquid crystal and solid/liquid.

Classification of liquid crystals into Smectic and Nematic. Application of liquid crystals as LCD devices.

MODULE V

1. Solutions 6h

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol- water system. Critical solution temperature (CST), Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium 3h

Ionic product, common ion effect, solubility and solubility product. Calculations based on solubility product.

3. Dilute solutions

5h

Colligative properties- RLVP, Osmotic pressure, Elevation in boiling point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boiling point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

CO CURRICULAR ACTIVITIES & 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.

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 Chemist

LABORATORY COURSE -I 30 hrs

Credits 1

(2 h/w)

Qualitative inorganic analysis (Minimum of Six mixtures should be analysed) 50 M

Course outcomes:

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

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

Analysis of SALT MIXTURE

50 M

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.







BLUE PRINT

Based on Bloom's taxonomy the paper should comprises as following:

Knowledge & Understanding: 50%

Application & Analysis: 30%

Evaluate: 20%

Bloom's criteria	Weightage	Module I	Module II	Module III	Module IV	Module V
Knowledge	30%	1 Essay	1 Essay		1 Essay	2 shorts
Understanding	20%	1 Essay	1 short	1 Essay	1 short	
Application	20%			1 Essay	1 short	1 Essay
Analysis	15%	1 short	1 Essay	1 short	1 Essay	
Evaluate	15%		1 short			1 Essay

S. NO	MODULES	No. of Essay questions (10 M)	No. Of Short questions (5 M)	Total Marks
1	Chemistry of p-block elements	2	1	15
2	Chemistry of d-block elements & Chemistry of f-block elements:	1	2	20
3	Theories of bonding in metals:	1		
4	Solid state	2	1	15
5	Gaseous state	1	1	20
6	Liquid state	1	1	
7	Solutions & Ionic equilibrium	1	1	20
8	Dilute solutions	1	1	
	TOTAL	10	8	90 (75)

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
MODEL QUESTION PAPER

SEMESTER 1 -COURSE I (INORGANIC & PHYSICAL CHEMISTRY) -Max. Marks 75

SECTION -- A

Answer any **FIVE** Questions from the following.

5 X 5 = 25 M

1. Explain phosphonitrilic halides with examples.
2. Give the differences between 4f block and 5f block elements.
3. Describe briefly actinoid contraction.
4. Explain Weiss indices and Miller indices.
5. Discuss briefly Joule Thomson effect.
6. Give the applications Liquid crystals.
7. Define solubility product, write the relationship between solubility and solubility product of BaCl_2 .
8. Describe briefly abnormal colligative properties.

SECTION -- B

Answer **ALL** the Questions from the following.

5 X 10 = 50 M

9. (a) Discuss the preparation of Silicones. Write the uses of Silicones.
(Or)
(b) What are inter halogen compounds. Explain the structures of Inter halogen Compounds
10. (a) Explain Lanthanoid contraction. Give the consequences of lanthanoid contraction.
(Or)
(b) Describe band theory of solids. Explain conductors, semiconductors and insulators briefly with examples.
11. (a) write a brief account on crystal defects.
(Or)
(b) Derive Bragg's equation. Explain powder method to determine the crystal Structure.
12. (a) Derive the relationship between Vander wall's constants and critical constants.
(Or)
(b) What are Liquid crystals. Give the classification of liquid crystals.
13. (a) Explain Nernst distribution law. Give its applications.
(Or)
(b) What are colligative properties. How you determine the molecular weight of a non-volatile solute by using colligative properties.

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER II
COURSE II: ORGANIC CHEMISTRY AND GENERAL CHEMISTRY
(w.e.f. Academic Year 2022-2023)

Credits 4

60 hrs (4 h / w)

Learning objectives:

On completion of this course, the students will be able to understand:

- LO 1:** Basic of organic molecules, structure, bonding, reactivity and reaction mechanisms.
- LO 2:** Stereochemistry of organic molecules – conformation and configuration, asymmetric molecules and nomenclature.
- LO 3:** Aromatic compounds and aromaticity, mechanism of aromatic reactions.
- LO 4:** Hybridization and geometry of atoms, 3-D structure of organic molecules, identifying chiral centers.
- LO 5:** Reactivity, stability of organic molecules, structure, stereochemistry.
- LO 6:** Electrophile, nucleophiles, free radicals, electronegativity, resonance, and intermediates along the reaction pathways.
- LO 7:** Mechanism of organic reactions (effect of nucleophile/leaving group, solvent), substitution vs. elimination.

Course outcomes:

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

- CO 1:** Illustrating methodologies for the synthesis of alkanes, alkenes and alkynes.
- CO 2:** Draw the various conformations of alkanes and cycloalkanes and predict the relative stabilities.
- CO 3:** Describe different types of additions and elimination reactions in unsaturated hydrocarbons.
- CO 4:** Recognise the type of mechanism & intermediates involved in the given organic reaction.
- CO 5:** Predict the regiospecificity of several alkene addition reactions using Markovnikov's rule.
- CO 6:** Understand the concept of aromaticity and identifies the aromatic compounds.
- CO 7:** Explain the various electrophilic substitutions in aromatic compounds.
- CO 8:** Interpret the effect of substituents on orientation and reactivity of benzene.
- CO 9:** Define and explain surface- and interfacial phenomena.
- CO 10:** Predict the hybridisation and geometries of the molecule.
- CO 11:** Know the bond order, bond length, bond dissociation energy.

CO 12: Understand the metal-ligand interactions and reactivity in metal complexes using HSAB.

CO 13: Write the inter conversions between different molecular representations.

CO 14: Identify the chiral centres, enantiomers and diastereomers and meso compounds.

CO 15: Know the relation between symmetry and chirality.

CO 16: Calculate the number of optical isomers for the given chiral compound.

CO 17: Assign D/L, R/S, cis-trans or E/Z configuration to the given compound.

Module 1

Recapitulation of Basics of Organic Chemistry

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes) 12h

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, Free radical substitutions; Halogenation, concept of relative reactivity v/s selectivity. Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane). General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of monosubstituted (methyl) cyclohexane and disubstituted (dimethyl) cyclohexane.

Module 2

Carbon-Carbon pi Bonds (Alkenes and Alkynes) 12h

General methods of preparation, physical and chemical properties. Mechanism of E1, E2, E1cb reactions, Saytzeff and Hoffmann eliminations, Electrophilic Additions, mechanism (Markownikoff/ Anti-markownikoff addition) with suitable examples, syn and anti-addition; addition of H₂, X₂, HX. Oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, epoxide formation with peracids, hydroxylation, metal-ammonia reductions.

Diels Alder reaction, 1,2- and 1,4-addition reactions in conjugated dienes. Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Module 3

Benzene and its reactivity 12h

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism

of electrophilic aromatic substitution, mechanism of halogenation, nitration, sulphonation, Friedel-Craft's alkylation and acylation. Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens (Explanation by taking minimum of one example from each type)

Module 4

Surface chemistry and chemical bonding

1. Surface chemistry 6h

Colloids- Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number. Adsorption-Physical and chemical adsorption, Langmuir adsorption isotherm, applications of adsorption.

2. Chemical Bonding 6h

Valence bond theory, hybridization, VB theory as applied to ClF_3 , $\text{Ni}(\text{CO})_4$, Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo and hetero nuclear diatomic molecules (N_2 , O_2 , CO , NO , CN)

3. HSAB 2h

Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

Module 5

Stereochemistry of carbon compounds 10h

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae. Optical isomerism: Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation. Chirality - definition and criteria for optical activity - Definition and characteristics of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane. Calculation of number of possible optical isomers for 2,3-dibromo pentane, Tartaric acid and 2,3,4-trihydroxy glutaric acid. (Enantiomers, diastereomers, meso forms). Relative configuration, Absolute configuration and E, Z-configuration with examples. Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques).

List of Reference Books Theory:

1. Solomons, T.W G., Fryhle, B. Craig. Organic Chemistry, John Wiley & Sons, Inc (2009).

2. McMurry, J.E. Fundamentals of Organic Chemistry, Seventh edition Cengage Learning, 2013.
3. Pine S. H. Organic Chemistry, Fifth Edition, McGraw Hill, (2007
4. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
7. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.
8. Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

LABORATORY COURSE-II

30hrs (2 h / w)

Practical-II Volumetric Analysis

(At the end of Semester-II)

Learning objectives:

1. To estimate the metal ions by volumetric methods employing redox and acid-base titration concepts.
2. To get hands on experience for the systematic qualitative analysis of the organic compounds.

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 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 KMnO_4 .

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Course II: Organic Chemistry and General Chemistry

Important Tips for Setting Question Paper

- ✓ The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.
- ✓ It is suggested that the question writer should use his/her judgment in assigning difficulty value to each question. Following scale should guide you to set questions at different difficulty levels and use the Bloom's Taxonomy action verbs given below.

Bloom's Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
% of Weightage	30	20	20	15	10	5

Question Paper Pattern

- ✓ The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks.

- ✓ The examiner has to choose 2 question from each module.

Sl. No	Modules	Name of the Module	5 M Questions	Question Serial Number	10 M Questions	Question Serial Number	Weightage per Module
1	1	Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)	2	1, 2	2	9 (a) or 9 (b)	20 Marks
2	2	Carbon-Carbon pi Bonds (Alkenes and Alkynes)	2	3, 4	2	10 (a) or 10 (b)	20 Marks
3	3	Benzene and its reactivity	1	5	2	11 (a) or 11 (b)	15 Marks
4	4	Surface chemistry and chemical bonding	2	6, 7	2	12 (a) or 12 (b)	20 Marks
5	5	Stereochemistry of carbon compounds	1	8	2	13 (a) or 13 (b)	15 Marks

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
 Revised Bloom's Taxonomy Definitions and Action Verbs

Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Choose	Classify	Apply	Analyze	Agree	Adapt
Define	Compare	Build	Assume	Appraise	Build
Find	Contrast	Choose	Categorize	Assess	Change
How	Demonstrate	Construct	Classify	Award	Choose
Label	Explain	Develop	Compare	Choose	Combine
List	Extend	Experiment with	Conclusion	Compare	Compile
Match	Illustrate	Identify	Contrast	Conclude	Compose
Name	Infer	Interview	Discover	Criteria	Construct
Omit	Interpret	Make use of	Dissect	Criticize	Create
Recall	Outline	Model	Distinguish	Decide	Delete
Relate	Relate	Organize	Divide	Deduct	Design
Select	Rephrase	Plan	Examine	Defend	Develop
Show	Show	Select	Function	Determine	Discuss
Spell	Summarize	Solve	Inference	Disprove	Elaborate
Tell	Translate		Inspect	Estimate	Estimate
What			List	Evaluate	Formulate
When			Motive	Explain	Happen
Where			Relationships	Importance	Imagine
Which			Simplify	Influence	Improve
Who			Survey	Interpret	Invent
Why			Take part in	Judge	Make up
			Test for	Justify	Maximize
			Theme	Mark	Minimize
				Measure	Modify
				Opinion	Original
				Perceive	Originate
				Prioritize	Plan
				Prove	Predict
				Rate	Propose
				Recommend	Solution
				Rule on	Solve
				Select	Suppose
				Support	Test
				Value	Theory

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing, Abridged Edition. Boston, MA: Allyn and Bacon.

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
MODEL PAPER

B. Sc, DEGREE FIRST YEAR EXAMINATIONS
Paper-II, SEMESTER-II

ORGANIC CHEMISTRY AND GENERAL CHEMISTRY

Time: 3 hours

Maximum Marks: 75

PART-A

5 X 5 = 25 Marks

Answer any FIVE of the following questions.

1. Define Corey House synthesis and give one examples.
2. Draw the various conformations of cyclohexane. Give their order of stability.
3. What is Markonikov's rule? Explain with suitable example.
4. Write short note on acidity of alkynes.
5. Define the ortho, para and meta directing groups and give examples.
6. Discuss the Pearson's principle and give one example.
7. What is gold number and interpret its importance.
8. Write briefly about specific rotation?

PART-B

5 X 10 = 50 Marks

Answer ALL the questions.

- 9 (a) Explain the photochemical Halogenation of alkanes with mechanism.
(or)

(b) Discuss Bayer's strain theory.

- 10 (a) Explain the mechanism of E1 and E2 reactions with suitable examples.
(or)

(b) What is Diels Alder reaction and explain 1,2- & 1,4- HBr addition reactions of 1, 3- butadiene with mechanism.

- 11 (a) Define Huckel's rule and explain the aromaticity of Benzenoid and Non - Benzenoid compounds with at least two examples each.

(or)

(b) Explain the mechanisms of nitration and Friedel-Craft's alkylation of benzene.

- 12 (a) Construct molecular orbital diagrams for O₂ and CO diatomic molecules.

(or)

(b) Derive Langmuir adsorption isotherm equation.

- 13 (a) Explain CIP rules and assign R-S configuration to the glyceraldehyde and lactic acid.

(or)

(b) What is racemic mixture and explain any two methods for the resolution of racemic mixture.

Dr. V. S. Krishna Govt. Degree & PG College (A)

Visakhapatnam- 530 013,

SEMESTER - III

Course III (ORGANIC CHEMISTRY & SPECTROSCOPY) 60hrs (4 h / w)

➤ Course outcomes:

- At the end of the course, the student will be able to;
- Understand preparation, properties and reactions of haloalkanes, haloarenes and oxygen containing functional groups.
- Use the synthetic chemistry learning this course to do functional group transformations.
- To propose plausible mechanisms for any relevant reaction.
- Understand preparation, properties and reactions of haloalkanes, haloarenes and oxygen containing functional groups.
- Use the synthetic chemistry learning this course to do functional group transformations.
- To propose plausible mechanisms for any relevant reaction

ORGANIC CHEMISTRY

34h

UNIT – I

Chemistry of Halogenated Hydrocarbons:

6h

Alkyl halides: Methods of preparation and properties, nucleophilic substitution reactions— N1, SN2 and SNi mechanisms with stereo-chemical aspects and effect of solvent etc.; nucleophilic substitution vs. Elimination, Williamson's synthesis.

Aryl halides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; SNAr, Benzyne mechanism. Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Alcohols & Phenols

6h

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt Blanc Reduction; Commercial preparation of ethyl alcohol as a solvent Oxidation of diols by periodic acid and lead tetra acetate, Pinacol- Pinacolone rearrangement; Phenols: Preparation and properties; Acidity

and factors effecting it, Rings substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

UNIT-II

Carbonyl Compounds

10h

Structure, reactivity, preparation and properties; Nucleophilic additions, 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, Wolf-Kishner, with LiAlH_4 & NaBH_4). Addition reactions of α , β -unsaturated carbonyl compounds: Michael addition. Comparison of reactivities of aldehydes and ketones and their reactivity with the hydrocarbons. Active methylene compounds: Keto-Enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.

UNIT-III

Carboxylic Acids and their Derivatives

12h

General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of Substituents on acidic strength. Typical reactions of dicarboxylic acids, hydroxy 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, Reformatsky 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 Hunsdiecker reaction, decarboxylation by Schmidt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard-Zelinsky reaction.

SPECTROSCOPY

26 h

UNIT-IV

Molecular Spectroscopy:

18h

Interaction of electromagnetic radiation with molecules and various types of spectra;

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

Vibrational spectroscopy: Classical equation of vibration, computation of force constant, Harmonic and anharmonic oscillator, Morse potential curve, vibrational degrees of freedom for polyatomic molecules, modes of vibration. Selection rules for vibrational transitions, Fundamental frequencies, overtones and hot bands.

Rotation -vibration spectra of simple molecules

Electronic spectroscopy: Energy levels of molecular orbitals (σ , π , n). 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.

Nuclear Magnetic Resonance (NMR) spectroscopy: 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.

UNIT-V

8h

Application of Spectroscopy to Simple Organic Molecules Application of visible, ultraviolet and infrared spectroscopy in organic molecules. Application of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes and α , β – unsaturated compounds.

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 $>\text{C}=\text{O}$ stretching absorptions).

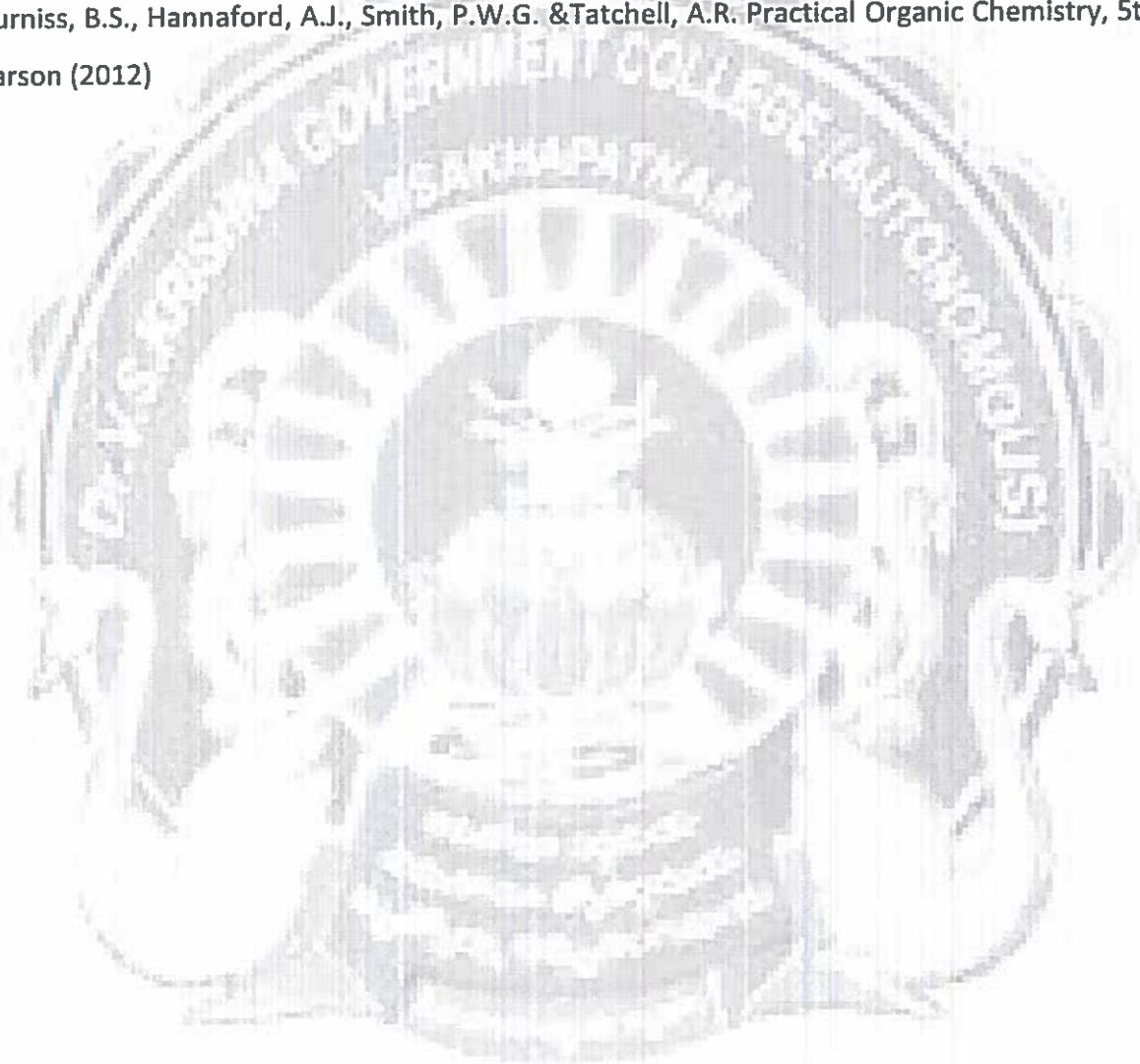
Co-curricular activities and Assessment Methods

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 Reference Books

1. A Text Book of Organic Chemistry by Bahl and Arunbahl
2. A Text Book of Organic chemistry by I L Finar Vol I
3. Organic chemistry by Bruice
4. Organic chemistry by Clayden

5. Spectroscopy by William Kemp
6. Spectroscopy by Pavia
7. Organic Spectroscopy by J. R. Dyer
8. Elementary organic spectroscopy by Y.R. Sharma
9. Spectroscopy by P.S.Kalsi
10. Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster
11. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
12. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)



LABORATORY COURSE -III 30hrs (2 h / w)

Practical Course-III Organic preparations and IR Spectral Analysis

(At the end of Semester- III)

Course outcomes:

On the completion of the course, the student will be able to do the following:

1. how to use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. how to calculate limiting reagent, theoretical yield, and percent yield
3. how to engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately
4. how to dispose of chemicals in a safe and responsible manner
5. How to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
6. how to create and carry out work up and separation procedures
7. 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

I. Organic preparations:

40M

1. Acetylation of one of the following compounds: amines (aniline, o-, m-, p-toluidines and o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any one method: a.) Using conventional method. B) Using green approach
2. Benzoylation of one of the following amines (aniline, o-, m-, p-toluidines and o-, m-, p-anisidine)
3. Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method
Salicylic acid by green approach (using ceric ammonium nitrate).

II. IR Spectral Analysis

10M

IR Spectral Analysis of the following functional groups with examples: Hydroxyl groups Carbonyl groups, Amino groups, and Aromatic groups.

For W

[Signature]

Dr. V. S. Krishna Govt. Degree & PG College (A)

Visakhapatnam- 530 013

SECOND YEAR B.Sc., DEGREE EXAMINATION

MODEL PAPER - 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. Discuss two methods for preparation of aryl halides.
2. Explain the mechanism for Pinacol-Pinacolone rearrangement.
3. Discuss the mechanism for Bayer-villiger oxidation reaction.
4. Explain the effect of substituents on acidic strength of mono-carboxylic acids.
5. Write the mechanism for Claisen Condensation reaction.
6. Write the selection rules in rotational spectroscopy.
7. Explain Spin – Spin coupling and Coupling Constant.
8. Explain types of electronic transitions in UV spectroscopy.

PART- B

5 X 10 = 50 Marks

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

9(a). Give the mechanism & stereochemistry of SN^1 & SN^2 reactions of alkyl halides with suitable example.

(or)

9(b). Explain the following reactions with mechanism.

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

10(a). Discuss the mechanism for following reactions.

(i) Perkin reaction. (ii) Cannizzaro reaction

(or)

10(b). Write the preparation and any three synthetic applications of diethyl malonate.

11(a). Explain acid and base hydrolysis reaction of esters with mechanism.

(or)

11(b). Explain the mechanisms of Curtius rearrangement & Arndt –Eastern reaction.

12(a). (i) Write a note on vibrational degrees of freedom for polyatomic molecules.

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

(or)

12(b). (i) Define Bathochromic shift. Explain the effect of conjugation in U.V. spectroscopy.

(ii) Discuss the principle of NMR spectroscopy.

13(a). Write Woodward-Fieser rules for calculating λ_{max} for conjugated dienes and α, β – unsaturated carbonyl compounds, and apply them for one example each.

(or)

13(b). (i) What is Fingerprint region. Explain its significance with an example. (ii) Write IR spectral data for any one alcohol, aldehyde and ketone.

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CHEMISTRY COURSE -IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks.

The examiner has to choose 2 question from each Module

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

The examiner is requested to give equal importance to easy, moderate and difficult questions.

MODULE	5 MARKS QUESTION S	QUESTIO N SERIAL NUMBER	10 MARKS QUESTIONS	QUESTION SERIAL NUMBER	TOTAL MARKS
1	1	1	1 (1 OUT OF 2 INTERNAL CHOICE)	9	15
2	1	2	1 (1 OUT OF 2 INTERNAL CHOICE)	10	15
3	2	3, 4	1 (1 OUT OF 2 INTERNAL CHOICE)	11	20
4	2	5, 6	1 (1 OUT OF 2 INTERNAL CHOICE)	12	20
5	2	7, 8	1 (1 OUT OF 2 INTERNAL CHOICE)	13	20

Weightage for each level of Bloom's Taxonomy

Bloom's Taxonomy level	Type of question	Weightage
Knowledge /Remember	(Define/ list /state) type.	15 marks
Comprehension / Understand	(Classify, describe, discuss, identify, explain, report) type	30 marks
Application	(Solve, Sketch, interpret) type. Sums & Mechanisms	20 marks
Analysis	(Differentiate, distinguish, Compare) type.	15 marks
Evaluation	Argue, Defend, judge,	10marks
Create	Derive, Design, construct, Develop, formulate, investigate	

DEPARTMENT OF CHEMISTRY

DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM

Syllabus For B. Sc. Degree Semester - 4 Course 4 (Inorganic, Organic and Physical Chemistry)
(w.e.f. Academic Year 2022-2023)

Credits: 4

Teaching Hours: 60 Hours (4h / W)

Course outcomes:

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

1. Classify organometallic Compounds based on the C – M bonding types.
2. Explain the preparation and structural aspects of Metal carbonyls
3. Explain the structures of glucose and fructose.
4. Draw the scheme of reactions for inter conversion of one carbohydrate to another carbohydrate
5. Classify and explain the physical and chemical properties of amino acids.
6. Explain the structure of protein.
7. Describe the aromatic character, preparation methods, and chemical properties of Furan, Pyrrole, Thiophene, and Pyridine.
8. Explains Tautomerism in nitro compound.
9. Explain the basic nature, preparation methods, and chemical properties of amines.
10. Discuss about the laws of absorption of light energy by molecules and the subsequent photo chemical reactions.
11. Explain the concept of quantum efficiency and mechanisms of photochemical reactions.
12. Explain the laws of thermodynamics
13. Describes Heat capacities, Joule-Thomson effect, Kirchhoff's equation, Nernst heat theorem, and Helmholtz and Gibbs energies
14. Explains Carnot cycle and its efficiency.
15. Explains entropy changes in reversible and irreversible processes and Criteria for spontaneity.

UNIT - I Organometallic Compounds

8h

Definition and classification of organometallic Compounds on the basis of bond type, Concept of hapticity of organic ligands. Structures of methyl lithium, Zeiss salt and ferrocene.

Metal carbonyls: 18 electron rule, electron count of mono nuclear, poly nuclear and substituted metal carbonyls of 3d series. General methods of preparation of mono and binuclear carbonyls of 3d series. π -acceptor behaviour of carbon monoxide. Synergic effects (VB approach) - (MO diagram of CO can be referred to for synergic effect to IR frequencies).

UNIT – II Carbohydrates

8h

Occurrence, classification of carbohydrates, reducing and non-reducing sugars. Monosaccharides: Glucose and Fructose, their open chain structure, epimers and anomers, mutarotation, Haworth projections and; Inter-conversions of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation; Disaccharides– Elementary treatment of maltose, lactose and sucrose. Polysaccharides–Elementary treatment of starch.

UNIT- III Amino acids - proteins and Heterocyclic Compounds

13H

III. A. Amino acids and proteins (6H)

Classification of Amino Acids, Zwitterion structure and isoelectric point. General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Gabriel Phthalimide synthesis, c) strecker's synthesis. Overview of Primary, Secondary, Tertiary and Quaternary structure of proteins. Determination of primary structure of peptides, determination of N-terminal amino acid (by DNFB) and C-terminal amino acid (by carboxypeptidase enzyme).

III B. Heterocyclic Compounds (7H)

Heterocyclic Compounds: definition: Aromatic character and Preparation of Furan, Thiophene and pyrrole by Paul-Knorr synthesis.

Properties: Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Diels Alder reaction in furan.

Pyridine – Structure - Basicity - Aromaticity- Comparison with pyrrole- - Reactivity towards Nucleophilic substitution reaction.

UNIT- IV Nitrogen Containing Functional Groups

(14H)

IV A. Nitro hydrocarbons (3H)

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitro alkanes leading to aci and keto form, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Micheal addition and reduction.

IV B. Amines: (11H)

Introduction, classification, chirality in amines (pyramidal inversion), importance and general methods of preparation. Properties: Physical properties, Basicity of amines: Effect of substituent, solvent and steric effects. Distinction between Primary, secondary and tertiary amines using

Hinsberg's method and nitrous acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann- Bromamide reaction, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann elimination reaction and Cope elimination.

Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, and cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).

UNIT- V Photochemistry and Thermodynamics

17H

V A. Photochemistry: (5H)

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).

V B. Thermodynamics (12H)

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- Kirchhoff'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.

Co-curricular activities and Assessment Methods

Continuous Evaluation: Monitoring the progress of student's learning Class Tests, Work sheets 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 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
6. Concise Inorganic Chemistry by J.D.Lee
7. Advanced Inorganic Chemistry Vol-I by Satya Prakash, Tuli, Basu and Madan
8. A Text Book of Organic Chemistry by Bahl and Arunbahl
9. A Text Book of Organic chemistry by I L FinarVol I
10. A Text Book of Organic chemistry by I L FinarVol II
11. Advanced physical chemistry by Gurudeep Raj

LABORATORY COURSE -IV

Semester- IV- Practical Course-IV Organic Qualitative analysis

50 M

Credits: 1

Teaching Hours: 30 Hours (2H / W)

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

Organic Qualitative analysis

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

F. S. Raw
Q.

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CHEMISTRY COURSE -IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

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Analysis	(Differentiate, distinguish, Compare) type.	15 marks
Evaluation	Argue, Defend, judge,	10marks
Create	Derive, Design, construct, Develop, formulate, investigate	

MODEL PAPER
SECOND YEAR B.Sc., DEGREE EXAMINATION
SEMESTER-IV

CHEMISTRY COURSE -IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

Time: 3 hours

Maximum Marks: 75

PART- A

Answer any 5 of the following questions. Each carries 5 marks: 5 X 5 = 25 Marks

1. Explain the structure of nickel carbonyl.
2. Compare epimers and anomers with suitable examples.
3. Discuss about zwitter ion.
4. Discuss the Paul-Knorr synthesis.
5. Explain Tautomerism shown by nitro alkanes
6. Discuss the basic nature of amines.
7. Differentiate and Compare thermal and photochemical reactions.
8. Derive heat capacities and derive $C_p - C_v = R$

PART- B

Answer ALL the questions. Each carries TEN marks 5 X 10 = 50 Marks

- 9.(a). What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples.

(or)

- (b). Discuss the general methods of preparations of mono & bi-nuclear carbonyls of 3d series.

- 10.(a). Discuss various reactions that support the straight chain structure of glucose.

(or)

- (b). (i) Explain Ruff's degradation. Explain Kiliani- Fischer synthesis.

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

(or)

- (b). Discuss the aromatic character of Furan, Thiophene and Pyrrole.

12. (a). Write the mechanism for the following.

(i) Nef reaction

(ii) Mannich reaction

(or)

- (b). Write any two methods for the preparation of amines and Explain Hinsberg separation of amines.

- 13.(a). What is quantum yield? Explain the quantum for the reaction between of Hydrogen- Chlorine and Hydrogen - Bromine.

(or)

- (b) Explain Carnot cycle.

SEMESTER - IV

Course V (INORGANIC & PHYSICAL CHEMISTRY) 60 hrs (4h / w)

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 values
2. Application of quantization to spectroscopy.
3. Various types of spectra and the structure determination.

INORGANIC CHEMISTRY 26 Hrs.

Module-I 12 Hrs

Coordination Chemistry

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, Spectrochemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Tetragonal distortion of octahedral geometry, Jahn-Teller distortion, square planar coordination.

Module-II 14 Hrs

1. Inorganic Reaction Mechanism (4 Hrs)

Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions - SN^1 and SN^2 , Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications

2. Stability of metal complexes (2 Hrs)

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.

3. Bioinorganic Chemistry: 8 Hrs

Metal ions present in biological systems, classification of elements according to their action in biological system. Sodium/K- pump, carbonic anhydrase and carboxypeptidase.

Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its application

in bio-systems, Haemoglobin, Myoglobin. Storage and transfer of iron.

PHYSICAL CHEMISTRY

34 Hrs

Module-III

1 .Phase rule

6 Hrs.

Concept of phase, components, degrees of freedom. 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, freezing mixtures.

Module-IV

Electrochemistry

14 Hrs

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-Onsager's equation for strong electrolytes. 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

Module-V

Chemical Kinetics:

14 Hrs

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. Half-life of a reaction. General 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 & key model. Michaelis-Menten equation- derivation, significance of Michaelis-Menten constant.

Co-curricular activities and Assessment Methods Continuous Evaluation: Monitoring the progress of student's learning Class Tests, Work sheets 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 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.deAtkin'sPhysicalChemistryEd.,OxfordUniversityPress
10thEd(2014).
11. Castellan,G.W.PhysicalChemistry4thEd.Narosa(2004).
12. Mortimer,R. G.PhysicalChemistry3rdEd. Elsevier:NOIDA,UP(2009).
13. Barrow,G.M.PhysicalChemistry

SEMESTER - IV

Course V

LABORATORY COURSE

30hrs (2 h / w)

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

1. **Conductometric titration-** Determination of concentration of HCl solution using standard NaOH solution.
2. **Conductometric titration-** Determination of concentration of CH_3COOH Solution using standard NaOH solution.
3. **Conductometric titration-** Determination of concentration of CH_3COOH and HCl in a mixture using standard NaOH solution.
4. **Potentiometric titration-** Determination of Fe (II) using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis.

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CHEMISTRY COURSE -V: (INORGANIC & PHYSICAL CHEMISTRY)

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered. PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks .

The examiner has to choose 2 question from each Module

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

The examiner is requested to give equal importance to easy, moderate and difficult questions.

MODULE	5 MARKS QUESTIONS	QUESTION SERIAL NUMBER	10 MARKS QUESTIONS	QUESTION SERIAL NUMBER	TOTAL MARKS
1	1	1	1 (1 OUT OF 2 INTERNAL CHOICE)	9	15
2	1	2	1 (1 OUT OF 2 INTERNAL CHOICE)	10	15
3	2	3, 4	1 (1 OUT OF 2 INTERNAL CHOICE)	11	20
4	1	5, 6	1 (1 OUT OF 2 INTERNAL CHOICE)	12	20
5	2	7, 8	1 (1 OUT OF 2 INTERNAL CHOICE)	13	20

Weightage for each level of Bloom's Taxonomy

Bloom's Taxonomy level	Type of question	Weightage
Knowledge /Remember	(Define/ list /state) type.	25 marks
Understanding	(Classify, describe, discuss, identify, explain, report) type	50 marks
Application	(Solve, Sketch, interpret) type. Sums & Mechanisms	10 marks
Analysis	(Differentiate, distinguish, Compare) type.	15 marks

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
REVISED UG SYLLABUS UNDER CBCS

(W.e.f. Academic Year, 2022-23)

PROGRAMME: THREE YEAR B.Sc. 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	Chemistry-1	3	25	75	3	3	50	2
	7C	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

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.

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY
Course6-A: Synthetic Organic Chemistry (Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify the importance of reagents used in the synthesis of organic compounds.
2. Acquire knowledge on basic concepts indifferent types of pericyclic reactions.
4. Understand the importance of retro synthesis in organic chemistry.
5. Comprehend the applications of different reactions in synthetic organic chemistry.

II. Syllabus :/ Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Module 1: Per cyclic reactions

12 hours

A brief introduction to synthetic organic chemistry, Features and classification of per cyclic reactions: Phases, nodes and symmetry properties of molecular orbital's in ethylene, 1, 3-butadiene, 1, 3, 5-hexatriene, alkylation and ally radical. Thermal and photochemical reactions.

Electrocyclic reactions: Definition and examples, definitions of con and dis rotation, Frontier Molecular Orbital (FMO) Method and its applications to cyclization of $4n \pi$ and $(4n + 2) \pi$ electron systems.

Cyclo addition reactions: Definition and examples, definitions of supra facial and antara facial addition, Frontier Molecular Orbital (FMO) Method and its applications to cycloaddition of $4n \pi$ and $(4n + 2) \pi$ electron systems.

Module 2: Organic photochemistry

8hours

Jablonski diagram-singlet and triplet states, Photochemistry of Carbonyl compounds- $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions, Norrish type-1 and type-2 reactions, Paterno – Buchi reaction.

Module 3: Retro synthesis

12 hours

Important terms in Retro synthesis with examples-Disconnection, Target molecule, FGI, Synthon, Retro synthetic analysis, chemo selectivity, region selectivity. Importance of Order of events in organic synthesis Retro synthetic analysis of the compounds: a. cyclohexene, b. 4-Nitro toluene, c. Paracetamol.

Module 4: Synthetic Reactions

8hours

Shapiro reaction, Stork - enamine reaction (only alkylation), Wittig reaction, Robinson annulation, Bailys-Hillman reaction, Heck reaction, Suzuki coupling. Synthesis of aldehydes and ketones using 1, 3-Dithiane.

Module 5: Reagents in Organic Chemistry

10 hours

Oxidizing agents: PCC, PDC, SeO_2 (Riley oxidation), NBS. Reducing agents: LiAlH_4 (with mechanism), LTBA, Metal-solvent reduction (Birch reduction), Catalytic reduction.

III. References

1. Pericyclic reactions by Ian Fleming, Second edition, Oxford University press.
2. Pericyclic Reactions-A Text book: Reactions, Applications and Theory by S. Sankararaman, WILEY-VCH.
3. Reaction Mechanism in Organic Chemistry by S.M. Mukherji and S.P. Singh, Revised edition, Trinity Press.
4. Pericyclic reactions-A Mechanistic study by S. M. Mukherji, Macmillan India.
5. Organic synthesis: The disconnection approach by Stuart Warren, John Wiley & Sons.
6. Organic chemistry by Jonathan Clayden, Nick Greeves and Stuart Warren, Second edition, Oxford university press.
7. Reactions, Reagents and Rearrangements by S.N. Sanyal, Bharati Bhawan Publishers & Distributors.

Course6-A: Synthetic Organic Chemistry-PRACTICAL SYLLABUS IV. Learning Outcomes:

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

1. Perform the organic qualitative analysis for the detection of N, S and halogens using the green procedure.
2. Learn the procedure for the separation of mixture of amino acids using paper Chromatography.
3. Prepare the TLC plates for TLC chromatography.
4. Acquire skills in conducting column chromatography for the separation of dyes in the given mixture.

V. Practical (Laboratory) Syllabus :(30hrs) (Max.50 Marks)

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
3. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
4. Separation of mixture of methyl orange and methyl orange by column chromatography
5. Separation of food dyes using Column Chromatography
6. Separation of triglycerides using TLC

VI. Lab References:

1. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F. G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

VII. 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 detection of N, S and halogens using the green procedure, preparation of TLC plates, detection of organic compounds using R_f values in

TLC/ paper chromatography, loading of column, selection of solvent system for column chromatography, separation of amino acids and dye mixture using chromatographic techniques.

2. **For Students:** Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observes the synthetic reactions. 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.*
4. Unit tests (IE).

b) Suggested Co-Curricular Activities

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

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Course6-A: Synthetic Organic Chemistry

Important Tips for Setting Question Paper

- ✓ The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.
- ✓ It is suggested that the question writer should use his/her judgment in assigning difficulty value to each question. Following scale should guide you to set questions at different difficulty levels and use the **Bloom's Taxonomy** action verbs given below.

Bloom's Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
% of Weightage	30	20	20	15	10	5

Question Paper Pattern

- ✓ The Semester question paper consists of 2 sections.

PART-A: Consists of **EIGHT** short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of **FIVE** internal choice essay questions. Each question carries 10 marks.

- ✓ The examiner has to choose 2 question from each module.

SI. No	Modules	Name of the Module	5 M Questions	Question Serial Number	10 M Questions	Question Serial Number	Weightage per Module
1	Module 1	Pericyclic reactions)	2	1, 2	2	9 (a) or 9 (b)	20 Marks
2	Module 2	Organic photochemistry	2	3, 4	2	10 (a) or 10 (b)	20 Marks
3	Module 3	Retro synthesis	1	5	2	11 (a) or 11 (b)	15 Marks
4	Module 4	Synthetic Reactions	2	6, 7	2	12 (a) or 12 (b)	20 Marks
5	Module 5	Reagents in Organic Chemistry	1	8	2	13 (a) or 13 (b)	16 Marks

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
MODEL PAPER
B. Sc, DEGREE THIRD YEAR EXAMINATIONS
SEMESTER – V
Course6-A: Synthetic Organic Chemistry

Time: 3 hours

Maximum Marks: 75

PART-A

5 X 5 = 25 Marks

Answer any FIVE of the following questions.

1. Construct the π – molecular orbitals of 1, 3-butadiene and assign symmetry elements.
2. Give the differences between thermal and photochemical reactions.
3. What is Paterno – Buchi reaction and give example.
4. Write short note on singlet and triplet states.
5. Define the terms disconnection, synthon and target molecule.
6. Discuss about Wittig reaction.
7. Write briefly Stork - enamine reaction.
8. Explain allylic bromination with NBS reagent with mechanism.

PART-B

5 X 10 = 50 Marks

Answer ALL the questions.

9. a) What is electrocyclic reactions and explain $4n \pi e^-$ electrocyclization using Woodward-Hoffmann selection rules.
(Or)
b) What is cyclo addition reactions and explain $(4 \pi + 2 \pi)$ cycloaddition using Woodward-Hoffmann selection rules.
10. a) Discuss various physical processes in Jablonski diagram.
(Or)
b) Explain Norrish type-1 and type-2 reactions with suitable examples.
11. a) Give the retro synthetic analysis of cyclohexene.
(Or)
b) Give the retro synthetic analysis of 4-Nitro toluene.
12. a) Explain Bailys-Hillman reaction and Heck reaction with mechanism.
(Or)
b) Explain Shapiro reaction and Suzuki coupling with mechanism.
13. a) Discuss about the PCC and SeO_2 oxidations.
(Or)
b) Discuss about the LiAlH_4 reduction with mechanism.

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)

PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY

Course7-A: Analysis of Organic Compounds

(Skill Enhancement Course (Elective), Credits: 05) Max Marks: 100+50

I. Learning Outcomes:

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

1. Identify the importance of mass spectrometry in the structural elucidation of organic compounds.
2. Acquire the knowledge on structural elucidation of organic compounds.
3. Understand various chromatography methods in the separation and identification of organic compounds.
4. Demonstrate the knowledge gained in solvent extraction for the separate the organic compounds.

II. Syllabus : (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Mass Spectrometry

10 hours

A brief introduction to analysis of organic compounds

Basic principles, Instrumentation - Mass spectrometer, electron Ionization (Electron Impact ionization, EI), Molecular ions, metastable ions, Isotope abundance. Basic fragmentation types. Fragmentation patterns in Toluene, 2-Butanol, But aldehyde, Propionic acid.

Unit-2:

- 8hours

Structural elucidation of organic compounds using IR, NMR, mass spectral data of 2, 2, 3, 3-Tetra methyl butane, Butane-2, 3-dione, Prop ionic acid and methyl propionate.

Unit-3:

8 hours

Structural elucidation of organic compounds using IR, NMR, Mass spectral data of Phenyl acetylene, acetophenone, amiciacid and p-nitro aniline.

Unit-4: Separation techniques-1

12 hours

1. Solvent extraction-Principle and theory, Batch extraction technique, application of batch extraction in the separation of organic compounds from mixture- acid & neutral, base & neutral.
2. Chromatography- Principle and theory, classification, types of adsorbents, eluents, R_f values and factors affecting R_f values.
3. Thin layer chromatography-principle, experimental procedure, advantages and applications.

Unit-5: Separation techniques-2

12 hours

1. Paper chromatography- Principle, experimental procedure, ascending, descending, radial and two dimensional, applications.
2. Column chromatography-Principle, classification, experimental procedure, applications. 3. HPLC-Principle, Instrumentation-block diagram and applications.

III. References

1. Organic Spectroscopy by William Kemp, Third Edition, Palgrave USA.

2. Introduction to Spectroscopy by Pavia, Lampman, Kriz and Vyvyan, Fifth edition, Cengage.
3. Organic Spectroscopy: Principles and Applications by Jag Mohan, Second edition, Alpha Science.
4. Spectroscopy of Organic Compounds by P.S.Kalsi, Seventh edition, New Age International.
5. Spectroscopic Methods in Organic Chemistry by Ian Fleming and Dudley Williams, Seventh edition, Springer.
6. Fundamentals of Analytical Chemistry by F.James Holler, Stanley R Crouch, Donald M. West and Douglas A. Skoog, Ninth edition, Cengage.
7. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and Kevin A.Schug, Seventh edition, Wiley.
8. Quantitative analysis by R.A.Day Jr. and A.L.Underwood, Sixth edition, Pearson.
9. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

Course 7-A: Analysis of Organic Compounds - PRACTICAL SYLLABUS

IV. Learning Outcomes:

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

1. Prepare acetanilide using the green synthesis.
2. Demonstrate the preparation of azodye.
3. Acquire skills in the separation of organic compounds in the given mixture using solvent extraction

V. Practical (Laboratory) Syllabus:(30hrs)

(Max.50 Marks)

1. Identification of various equipment in the laboratory.
2. Acetylation of 1^o amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
4. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
5. Green oxidation reaction: Synthesis of adipic acid
6. Preparation and characterization of biodiesel from vegetable oil/ waste cooking oil
7. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight.
8. Separation of organic compounds in a mixture (acidic compound + neutral compound) using solvent extraction.
9. Separation of organic compounds in a mixture (basic compound +neutral compound) using solvent extraction.

VI. Lab References:

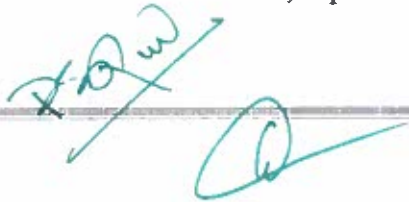
Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.

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

IV. Co-Curricular Activities:

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

5. **For Teacher:** Training of students by teacher in laboratory and field for not less than 15 hours on the field techniques/skills of preparation of acetanilide, preparation of azodye, use of separating funnel for solvent extraction, separation of organic compounds in a mixture.



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

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

b) Suggested Co-Curricular Activities

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

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Course6-A: Synthetic Organic Chemistry Important Tips for Setting Question Paper

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

It is suggested that the question writer should use his/her judgment in assigning difficulty value to each question. Following scale should guide you to set questions at different difficulty levels and use the Bloom's Taxonomy action verbs given below.

Bloom's Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
% Weightage	30	20	20	15	10	5

Question Paper Pattern

The Semester question paper consists of 2 sections.

PART-A: Consists of **EIGHT** short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of **FIVE** internal choice essay questions. Each question carries 10 marks.

The examiner has to choose 2 question from each module.

SI. No	Mod ules	Name of the Module	5 M Questi ons	Question Serial Number	10 M Questi ons	Question Serial Number	Weightage per Module
1	1	Mass Spectrometry	2	1, 2	2	9 (a) or 9 (b)	20 Marks
2	2	Structural elucidation of organic compounds.	1	3	2	10 (a) or 10 (b)	15 Marks
3	3	Structural elucidation of organic compounds.	1	4	2	11 (a) or 11 (b)	15 Marks
4	4	Separation techniques-1	2	5, 6	2	12 (a) or 12 (b)	20 Marks
5	5	Separation techniques-2	2	7, 8	2	13 (a) or 13 (b)	20 Marks

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
MODEL PAPER
B. Sc, DEGREE THIRD YEAR EXAMINATIONS
SEMESTER – V

Course 7-A: Analysis of Organic Compounds

Time: 3 hours

Maximum Marks: 75

PART-A

5 X 5 = 25 Marks

Answer any FIVE of the following questions.

1. Give the basic principle of mass spectrometry.
2. Define molecular ions and metastable ions in mass spectrometry.
3. Give the structure elucidation of 2, 2, 3, 3-Tetra methyl butane.
4. Give the structure elucidation of cinnamic acid with IR, NMR and Mass spectra.
5. What is solvent extraction. Give example.
6. What are the advantages of thin layer chromatography.
7. Write any four applications of column chromatography.
8. Discuss the applications of paper chromatography.

PART-B

5 X 10 = 50 Marks

Answer ALL the questions.

9. a) Give the fragmentation patterns for the toluene and butyraldehyde.
(Or)
b) Sketch the instrumentation diagram of mass spectrometry and explain.
10. a) Explain the structure elucidation of butane-2, 3-dione with IR, NMR and Mass spectra.
(Or)
b) Explain the structure elucidation of propionic acid with IR, NMR and Mass spectra.
11. a) Give the structure elucidation of phenyl acetylene with IR, NMR and Mass spectra.
(Or)
b) Give the structure elucidation of acetophenone with IR, NMR and Mass spectra.
12. a) How is Fe^{3+} is determined by solvent extraction method?
(Or)
b) How are chromatographic methods classified?
13. a) Explain principle and experimental procedure of column chromatography.
(Or)
b) Draw the block diagram of for HPLC and explain the functions of the components.

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc.

Domain Subject: CHEMISTRY

Max Marks: 100+50

Course6-B: Analytical Methods in Chemistry-1
(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify the importance of solvent extraction and ion exchange method.
2. Acquire knowledge on the basic principles of volumetric analysis and gravimetric analysis.
3. Demonstrate the usage of common laboratory apparatus used in quantitative analysis.
4. Understand the theories of different types of titrations. 5. Gain knowledge on different types of errors and their minimization methods.

Syllabus:

(Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Quantitative analysis-1

8 hours

1. A brief introduction to analytical methods in chemistry
2. Principles of volumetric analysis, concentration terms- Molarity, Molality, Normality, v/v, w/v, ppm and ppb, preparing solutions- Standard solution, primary standards and secondary standards.
2. Description and use of common laboratory apparatus- volumetric flask, burette, pipette, beakers, measuring cylinders.

Unit-2: Quantitative analysis-2

12hours

1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complex metric, iodometric and precipitation titrations-choice of indicators for the saturations.
2. Principles of gravimetric analysis: precipitation, coagulation, peptization, co precipitation, post precipitation, digestion, filtration, and washing of precipitate, drying and ignition.

Unit-3: Treatment of analytical data

8hours

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 interval.

Unit-4: separation techniques

12 hours

1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application-Determination of Iron (III). 2. Ion Exchange method: Introduction, action of ion exchange resins, applications.

UNIT-5: Analysis of water 10hours

Determination of dissolved solids, total hardness of water, turbidity, alkalinity, Dissolved oxygen, COD, determination of chloride using Mohr's method.

III. References

1. Fundamentals of 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.DayJr. And A.L.Underwood, Sixth edition, Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
5. Text book of Environmental Chemistry and Pollution Control by S.S.Dara and D.D.Mishra, Revised edition, S Chand & CoLtd.

Course6-B: Analytical methods in chemistry-1-PRACTICALSYLLABUS

IV. Learning Outcomes:

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

1. Estimate Iron(II) using standard Potassium dichromate solution
2. Learn the procedure for the estimation of total hardness of water
3. Demonstrate the determination of chloride using Mohr's method
4. Acquire skills in the operation and calibration of pH meter
5. Perform the strong acid vs strong base titration using pH meter

V. Practical (Laboratory) Syllabus :(30hrs)

(Max.50 Marks)

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 chlorideammonium hydroxide.

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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.

VI. Lab References: 1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

Co-Curricular Activities:

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

8. 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).

9. For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe various methods used for the analysis of water. Write their observations and submit a hand written fieldwork/project work report not exceeding 10 pages in the given format to the teacher.

10. 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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CHE(H)-COURSE-6B – ANALYTICAL METHODS IN CHEMISTRY-2

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks. The examiner has to choose 2 questions from each Module

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

The examiner is requested to give equal importance to easy, moderate and difficult questions.

MODULE	5 MARKS QUESTIONS	QUESTION SERIAL NUMBER	10 MARKS QUESTIONS	QUESTION SERIAL NUMBER	TOTAL MARKS
1	2	1,2	1 (1 OUT OF 2 INTERNAL CHOICE)	9	20
2	2	3,4	1 (1 OUT OF 2 INTERNAL CHOICE)	10	20
3	1	5	1 (1 OUT OF 2 INTERNAL CHOICE)	11	15
4	2	6,7	1 (1 OUT OF 2 INTERNAL CHOICE)	12	20
5	1	8	1 (1 OUT OF 2 INTERNAL CHOICE)	13	15

Weightage for each level of Bloom's Taxonomy

Bloom's Taxonomy level	Type of question	Weightage
Knowledge /Remember	(Define/ list /state) type.	15 marks
Comprehension/ Understand	(Classify, describe, discuss, identify, explain, report) type	30 marks
Application	(Solve, Sketch, interpret) type. Sums & Mechanisms	20 marks
Analysis	(Differentiate, distinguish, Compare) type.	15 marks
Evaluation	Argue, Defend, judge,	10marks
Create	Derive, Design, construct, Develop, formulate, investigate	

MODEL PAPER B.Sc., DEGREE EXAMINATION PAPER-6B
SEMESTER-V/VI
CHE(H)-COURSE-6B – ANALYTICAL METHODS IN CHEMISTRY-2

Time: 3 hours

Maximum Marks: 75

PART-A

Answer any FIVE of the following questions. Each carry FIVE marks

5 X 5 = 25 Marks

1. What are primary and secondary standards?
2. Give a brief introduction to analytical methods in chemistry?
3. Explain Iodometric titration with a suitable example?
4. Discuss the choice of indicators for the titrations with suitable examples.?
5. Define Precipitation and Coagulation?
6. What is Correlation coefficient?
7. What are the methods of expressing Accuracy?
8. Define Dissolved Oxygen & COD?

PART-B

Answer ALL the questions. Each carry TEN marks

5X 10 = 50 Marks

9 (a). Write down principle of volumetric analysis and explain the concentration terms of Molarity and Normality with examples?

(Or)

(b) Write the Description and use of common laboratory apparatus?

10.(a). Describe the acid-base titrations in detailed?

(Or)

(b) Explain the complex metric titrations with examples?

11.(a). What is the principle of gravimetric analysis? Discuss the concepts of peptization and filtration?

(or)

(b) Describe the Co-Precipitation and Post-Precipitation in detailed?

12.(a). Discuss various types of errors with suitable examples.

Or

(b) Give a brief account on standard deviation, accuracy and precision?

13. (a) Describe the methods to convert permanent hard water to soft water?

Or

(b) Discuss the determination of chloride using Mohr's method?

DEPARTMENT OF CHEMISTRY

DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM

SEMESTER V (w.e.f. Academic Year, 2022-23)

PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY

Course7-B: Analytical Methods in Chemistry-2

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify the importance of chromatography in the separation and identification of compounds in a mixture
2. Acquire a critical knowledge on various chromatographic techniques.
3. Demonstrate skills related to analysis of water using different techniques.
4. Understand the principles of spectro chemistry in the determination of metal ions. 5. Comprehend the applications of atomic spectroscopy.

II. Syllabus : (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Chromatography-Introduction and classification 10 hours

Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.

UNIT-2: TLC and paper chromatography 12 hours

Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.

Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography 12 hours

Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications.

HPLC: Basic principles, instrumentation –block diagram and applications.

UNIT-4: Spectrophotometry 8hours

Principle, Instrumentation: Single beam and double beam spectrometer, BeerLambert's law- Derivation and deviations from Beer-Lambert's law, applications of BeerLambert's law-Quantitative determination of Fe^{+2} , Mn^{+2} and Pb^{+2} .

UNIT-5: Atomic spectroscopy 8hours

Types, atomizer, atomic absorption and emission and applications.

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 Kevin A.Schug, Seventh edition, Wiley.

MODEL PAPER B.Sc., DEGREE EXAMINATION PAPER-6B
SEMESTER-V/VI
CHE(H)-COURSE-6B - ANALYTICAL METHODS IN CHEMISTRY-2

Time: 3 hours

Maximum Marks: 75

PART-A

Answer any FIVE of the following questions. Each carry FIVE marks

5 X 5 = 25 Marks

1. What are primary and secondary standards?
2. Give a brief introduction to analytical methods in chemistry?
3. Explain Iodometric titration with a suitable example?
4. Discuss the choice of indicators for the titrations with suitable examples.?
5. Define Precipitation and Coagulation?
6. What is Correlation coefficient?
7. What are the methods of expressing Accuracy?
8. Define Dissolved Oxygen & COD?

PART-B

Answer ALL the questions. Each carry TEN marks

5X 10 = 50 Marks

- 9 (a). Write down principle of volumetric analysis and explain the concentration terms of Molarity and Normality with examples?

(Or)

- (b) Write the Description and use of common laboratory apparatus?

- 10.(a). Describe the acid-base titrations in detailed?

(Or)

- (b) Explain the complex metric titrations with examples?

- 11.(a). What is the principle of gravimetric analysis? Discuss the concepts of peptization and filtration?

(or)

- (b) Describe the Co-Precipitation and Post-Precipitation in detailed?

- 12.(a). Discuss various types of errors with suitable examples.

Or

- (b) Give a brief account on standard deviation, accuracy and precision?

13. (a) Describe the methods to convert permanent hard water to soft water?

Or

(b) Discuss the determination of chloride using Mohr's method?

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY
Course7-B: Analytical Methods in Chemistry-2
(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify the importance of chromatography in the separation and identification of compounds in a mixture
2. Acquire a critical knowledge on various chromatographic techniques.
3. Demonstrate skills related to analysis of water using different techniques.
4. Understand the principles of spectro chemistry in the determination of metal ions. 5. Comprehend the applications of atomic spectroscopy.

II. Syllabus : (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Chromatography-Introduction and classification 10 hours

Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.

UNIT-2: TLC and paper chromatography 12 hours

Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.

Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography 12 hours

Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications.

HPLC: Basic principles, instrumentation –block diagram and applications.

UNIT-4: Spectrophotometry 8hours

Principle, Instrumentation: Single beam and double beam spectrometer, BeerLambert's law- Derivation and deviations from Beer-Lambert's law, applications of BeerLambert's law-Quantitative determination of Fe^{+2} , Mn^{+2} and Pb^{+2} .

UNIT-5: Atomic spectroscopy 8hours

Types, atomizer, atomic absorption and emission and applications.

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 Kevin A.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.

Course7-B: Analytical Methods in Chemistry-2- PRACTICAL SYLLABUS

V. Learning Outcomes:

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

1. Perform the separation of a given dye mixture using TLC
2. Learn the preparation of TLC plates
3. Demonstrate the separation of mixture of amino acids using paper chromatography
4. Acquire skills in using column chromatography for the separation of dye mixture

VI. Practical (Laboratory) Syllabus: (30hrs)

(Max.50Marks)

1. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
2. Separation of mixture of methyl orange and methylene blue by column chromatography.
3. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
4. Separation of food dyes using Column Chromatography
5. Separation of triglycerides using TLC
6. Verification of Beer lambert's law. (Using potassium permanganate solution) using colorimeter /spectrophotometer.

VII. Lab References:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
1. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley- Eastern.
3. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F.Gand Saunders B.C, Practical Organic Chemistry, Pearson Education.

VII. Co-Curricular Activities:

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

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.

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.

Max marks for Fieldwork/project work Report: 05.

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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CHE(H)-COURSE-6B – ANALYTICAL METHODS IN CHEMISTRY-2

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks. The examiner has to choose 2 questions from each Module

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

The examiner is requested to give equal importance to easy, moderate and difficult questions.

MODULE	5 MARKS QUESTIONS	QUESTION SERIAL NUMBER	10 MARKS QUESTIONS	QUESTION SERIAL NUMBER	TOTAL MARKS
1	2	1,2	1 (1 OUT OF 2 INTERNAL CHOICE)	9	20
2	2	3,4	1 (1 OUT OF 2 INTERNAL CHOICE)	10	20
3	1	5	1 (1 OUT OF 2 INTERNAL CHOICE)	11	15
4	2	6,7	1 (1 OUT OF 2 INTERNAL CHOICE)	12	20
5	1	8	1 (1 OUT OF 2 INTERNAL CHOICE)	13	15

Weightage for each level of Bloom's Taxonomy

Bloom's Taxonomy level	Type of question	Weightage
Knowledge /Remember	(Define/ list /state) type.	15 marks
Comprehension/ Understand	(Classify, describe, discuss, identify, explain, report) type	30 marks
Application	(Solve, Sketch, interpret) type. Sums & Mechanisms	20 marks
Analysis	(Differentiate, distinguish, Compare) type.	15 marks
Evaluation	Argue, Defend, judge,	10marks
Create	Derive, Design, construct, Develop, formulate, investigate	

MODEL PAPER B.Sc., DEGREE EXAMINATION PAPER-6B
SEMESTER-V/VI
CHE(H)-COURSE-6B – ANALYTICAL METHODS IN CHEMISTRY-2

Time: 3 hours

Maximum Marks: 75

PART-A

Answer any FIVE of the following questions. Each carry FIVE marks

5 X 5 = 25 Marks

1. What are primary and secondary standards?
2. Give a brief introduction to analytical methods in chemistry?
3. Explain Iodometric titration with a suitable example?
4. Discuss the choice of indicators for the titrations with suitable examples.?
5. Define Precipitation and Coagulation?
6. What is Correlation coefficient?
7. What are the methods of expressing Accuracy?
8. Define Dissolved Oxygen & COD?

PART-B

Answer ALL the questions. Each carry TEN marks

5X 10 = 50 Marks

- 9 (a). Write down principle of volumetric analysis and explain the concentration terms of Molarity and Normality with examples?

(Or)

- (b) Write the Description and use of common laboratory apparatus?

- 10.(a). Describe the acid-base titrations in detailed?

(Or)

- (b) Explain the complex metric titrations with examples?

- 11.(a). What is the principle of gravimetric analysis? Discuss the concepts of peptization and filtration?

(or)

- (b) Describe the Co-Precipitation and Post-Precipitation in detailed?

- 12.(a). Discuss various types of errors with suitable examples.

Or

- (b) Give a brief account on standard deviation, accuracy and precision?

13. (a) Describe the methods to convert permanent hard water to soft water?

Or

- (b) Discuss the determination of chloride using Mohr's method?

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY
Course 7-B: Analytical Methods in Chemistry-2
(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

5. Identify the importance of chromatography in the separation and identification of compounds in a mixture
6. Acquire a critical knowledge on various chromatographic techniques.
7. Demonstrate skills related to analysis of water using different techniques.
8. Understand the principles of spectro chemistry in the determination of metal ions. 5. Comprehend the applications of atomic spectroscopy.

II. Syllabus : (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Chromatography-Introduction and classification 10 hours Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.

UNIT-2: TLC and paper chromatography 12 hours

1. Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.
2. Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography 12 hours

1. Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications.
2. HPLC: Basic principles, instrumentation –block diagram and applications.

UNIT-4: Spectrophotometry 8hours

Principle, Instrumentation: Single beam and double beam spectrometer, BeerLambert's law- Derivation and deviations from Beer-Lambert's law, applications of BeerLambert's law-Quantitative determination of Fe⁺², Mn⁺² and Pb⁺².

UNIT-5: Atomic spectroscopy 8hours

Types, atomizer, atomic absorption and emission and applications.

III. References

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

Course7-B: Analytical Methods in Chemistry-2- PRACTICAL SYLLABUS

V. Learning Outcomes:

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

5. Perform the separation of a given dye mixture using TLC
6. Learn the preparation of TLC plates
7. Demonstrate the separation of mixture of amino acids using paper chromatography
8. Acquire skills in using column chromatography for the separation of dye mixture

VI. Practical (Laboratory) Syllabus: (30hrs)

(Max.50Marks)

7. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
8. Separation of mixture of methyl orange and methylene blue by column chromatography.
9. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
10. Separation of food dyes using Column Chromatography
11. Separation of triglycerides using TLC
12. Verification of Beer lambert's law. (Using potassium permanganate solution) using colorimeter /spectrophotometer.

VII. Lab References:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
4. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
5. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley- Eastern.
6. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F.Gand Saunders B.C, Practical Organic Chemistry, Pearson Education.

VII. Co-Curricular Activities:

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

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.

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.

Max marks for Fieldwork/project work Report: 05.

c) Suggested Co-Curricular Activities

5. Training of students by related industrial experts.
6. Assignments, Seminars and Quiz (on related topics).
7. Visits to facilities, firms, research organizations etc.
8. Invited lectures and presentations on related topics by field/industrial experts.

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DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY

Max. Marks : 100+50

Course6-C: Industrial Chemistry-1

(Skill Enhancement Course (Elective), Credits: 05)

I. Learning Outcomes:

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

1. Identify the importance of different surface coatings.
2. Acquire a critical knowledge on manufacture of ceramics and cement.
3. Understand various steps in the manufacture of cane sugar.
4. Explain the manufacture of pulp and paper.

II. Syllabus : (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Fertilizers

10 hours

A brief introduction to Chemistry

Different types of fertilizers. Manufacture of the following fertilizers: Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphates; Polyphosphate, Superphosphate, Compound and mixed fertilizers.

Unit-2: Silicates

10hours

1. **Ceramics:** Important clays and Felds par. Ceramics-types, uses and manufacture. High technology ceramics and their applications.
2. **Cements:** Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

Unit-3: Surface Coatings

12 hours

Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, modified oils, Pigments, toners and lake pigments, fillers, thinners, enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Water and Oil paints.

Unit-4: Sugar Chemistry

08hours

Introduction–Manufacture and recovery of cane sugar from molasses, manufacture of sucrose from beat root, testing and estimation of sucrose.

Unit-5: Paper Industry

10hours

Pulp and Paper-Introduction, Manufacture of pulp, sulphate or Kraft pulp, soda pulp, sulphite pulp, rag pulp, beating, refining, filling, sizing and colouring of pulp, manufacture of paper.

III. References:

1. E.Stocchi: *Chemistry*, Vol-I, Ellis Horwood Ltd.UK
2. J.A.Kent: *Riegel's Hand book of Chemistry*, CBS Publishers, New Delhi.
3. P.C.Jain, M.Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
4. R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry*, Vikas Publications, New Delhi.
5. B.K.Sharma: *Engineering Chemistry*, Goel Publishing House, Meerut
6. O. P. Vermani, A. K. Narula: *Chemistry*, Galgotia Publications Pvt. Ltd., New Delhi.

Course 6 C: Chemistry-1- PRACTICAL SYLLABUS IV. Lab work-Skills Outcomes:

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

1. Determine free acidity in ammonium sulphate fertilizer.
2. Learn the procedure for the Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Demonstrate skills on Estimation of phosphoric acid in superphosphate fertilizer.
4. Acquire skills in using colorimetry for the estimation of sucrose.

V. Practical(Laboratory)Syllabus:(30hrs)

(Max.50 Marks)

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Estimation of sucrose by colorimetry. VI: Lab References
1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
2. Text book on Experiments and Calculations in Engineering Chemistry, S.S.Dara, S.Chand.
3. R.Gopalan, D.Venkappayya, S.Nagarajan: *Engineering Chemistry*, Vikas Publications.
4. B.K.Sharma: *Engineering Chemistry*, Goel Publishing House, Meerut

VII. 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 field related skills in determination of free acidity, estimation of calcium and phosphoric acid in a fertilizer, use of colorimeter to estimate sucrose.
2. **For Student:** Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the surface coatings of surfaces used to prevent the corrosion. 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.

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Important Tips for Setting Question Paper

1. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.
2. It is suggested that the question writer should use his/her judgment in assigning difficulty value to each question. Following scale should guide you to set questions at different difficulty levels and use the Bloom's Taxonomy action verbs given below.

Bloom's Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
% of Weightage	30	20	20	15	10	5

Question Paper Pattern

1. The Semester question paper consists of 2 sections.
PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.
PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks. The examiner has to choose 2 questions from each module.

Sl. No	Modules	Name of the Module	5 M Questions	Question Serial Number	10 M Questions	Question Serial Number	Weightage per Module
1	Module 1	Fertilizers	2	1, 2	2	9 (a) or 9 (b)	20 Marks
2	Module 2	Silicates	2	3, 4	2	10 (a) or 10 (b)	20 Marks
3	Module 3	Surface Coatings	1	5	2	11 (a) or 11 (b)	15 Marks
4	Module 4	Sugar Chemistry	2	6, 7	2	12 (a) or 12 (b)	20 Marks
5	Module 5	Paper Industry	1	8	2	13 (a) or 13 (b)	15 Marks

DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY
***Course6-C: Industrial Chemistry-1* Max. Marks : 75**
(Skill Enhancement Course (Elective), Credits: 04)

MODEL PAPER

SECTION -- A

Answer any **FIVE** questions from the following.

5 X 5 = 25 M

1. Explain compound fertilizers with examples.
2. Give the composition of the superphosphate of lime.
3. Write the composition and uses of felspar.
4. Explain the setting process of cement.
5. Define thinners and enamels with examples.
6. Describe the tests for the estimation of sucrose.
7. Write the systematic flow diagram for the manufacture of sugar.
8. Discuss the terms filling and sizing in the paper industry.

SECTION -- B

Answer **ALL** the following questions.

5 X 10 = 50 M

9. (a) Explain briefly the classification of fertilizers.

(Or)

(b) Explain the process of industrial manufacture of ammonium nitrate.

10. (a) Explain high technology ceramics with their applications.

(Or)

(b) Explain the manufacture of cement.

11. (a) Write the objectives of surface coatings.

(Or)

(b) Discuss briefly eco paints and plastic paints.

12. (a) Explain the industrial process of manufacturing of sugar from molasses.

(Or)

(b) Explain the industrial process of preparation of sucrose from beetroot.

13. (a) Give the preparation of kraft pulp and sulphate pulp.

(Or)

(b) Write the different steps involved in preparation of paper in paper industry.

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)

PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY Max Marks: 100T + 50P

Course 7-C: Industrial Chemistry-2
(Skill Enhancement Course (Elective), Credits: 05)

Learning Outcomes:

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

1. Identify the importance of industrial waste management.
2. Acquire a critical knowledge on the preparation and applications of organic polymers.
3. Demonstrate the analysis of water quality parameters.
4. Explain the sources of air pollution.

II. Syllabus : (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

Unit-1: Organic Polymers-1

10 hours

Basic definitions, degree of polymerization, classification of polymers- Natural and Synthetic polymers, Organic and In organic polymers, Thermoplastic and Thermo setting polymers, Plastics, Elastomers, Fibers and Resins, Linear, Branched and CrossLinked polymers.

Unit-2: Organic Polymers-2

10 hours

Addition polymers and Condensation polymers, mechanism of polymerization- Free radical, ionic and Zeigler-Natta polymerization. Industrial manufacturing and applications of following polymers, Polystyrene, Poly acrylonitrile, Poly methacrylate, Poly methyl-methacrylate.

Unit-3: Air Pollution

8 hours

Sources of air pollution, acid rain, photochemical smog, Greenhouse effect, Formation and depletion of ozone, sources and effects of various gaseous pollutants: NO_x, SO_x, SPM, CO, hydrocarbons, controlling methods of air pollution.

Unit-4: Analysis of water

10hours

Determination of total hardness of water, Dissolved oxygen, BOD, COD, total dissolved solids, turbidity, alkalinity, determination of chloride using Mohr's method.

Unit-5: Industrial Waste Management 12hours

Waste water treatment - primary, secondary & tertiary treatment. (All treatment methods in detail). Characteristics of solid wastes, methods of solid waste treatment and disposal, microbiology involved in solid waste disposal, methods of solid waste disposal composting, sanitary landfilling- economic, aesthetic and environmental problems.

III. References:

1. E.Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK
2. J.A.Kent: *Riegel's Handbook of Chemistry*, CBS Publishers, New Delhi.
3. P.C.Jain, M.Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.

4. R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry*, Vikas Publications, New Delhi.
5. B.K.Sharma: *Engineering Chemistry*, Goel Publishing House, Meerut
6. O. P. Vermani, A. K. Narula: *Chemistry*, Galgotia Publications Pvt. Ltd., New Delhi.

7. A.K.De, *Environmental Chemistry*: New Age International Pvt, Ltd, New Delhi.
8. C.k.Varshney: *Water Pollution and Management*, Wiley Eastern Limited, Chennai.
9. S.S. Dara and D.D. Mishra: *Textbook of Environmental Chemistry and Pollution Control*, Revised edition, S.C.Hand &CoLtd.

Course7-C: Industrial Chemistry-2 -PRACTICAL SYLLABUS IV. Lab work-Skills Outcomes:

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

1. Learn the procedures for the determination of BOD and COD.
2. Demonstrate skills in the determination of chloride in the given water sample.
3. Acquire skills in determining the hardness of water.

V. Practical (Laboratory) Syllabus:(30hrs)

(Max.50 Marks)

1. Determination of Hardness of water by EDTA titration.
2. Determination of Chemical Oxygen Demand (COD) 3. Determination of Biological Oxygen Demand (BOD)
4. Determination of chloride using Mohr's method.
5. Determination of pH, turbidity and total solids in water sample.
6. Determination of Ca^{+2} and Mg^{+2} in soil sample by flame photometry. 7. Determination of Ph in soil samples using pH metry.

VI. Lab References:

1. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
2. Textbook on Experiments and Calculations in Engineering Chemistry, S.S.Dara, S.Chand.

VII. Co-Curricular Activities

a) **Mandatory:**(Student training by teacher in field related skills: inlab:15,infield: 05 hours):

1. **For Teacher:** Training of students by the teacher in laboratory and field for not lesst han15hours on the field related skills in determination of hardness of water, estimation of COD and BOD in water sample, determination chloride ion in water sample.
2. **For Student:** Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the measurement of water quality parameters. Write their observations and submit a hand written fieldwork/project work report not exceeding10 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).

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Important Tips for Setting Question Paper

1. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.
2. It is suggested that the question writer should use his/her judgment in assigning difficulty value to each question. Following scale should guide you to set questions at different difficulty levels and use the Bloom's Taxonomy action verbs given below.

Bloom's Level	Remember	Understand	Apply	Analyse	Evaluate	Create
% of Weightage	30	20	20	15	10	5

Question Paper Pattern

1. The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks.

1. The examiner has to choose 2 questions from each module.

SI . N o	Modules	Name of the Module	5 M Questions	Question Serial Number	10 M Questions	Question Serial Number	Weightage per Module
1	1	Organic polymers 1	2	1, 2	2	9 (a) or 9 (b)	20 Marks
2	2	Organic polymers 2	2	3, 4	2	10 (a) or 10 (b)	20 Marks
3	3	Air pollution	1	5	2	11 (a) or 11 (b)	15 Marks
4	4	Analysis of water	2	6, 7	2	12 (a) or 12 (b)	20 Marks
5	5	Industrial waste management	1	8	2	13 (a) or 13 (b)	15 Marks

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY Max Marks: 75

Course7-C: Industrial Chemistry-2
(Skill Enhancement Course (Elective), Credits: 04)

SECTION -- A

Answer any **FIVE** questions from the following.

5 X 5 = 25 M

1. Explain degree of polymerisation.
2. Write the differences between thermo setting and thermo plastic polymers.
3. Write about condensation polymers.
4. Give the preparation of acrylo nitrile.
5. Write a note on greenhouse effect.
6. Define COD and BOD.
7. Explain the pollution effect by Nitrogen oxides.
8. Explain classification solid waste.

SECTION -- B

Answer **ALL** the following questions.

5 X 10 = 50 M

9. (a) Discuss briefly the classification of polymers.

(Or)

(b) Explain linear and branched chain polymerization processes.

10. (a) Explain Zeigler Natta's catalysis.

(Or)

(b) Explain the mechanism ionic and free radical polymerization.

11. (a) Explain (i) photochemical smog (ii) Depletion of ozone layers.

(Or)

(b) Discuss effect of different air pollutants.

12. (a) Explain hardness of water. Explain methods to remove hardness of water.

(Or)

(b) Write the experimental methods to determine the chloride and alkalinity in water.

13. (a) Explain different steps involved in water treatment process.

(Or)

(b) Explain the solid waste management briefly.

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)
PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY

Course6-D: Environmental Chemistry

(Skill Enhancement Course (Elective), Credits -05 Max Marks: 100+50)

I. Learning Outcomes:

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

1. Understand the environment functions and how it is affected by human activities.
2. Acquire chemical knowledge to ensure sustainable use of the world's resources and ecosystems services.
3. Engage in simple and advanced analytical tools used to measure the different types of pollution.
4. Explain the energy crisis and different aspects of sustainability.
5. Analyze key ethical challenges concerning biodiversity and understand the moral principles, goals and virtues important for guiding decisions that affect Earth's plant and animal life.

II Syllabus : (Total Hours: 90, including Teaching, Lab, Field Skills Training, Unit tests etc.)

UNIT-I Introduction 10h

Environment Definition – Concept of Environmental chemistry- Scope and importance of environment in nowadays – Nomenclature of environmental chemistry – Segments of environment– Effects of human activities on environment – Natural resources–Renewable Resources–Solar and biomass energy and Nonrenewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydro logical cycle.

UNIT-II Air Pollution 10h

Definition – Sources of air pollution – Classification of air pollution – Ambient air quality standards- Climate change – Global warming – Pollution from combustion systems- Acid rain – Photochemical smog – Greenhouse effect – Formation and depletion of ozone – Bhopal gas disaster–Instrumental techniques to monitor pollution – Controlling methods of air pollution.

UNIT-III Water pollution 10h

Unique physical and chemical properties of water – Water quality standards and parameters – Turbidity- pH Dissolved oxygen – BOD, COD, Suspended solids, total dissolved solids, alkalinity– Hardness of water–Methods to convert temporary hard water in to soft water – Methods to convert permanent hard water into soft water – eutrophication and its effects –Industrial waste water treatment.

UNIT-IV Chemical Toxicology 10h

Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium- Solid waste management.

UNIT-V Ecosystem and biodiversity 10h

Ecosystem

Concepts–structure–Functions and types of ecosystem–Abiotic and biotic components – Energy flow and Energy dynamics of ecosystem– Food chains – Food web– Tropic levels–Biogeochemical cycles (carbon, nitrogen and phosphorus)

Biodiversity

Dr. Srinu

(Signature)

Definition – level and types of biodiversity – concept- significance – magnitude and distribution of biodiversity–trends-bio geographical classification of India–biodiversity at national, global and regional level.

III. List of Reference books:

1. Fundamentals of ecology by M.C.Dash
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir k.Banerji
4. Water pollution, Lalude, MC Graw Hill
5. Environmental Chemistry, Anil Kumar De, Wiley Eastern ltd.
6. Environmental analysis, SM Khopkar (IIT Bombay)

Course6-D: Environmental Chemistry – Practical syllabus IV. Lab work-Skills Outcomes:

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

1. List out, identify and handle various equipment in Chemistry lab.
2. Learn the procedures of preparation of standard solutions.
3. Demonstrate skills in operating instruments.
4. Acquire skills in handling spectrophotometer.
5. Analyse water and soil samples.

V. Practical (Laboratory) Syllabus: (30hrs) (Max.50Marks).

1. Identification of various equipment in the laboratory.
2. Determination of carbonate and bicarbonate in water samples by double titration method.
3. Determination of hardness of water using EDTA
 - a) Permanent hardness
 - b) Temporary hardness
4. Determination of Chlorides in water samples by Mohr's method.
5. Determination of pH, turbidity and total solids in water sample.
6. Determination of Ca^{+2} and Mg^{+2} in soil sample by flame photometry.
7. Determination of PH in soil samples using pH metry.

List of Reference books:

1. A Text Book of Quantitative Inorganic Analysis (3rd Edition)–A.I.Vogel
2. Water pollution, Lalude, MC Graw Hill
3. Environmental analysis, SM Khopkar (IIT Bombay)
4. Web related references suggested by teacher.

Co-Curricular Activities:

a) **Mandatory:** (Training of students by teacher on field related skills: 15hrs)

1. **For Teacher:** Skills training of students by the teacher in classroom, lab and field for not less than 15 hours on field related quantitative techniques for the water quality parameters, soil pollution and air pollution.
2. **For Student:** Individual visit to any one of the local field agencies/research laboratories in universities/research organizations/private sector culminating writing and submission of a handwritten fieldwork/project work Report not exceeding 10 pages in the given format.
3. Max marks for Fieldwork/project work Report: 05.
4. Suggested Format for Fieldwork/project work: *Title page, student details, index page, details of places visited, observations, findings and acknowledgements.*
5. Unit tests (IE)

7/6/20

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ENVIRONMENTAL CHEMISTRY

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks. The examiner has to choose 2 questions from each Module

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

The examiner is requested to give equal importance to easy, moderate and difficult questions.

MODULE	5 MARKS QUESTIONS	QUESTION SERIAL NUMBER	10 MARKS QUESTION S	QUESTION SERIAL NUMBER	TOTAL MARKS
1	2	1,2	1(1 OUTOF2 INTERNALCHOICE)	9	20
2	2	3,4	1(1 OUTOF2 INTERNALCHOICE)	10	20
3	1	5	1(1 OUTOF2 INTERNALCHOICE)	11	15
4	2	6	1(1 OUTOF2 INTERNALCHOICE)	12	15
5	1	7,8	1(1 OUTOF2 INTERNALCHOICE)	13	20

Weightage for each level of Bloom's Taxonomy

Bloom's Taxonomy level	Type of question	Weightage
Knowledge/Remember	(Define/list/state)type.	15marks
Comprehension/Understand	(Classify, describe, discuss, identify, explain, report)type	30marks
Application	(Solve, Sketch, interpret)type. Sums & Mechanisms	20marks
Analysis	(Differentiate, distinguish, Compare) type.	15marks
Evaluation	Argue, Defend, judge,	10marks
Create	Derive, Design, construct, Develop, formulate, investigate	

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
MODEL PAPER
B. Sc, DEGREE THIRD YEAR EXAMINATIONS
Paper-6D, SEMESTER-V/VI
ENVIRONMENTAL CHEMISTRY

Time: 3 hours

Maximum Marks: 75

SECTION - A

Answer any five of the following questions.

5x5=25Marks

- 1 Explain the terms with examples a) Pollutant b) Contaminant
- 2 Write the reaction of atmospheric oxygen
3. What are Acid rains?
4. Brief note on Bhopal gas disaster
5. Define BOD & COD.
6. Brief about Solid waste management.
7. Describe Biodiversity at regional level.
8. Discuss briefly about Carbon cycle.

SECTION - B

Answer any five of the following questions

5x10 = 50

- 9(a) Discuss about the renewable energy resources.

OR

- (b) Explain the scope and importance of environment in now-a-days. And write about Hydrological cycle

- 10(a) Explain the formation and depletion of the Ozone layer.

OR

- (b) Discuss about the sources and classification of Air Pollution.

- 11(a) Describe the methods to convert permanent hard water to soft water.

OR

- (b) Discuss about the Industrial wastewater treatment.

- 12 (a) what are the toxic effects of cyanide on the environment?

OR

- (b) Describe the toxic effects of Lead and Mercury

- 13(a) Outline the functions and types of ecosystem.

OR

- (b) Give a detailed account on biodiversity

DEPARTMENT OF CHEMISTRY
DR. V. S KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
SEMESTER V (w.e.f. Academic Year, 2022-23)

PROGRAMME: THREE YEAR B.Sc. Domain Subject: CHEMISTRY

Course7- D: Green Chemistry and Nanotechnology

(Skill Enhancement Course (Elective), Credits – 05) Max Marks: 100+50

1. Learning Outcomes:

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

1. Understand the importance of Green chemistry and Green synthesis.
2. Engage in Microwave-assisted organic synthesis.
3. Demonstrate skills using the alternative green solvents in synthesis.
4. Demonstrate and explain enzymatic catalysis.
5. Analyse alternative sources of energy and carry out green synthesis.
6. Carry out the chemical method of nanomaterial synthesis.

VI. Syllabus: Total Hours: 90, including Teaching, Lab, Field Training, Unit tests etc.)

UNIT-I Green Chemistry: Part- I

10 hrs

Introduction-Definition of green Chemistry, Need for green chemistry, Goals of Green chemistry

Basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction

i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required and examples of sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).

UNIT- II Green Chemistry: Part- II

10 hrs

A) Selection of solvent:

i) Aqueous phase reactions ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation.
iii) Solid supported synthesis

B) Supercritical CO₂: Preparation, properties and applications, (decaffeination, drycleaning)

C) Green energy and sustainability.

UNIT-III Microwave and Ultrasound assisted green synthesis:

10 hrs

Apparatus required, examples of MAOS (synthesis of fused anthraquinones, Leuckart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldolcondensation –Cannizzaro reaction- Diels-Alder reactions-Strecker's synthesis

UNIT-IV Green catalysis and Green synthesis

10 hrs.

Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis - bio catalysis: Enzymes, microbes Phase transfer catalysis (micellar /surfactant)

1. Green synthesis of the following compounds: adipic acid, catechol, disodium menudo acetate (alternative Strecker's synthesis) Microwave assisted reaction in water –Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols–microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction. Ultrasound assisted reactions–sonochemical Simmons–Smith reaction (ultrasonic alternative to iodine)

UNIT – V Nanotechnology in Green chemistry

10 hrs

Basic concepts of Nano science and Nanotechnology – Bottom-up approach and Top down approaches with examples – Synthesis of Nano materials – Classification of Nanomaterial – Properties and Application of Nanomaterial. Chemical and Physical properties of Nanoparticles – Physical synthesis

of nanoparticles – Inert gas condensation - aerosol method - Chemical Synthesis of nanoparticles – precipitation and co-precipitation method, sol-gel method.

III. Lab work - Skills Outcomes:

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

1. List out, identify and handle various equipment in the laboratory.
2. Learn the procedures of green synthesis.
3. Demonstrate skills in the preparation of Nanomaterials.
4. Acquire skills in Microwave assisted organic synthesis.
5. Perform some applications of Nanomaterials.

Practical (Laboratory) Syllabus: (30 hrs.) (Max.50 Marks).

6. Identification of various equipment in the laboratory.
7. Acetylation of 1^o amine by green method: Preparation of acetanilide
8. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
9. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
10. Green oxidation reaction: Synthesis of adipic acid
11. Preparation and characterization of biodiesel from vegetable oil/ waste cooking oil 7.
Preparation and characterization of Nanoparticles of gold using tea leaves.
8. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
9. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight.

Reference books:

12. Green Chemistry Theory and Practical. P.T. Anatas and J.C. Warner
13. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
14. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
15. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
16. Principles and practice of heterogeneous catalysis, Thomas J.M., Thomas M.J., John Wiley
17. Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava, Narosa Publications
18. Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press (2008).
19. Green Processes for Nanotechnology: From Inorganic to Bioinspired Nanomaterials, Vladimir A. Basiuk, Elena V. Basiuk Springer (2015)
20. Web related references suggested by teacher.

Co-Curricular Activities:

a) Mandatory: (Training of students by teacher on field related skills: 15 hours)

1.For Teacher: Training of students by the teacher in the classroom or in the laboratory for not less than 15 hours on field related quantitative techniques for Enzymatic catalysis, Microwave assisted organic synthesis, Biodiesel preparation etc.

2.For Student: Individual visit to any one of the local field agencies, research laboratories in universities/research organizations/private sector culminating writing and submission of a handwritten fieldwork/project work Report not exceeding 10 pages in the given format.

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

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

5. Unit tests (IE).

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GREEN CHEMISTRY & NANOTECHNOLOGY

The Semester question paper consists of 2 sections.

PART-A: Consists of EIGHT short answer questions carries 5 marks out of which 5 are to be answered.

PART- B: Consists of FIVE internal choice essay questions. Each question carries 10 marks. The examiner has to choose 2 questions from each Module

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

The examiner is requested to give equal importance to easy, moderate and difficult questions.

MODULE	5 MARKSQUESTIONS	QUESTION SERIALNUMBER	10 MARKSQUESTIONS	QUESTION SERIAL NUMBER	TOTAL MARKS
1	2	1,2	1(1 OUTOF2 INTERNALCHOICE)	9	20
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3	1	5	1(1 OUTOF2 INTERNALCHOICE)	11	15
4	2	6	1(1 OUTOF2 INTERNALCHOICE)	12	15
5	1	7,8	1(1 OUTOF2 INTERNALCHOICE)	13	20

Weightage for each level of Bloom's Taxonomy

Bloom's Taxonomy level	Type of question	Weightage
Knowledge/Remember	(Define/list/state)type.	15marks
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Application	(Solve, Sketch, interpret)type. Sums & Mechanisms	20marks
Analysis	(Differentiate, distinguish, Compare) type.	15marks
Evaluation	Argue, Defend, judge,	10marks
Create	Derive, Design, construct, Develop, formulate, investigate	

DEPARTMENT OF CHEMISTRY
DR. V. S. KRISHNA GOVT. DEGREE COLLEGE (A), VISAKHAPATNAM
MODEL PAPER

B. Sc, DEGREE THIRD YEAR EXAMINATIONS
Paper-7D, SEMESTER-V/VI

GREEN CHEMISTRY & NANOTECHNOLOGY

Time: 3 hours

Maximum Marks: 75

SECTION - A

Answer any five of the following questions

5x5=25

1. What is the need of green chemistry?
2. Discuss atom economy reactions.
3. Write short notes on Suzuki reaction.
4. Explain solid supported synthesis.
5. Describe the advantages of MAOS.
6. Brief about Bio catalysis.
7. What is chemical vapour synthesis?
8. Describe about sol gel method.

SECTION - B

Answer any five of the following questions

5x10 = 50

9(a) Explain the basic principles of green chemistry

OR

(b) Illustrate the sonication method with any two reactions

10(a) Describe the preparation and properties of super critical carbon dioxide.

OR

(b) Write short notes on Heck reaction and explain solid supported synthesis.

11(a) Explain the synthesis of fused anthro quinines by microwave assisted organic synthesis

OR

(b) Discuss about green synthesis of Aldol condensation and Cannizaro condensation

12(a) How are adipic acid and catechol prepared by Green synthesis?

OR

(b) Describe the green synthetic procedure for the Diels-alder reaction and decarboxylation reaction

13(a) Discuss the classification and applications of Nanomaterials

OR

(b) Give a detailed account on chemical synthesis of nanoparticles.

Department of Chemistry
Dr. V. S. Krishna Govt. Degree College (A),
Visakhapatnam



SYLLABUS
OF
FOOD ADULTERATION

UNDER SKILL DEVELOPMENT COURSES UNDER CBCS
FRAMEWORK WITH EFFECT FROM 2022-23

Department of Chemistry
Dr. V. S. Krishna Govt. Degree College (A), Visakhapatnam
Revised CBCS w.e.f. 2022-23
SKILL DEVELOPMENT COURSES

Science Stream
Syllabus of
FOOD ADULTERATION

Total 30 hrs (02h/wk),

02 Credits & Max Marks: 50

Learning Outcomes:

After successful completion of the course, students will be able to:

- 1. Get basic knowledge on various foods and about adulteration.*
- 2. Understand the adulteration of common foods and their adverse impact on health*
- 3. Comprehend certain skills of detecting adulteration of common foods.*
- 4. Be able to extend their knowledge to other kinds of adulteration, detection and remedies.*
- 5. Know the basic laws and procedures regarding food adulteration and consumer protection.*

SYLLABUS:

Module 1: Common Foods and Adulteration:

(07hrs)

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.

Module 2: Adulteration of Common Foods and Methods of Detection: (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).

Module 3: Present Laws and Procedures on Adulteration:

(08hr)

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 - Offences and Penalties - Procedures to Complain - Compensation to Victims.

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Recommended Co-curricular Activities (including Hands on Exercises): (05hrs)

1. Collection of information on adulteration of some common foods from local market
2. Demonstration of Adulteration detection methods for a minimum of 5 common foods (one method each)
3. Invited lecture/training by local expert
4. Visit to a related nearby laboratory
5. Assignments, Group discussion, Quiz etc.

Reference e-Books and Websites:

1. A firstcourseinFoodAnalysis–A.Y.Sathe,NewAgeInternational(P)Ltd.,1999
2. FoodSafety,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_Manuals/Beverages_and_confectionary.pdf)
4. <https://cbseportal.com/project/Download-CBSE-XII-Chemistry-Project-FoodAdulteration#gsc.tab=0> (Downloadable e material on food adulteration)
5. <https://www.fssai.gov.in/>
6. <https://indianlegalsolution.com/laws-on-food-adulteration/>
7. <https://fssai.gov.in/dart/>
8. <https://byjus.com/biology/food-adulteration/>
9. Wikiepedia
10. Vikaspedia

BLUE PRINT

Course: FOOD ADULTERATION

Important Tips for Setting Question Paper

- ✓ The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.
- ✓ It is suggested that the question writer should use his/her judgment in assigning difficulty value to each question. Following scale should guide you to set questions at different difficulty levels and use the Bloom's Taxonomy action verbs given below.

Bloom's Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
% of Weightage	30	20	20	15	10	5

Question Paper Pattern

- ✓ The Semester question paper consists of 2 sections.

PART-A: Consists of **EIGHT** short answer questions carries **5** marks out of which **4** are to be answered.

PART- B: Consists of **FIVE** essay questions. Each question carries **10** marks.

- ✓ The examiner has to choose at least one question from each module.

Sl. No	Modules	Name of the Module	5 M Questions	Question Serial Number	10 M Questions	Question Serial Number	Weightage per Module
1	Module 1	Common Foods and Adulteration	3	1, 2, 3	2	9, 10	35 Marks
2	Module 2	Adulteration of Common Foods and Methods of Detection	2	4, 5	1	11	20 Marks
3	Module 3	Present Laws and Procedures on Adulteration	3	6, 7, 8	2	12, 13	35 Marks

Department of Chemistry
Dr. V. S. Krishna Govt. Degree College (A), Visakhapatnam
Revised CBCS w.e.f. 2022-23
SKILL DEVELOPMENT COURSES
FOOD ADULTERATION
MODEL QUESTION PAPER

Max. Marks: 50

Time: 2 hrs

SECTION- A

(4x5M=20 Marks)

Answer any four questions. Each answer carries 5 marks

(At least 1 question should be given from each Unit)

1. Define food adulteration?
2. Explain the adulteration through Food Additives
3. Name few cheap substitutes used in food adulteration
4. Give examples for food additives and sweetening agents
5. Write a short note on processed food
6. Explain the procedures to complain about the food adulteration
7. Name the laws that governs the food adulteration
8. Explain the procedure to get compensation to the victims of food adulteration

SECTION- B

(3x10M=30 Marks)

Answer any three questions. Each answer carries 10 marks.

(At least 1 question should be given from each Unit)

9. Write an essay on the common Foods which are subjected to Adulteration and explain the types poisonous substances added for food adulteration.
10. Write in detail about the general Impact of food adulteration on Human Health.
11. Explain the food testing and standardized testing methods and protocols.
12. Describe the highlights of Food Safety and Standards Act 2006 (FSSAI)
13. Write an essay on different types of offenses of food adulteration and the penalties imposed.

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Visakhapatnam



SYLLABUS
OF
Clinical Lab Technology
(Inter Disciplinary Add on Course)

Model Curriculum - Inter Disciplinary Add on Course

Clinical Lab Technology

MODULE-I (Clinical Lab Technology) 18 hrs

1. Solutions: 2Hrs

Definition, different concentration methods

2. Carbohydrates and Lipids 4Hrs

(a) Carbohydrates: Definition, biological importance, classification, qualitative tests

(b) Lipids: Definition, biological importance, classification and clinical importance.

3. Amino acids Proteins 4Hrs

Definition, biological importance, classification, qualitative tests.

4. Vitamins and Minerals 4Hrs

(a) Vitamins: Classification, source, deficiency diseases

(b) Minerals: source, importance, deficiency diseases and clinical tests

5. Blood composition 4Hrs

Blood composition functions tests

6. Practical 12Hrs

(a) Blood tests, group identification, haemoglobin, other tests


(b) Blood sugar test

(c) Lipid profile test

(d) Liver function test

(e) Kidney function test

(f) Serum calcium, Sodium, Potassium test



Guidelines to the Paper Setter:

The syllabus Inter Disciplinary Add on Course consists of Clinical Lab Technology. The question paper consists of 3 sections.

In Section A: consists of 6 very short answers questions in which 5 are to be answered each question carries 2 marks.

In Section B: consists of 8 short answer questions carries 5 marks out of which 5 are to be answered.

In section - C: 6 essay questions are to be set each question carrying 10 marks out of which 4 questions are to be answered.

The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

**Inter Disciplinary Add on Course
Clinical Lab Technology
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S I No	Name of the Chapter	2 Marks	5 Marks	10 Marks
Module -I(Clinical Lab Technology)				
1	Solutions	1	1	
2	Carbohydrates and Lipids	2	2	2
3	Amino acids and Proteins	1	1	1
4	Vitamins and Minerals	1		1
5	Blood composition	1	2	1
6	Practical		2	

DEPARTMENT OF CHEMISTRY

Inter Disciplinary Add on Course Clinical Lab Technology

Time: 3 Hours

Model Paper

Max. Mark: 75

SECTION-A

Answer any **FIVE** questions. Each question carries 2 Marks

(5 X 2=10 Marks)

1. Define Molarity?
2. Write Molisch test?
3. What is a lipid?
4. What are amino acids?
5. Write the deficiency disease of vitamin A?
6. What is Plasma?

SECTION-B

Write any **FIVE** questions. Each question carries 5 Marks

(5 X 5=25 Marks)

7. Explain about Lipid profile test?
8. Explain about Liver function test?
9. Explain various concentrations methods of solutions?
10. Explain about Blood sugar test?
11. What is Haemoglobin? Explain its functions?
12. Write about Blood clotting and role of vitamin in it?
13. What are amino acids? Explain their classification?
14. Explain about serum creatine and serum urea test?

SECTION-C

Answer any **FOUR** questions. Each question carries 10 Marks

(4 X 10 = 40Marks)

15. What are carbohydrates? Explain their classification and biological importance?
16. Explain the functions, biological importance and normal levels of Cholesterol?
17. What are Proteins? Explain their functions and tests to identify?
18. Explain the sources and deficiency diseases of vitamin A, B, C, D.E
19. Explain the sources and biological importance of Na, K and Ca?
20. Explain the composition of Blood and its function?

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DEPARTMENT OF CHEMISTRY

FUNDAMENTALS OF NANOTECHNOLOGY

Duration : 30h

Learning Objectives:

After the studying the course, the student will be able to understand

1. The nanotechnology of ancient times
2. Synthetic methods of nanomaterials
3. Characterization of nanomaterials
4. Types of nanomaterials
5. Green nanotechnology
6. Green nanotechnology
- 7.

Module -I

10h

Introduction of Nanotechnology - Nanotechnology of ancient times - Classification of nanomaterials - Synthetic methods of nanomaterials-Top down methods Synthetic methods of nanomaterials-Bottom up methods -Synthetic methods of nanomaterials-Biological methods - Characterization of nanoparticles-UV-Visible spectroscopy, FTIR -EDX, SEM,TEM analysis - Physical properties of nanomaterials - Catalytic properties of nanomaterials - Antimicrobial studies of nanomaterials - Cytotoxicity of nanomaterials - nanocomposites

Module -II

10h

Metal oxide nanoparticles – Graphene- Nanoparticles in water treatment -nanobiotechnology Nanoparticles in electronic devices - Carbon Nanotubes- Dendrimers (Organic nanoparticles) Quantum Dots - Nanotechnology in Drug delivery – Therapeutic applications Nanotechnology in Textiles -Lithography and Nanofabrication - Nanobots- Biological Applications - Green nanotechnology - Nanoglasses -Nano ceramics- nanopolymers Nanomedicine - Nanotoxicology challenges

Practicals:

10h

1. Green synthesis of silver nanoparticles
2. Green synthesis CuO nanoparticles

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VISAKHAPATNAM**

DEPARTMENT OF CHEMISTRY
Certificate Course (Water Quality Assessment) –

Blue Print

Module	No.of Short Answer Questions (each question carries 5M)	WEIGHTAGE (Marks)	No.of Essay type Questions (Each question carries 10M)	WEIGHTAGE (Marks)	Total Weightage (Marks)
I	3	10	2	10	20
II	3	10	2	10	20

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DEPARTMENT OF CHEMISTRY

FUNDAMENTALS OF NANOTECHNOLOGY

max marks: 30

Time; 1h

Part –A

Answer any FOUR of the following questions. Each question carries 5 marks. **4x5=20**

1. Define nanotechnology.
2. Explain chemical vapour deposition
3. What is the sol-gel method?
4. Write about green nanotechnology.
5. Explain nanocatalysis.
6. Write about SEM analysis.
- 7.

PART-B

Answer the following questions. Each question carries 10 marks.

2x10=20

1. Explain any two characterization techniques of nanoparticles.
(or)
Write about applications of nanotechnology in medicine
2. Describe top down methods for nanosynthesis.
(or)
Explain classification of nanomaterials.

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DEPARTMENT OF CHEMISTRY

Certificate Course (Water Quality Assessment) –Syllabus

Duration : 30 h

Learning objectives:

After the studying the course, the student will be able to understand

1. Sources of water in India
2. Physical and chemical properties of water
3. Sources of water pollution and prevention measures
4. Water quality indicators
5. Methods of removal of hardness of water

Course outcomes :

1. The student understands and applies the sources of water, water pollution and effects of water pollution.
2. The student will get the skills to measure various water quality indicators.
3. The student will be able to understand the concept of hardness of water and apply the learned practical experience.
4. The student will be able to understand the origin and types of sewage and method of control of sewage water treatment.

Module-I

Water Sources and Water Pollution

10h

Physical and Chemical properties of water-Water sources in India-Sources of Water pollution-Measures of prevention of water pollution-Effects of water pollution- Eutrophication and Bioamplification.

Module-II

Water quality indicators

10h

TDS- Hardness of water – P^H of the water- D.O-BOD- COD- Conductivity of water- Alkalinity-Turbidity-Metal ions. Methods of removal of temporary hardness – Methods of removal of permanent hardness – Origin and types of Sewage- Sewage water treatment

Practicals:

10h

- 1) Testing of hardness of water with EDTA
- 2) P^H of the water sample
- 3) Total Alkalinity of water sample

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DEPARTMENT OF CHEMISTRY

Certificate Course (Water Quality Assessment) – Blue Print

Module	No.of Short Answer Questions (each question carries 5M)	WEIGHTAGE (Marks)	No.of Essay type Questions (Each question carries 10M)	WEIGHTAGE (Marks)	Total Weightage (Marks)
I	3	10	2	10	20
II	3	10	2	10	20

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DEPARTMENT OF CHEMISTRY
Certificate Course (Water Quality Assessment)

Model Question Paper

Time : 1h

Max.Marks: 40

Part –A

Answer any FOUR of the following questions. Each question carries 5 marks. 4x5=20

- 1) Write and explain any five physical properties of water?
- 2) Explain Eutrophication and Bioamplification.
- 3) Write any five chemical reactions of water.
- 4) What is temporary hardness of water. What is the cause for temporary hardness for water?
- 5) Explain conductivity and alkalinity of water?
- 6) Explain sewage water treatment.

PART-B

Answer the following questions. Each question carries 10 marks.

2x10=20

1)What are the water sources in Indian. Explain.

(or)

What are the sources of water pollution. Suggest any five methods for control of water pollution.

2)Explain the following for water

- a) D.O
- b) BOD
- c) COD
- d) TDS
- e) Alkalinity

(or)

Explain the methods of removal of permanent hardness of water.