SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA.

(NAAC Accredited B+ Grade (IIIcycle with CGPA 2.60) Institution & District Identified College)

DEPARTMENT OF CHEMISTRY

PROGRAMME: THREE-YEAR B. Sc (CHEMISTRY)

REVISED SYLLABUS UNDER CBCS FRAMEWORK
WITH EFFECT FROM 2021-2022
(With Learning Outcomes, Unit-wise Syllabus, References & Model Q.P)

BOARD OF STUDIES NOVEMBER- 2021

SRR & CVR GOVT. DEGREE COLLEGE (A), VIJAYAWADA

Department of Chemistry
Composition of Board of Studies

S.No	Category	Designation	Name of the Chairperson & Members of Board of studies	Remarks
1	Educational	Chairperson	Dr. V. Srinivasa Rao	
2	University Nominee	Member	Prof. M.V. Basaveswara Rao	
3	Subject expert	Member	Dr. G.V. Ramana	
4	Subject expert	Member	Dr. T. Narasimha Murthy	online
5	Industrialist	Member	Dr. S. Radha Krishna	online
6	Alumni	Member	Sri. K. Venkata Rao	online
7	Faculty	Member	Sri K.V.S. Prasad	
8	Faculty	Member	Dr. G. Nagarjuna	
9	Faculty	Member	Sri G.V. Swaroop Singh	
10.	Faculty	Member	Dr. M. Malyaadri	
11	Faculty	Member	Dr. Sk. Beebi	
12	Faculty	Member	Dr. PRG. Nallappa Reddy	

Department of chemistry

Resolutions of Board of Studies

Conventional courses

1.Mathematics, Physics & Chemistry (E.M)

2.Mathematics, Physics & Chemistry (T.M)

3.Botany, Zoology, Chemistry (E.M)

4.Botany, Zoology, Chemistry (T.M)

Restructured courses

1.Microbiology, Biochemistry, Chemistry (M.B.C)

2.Aquaculture Technology, Zoology, Chemistry (A.T.Z.C)

3.Mathematics, Chemistry, Computer Science (M.C. Cs)

4. B. Sc (Chemistry)

5. Botany, Horticulture, Chemistry (B.H.C)

S.R.R. & C.V.R. GOVT. DEGREE COLLEGE (A), VIJAYAWADA

DEPARTMENT OF CHEMISTRY

Minutes of Board of Studies in Chemistry

I, II, III IV, V & IV Semester

The meeting of the upgradation of syllabus for U.G (BOS) in the subject of chemistry was held on 30-11-2021 at 11PM through Blended mode Google Meet (Online) and Offline at SRR & CVR Govt. Degree College (Autonomous) Vijayawada. The following members attended the meeting through online and offline:

1.	Dr. V. SRINIVASA RAO	-	In-Charge of the Department & Chairperson BOS
2.	Prof. M.V. Basaveswara Rao	-	University nominee
3.	Dr. G.V. Ramana	-	Subject Expert
4.	Dr. T. Narasimha Murthy	-	Subject Expert
5.	Dr. S. Radha Krishna	-	Industrialist
6.	Sri. K.Venkata Rao	-	Alumni
7.	Sri K.V.S. Prasad	-	Faculty member
8.	Dr. G. Nagarjuna	-	Faculty member
9.	Sri. G.V. Swaroop Singh	-	Faculty member
10.	Dr. M. Malyaadri	-	Faculty member
11.	Dr. SK. Beebi	-	Faculty member
12.	Dr. PRG. Nallappa Reddy	-	Faculty member

Agenda:

1. Approval of the i. Syllabus, ii. Model Question paper, iii. Blue Print and iv. Question Bank of the Semesters I, II, III, IV,V & IV.
2. Approval of the duration of the Examination for 3 hours.
3. Approval of the Syllabus, Model Question paper, Blue Print and Question Bank of the Semesters II & III for i.e Life Skills and ii. Skill Development Course i.e Approval of Food Adulteration and Environmental Audit syllabus under skill development courses under CBCS framework with effect from 2021-22.
4. Approval of the activities proposed by the department, stipulated Credits, Work Load, Internal Marks, Scheme of valuation etc...

The Chairperson welcomed the members and had discussion on the Agenda. He appraised the members of the guidelines of the UGC, APSCHE, Krishna University and the CCE regarding the framing of Syllabus, etc., and the recommended evaluation ratio for internal before them and unanimously resolved the following:

The members of BoS Meeting Resolved:

1. To approve the syllabus for Semesters I, II, III, IV V and VI-- APSCHE's Syllabus for the announced subjects and the existing syllabus for other subjects for the academic year 2021- 2022.

   Sem III Details: Paper III - Inorganic & Organic Chemistry

   Sem V Details: Paper V & Paper VI - Inorganic Organic chemistry & Physical chemistry

   2 : To approve the i. Syllabus, ii. Model Question paper, iii. Blue Print and iv. Question Bank of the Semesters I, II, III, IV, V & VI

   3 : To approve the validity of this Syllabus for next three Years.

   4 : To follow the Autonomous pattern of Total 100 marks as : i. Theory of 60 Marks, and ii. Internal Assessment of 40 marks.

   5: To follow the Practical's components' Structure as resolved by the Science groups as Internal assessment - 25 marks and External assessment - 25 Marks

   6 : To follow Internal Assessment of 40 Marks Uniform pattern breakup resolved by the Autonomous Body / Committee.

7 : B O S Meeting is hybrid mode, Meeting pass code ID https://meet.google.com/ptm-azww-gjw

Link of the Recording : https://drive.google.com/file/d/1z7MaUJDK7jWWkKjbksfD0bXVGDZYsDyx/view?usp=sharing

8. To approve the syllabus of bridge course with 15 hours at the initial stage of I B.Sc .

I. Details of Members attended:

S.No	Name /Designation	Status of the expert	Online/offline/ Blended
1	Dr. V. SRINIVASA RAO In-charge of the Department	Chairperson, BOS	Offline
2	Prof. M.V. Basaveswara Rao	University Nominee	Online
3	Dr. G.V. Ramana	Subject Expert	Online
4	Dr. T. Narasimha Murthy	Subject Expert	Online
5	Dr. S. Radha Krishna	Industrialist	Online
6	Sri. K. Venkata Rao	Alumni	Online
7	Sri K.V.S. Prasad	Faculty member	Offline
8	Dr. G. Nagarjuna	Faculty member	Offline
9	Sri. G.V. Swaroop Singh	Faculty member	Offline
10	Dr. M. Malyaadri	Faculty member	Offline
11	Dr. Sk. Beebi	Faculty member	Offline
12	Dr. PRG. Nallappa Reddy	Faculty member	Offline

9 .To approve the stipulated Credits, Work Load, Internal Marks breakup etc.

10: To Approve the i. Syllabus, ii. Model Question paper, iii. Blue Print and iv. Question Bank of the Semesters I, II for i. Life Skills and ii. Skill Development Courses.

Details of Skill Dev. Courses: Food Adulteration.

Environmental Audit

12. Any other Resolutions, with the approval of the Chair:

13. To approve any other valid inclusion in B O S, with the permission of the Principal and Controller of Examinations (C O E). Details are given below: NIL

Signatures of the members of the BOS Meeting:

S.No	Name /Designation	Status of the expert	Signatures
1	Dr. V. SRINIVASA RAO In-charge of the Department	Chairperson, BOS	
2	Prof. M.V. Basaveswara Rao	University Nominee	
3	Dr. G.V. Ramana	Subject Expert	
4	Dr. T. Narasimha Murthy	Subject Expert	online
5	Dr. S. Radha Krishna	Industrialist	online
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7	Sri K.V.S. Prasad	Faculty member	
8	Dr. G. Nagarjuna	Faculty member	
9	Sri. G.V. Swaroop Singh	Faculty member	
10	Dr. M. Malyadri	Faculty member	
11	Dr. SK. Bechi	Faculty member	
12	Dr. PRG. Nallappa Reddy	Faculty member	

Counter signed by:

Principal

PRINCIPAL
SRR & CVR GOVT. DEGREE COLLEGE
(Autonomous)
Machavaram, VIJAYAWADA - 520 004

Department of Chemistry
SRR & CVR Govt. Degree College(A), Vijayawada

Programme Objectives:

On successful completion of the **B.Sc Chemistry** Programme, students are able to:

(i) Understand Systematic and fundamental concepts of chemistry as a discipline.

(ii) Acquire Skill and related developments of specialization in the subject.

(iii) Identify chemistry related problems, analysis and application of data using appropriate methodologies.

(iv) Apply subject knowledge and skill to solve complex problems with defined solutions.

(v) Find opportunity to apply subject-related skill for acquiring jobs and self-employment.

Programme Specific Outcomes:

On successful completion of the **B. Sc Chemistry** Programme students are able to:

(i) Understand new frontiers of knowledge in chemistry for professional development.

(ii) Apply subject knowledge for solving societal problems related to application of chemistry in day to day life.

(iii) Develop industry focused skills to lead a successful career.

(iv). Express proficiency in oral and written communications to appreciate innovation in research.

Structure of I Semester II semester syllabus under CBCS

YEAR	SEMESTER	COURSE	TITLE	MARKS	CREDITS
I	I	I	Inorganic and Physical Chemistry	100	03
			Practical – I Analysis of SALT MIXTURE	50	02
	I I	II	Organic and General Chemistry	100	03
			Practical – IIVolumetric Analysis	50	02

SEMESTER-I

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

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

1. Understand the basic concepts of p-block elements
2. Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
3. Apply the concepts of gas equations, pH and electrolytes while studying other chemistry course

INORGANIC CHEMISTRY 24 h

UNIT - I

Chemistry of p-block elements **8h**

Group-13 : Preparation & Structure of Diborane ,Borazine
Group -14 : Preparation ,classification and uses of Silicones.
Group15 : Preparation Structures of Phosphonitrilic halides {(PNCl2)n where n=3, 4}
Group:16 : Classification of Oxides and Oxo acids of sulphur (Structure only)
Group:17 : Pseudo halogens ,structures of Interhalogen compounds

UNIT - 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 , Separation of lanthanides and actinides(Ion exchange method) .

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 their classification and insulators .

PHYSICAL CHEMISTRY

36h

UNIT- III

Solid state 10h

Symmetry in crystals, Law of constancy of interfacial angles, The Law of rationality of Indices, The Laws of symmetry, Miller indices, Definition of lattice point, space lattice, Unit cell. Bravais Lattices and crystal systems. X-ray diffraction and crystal structure, Bragg's Law ,powder method Defects in crystals, stoichiometric and non-stoichiometric crystal defects.

UNIT-IV

1.Gaseou state 6h

van der Waals equation of state, Andrew's Isotherms of carbon dioxide, Continuity of state ,Critical phenomenon ,Relation between critical constants and van der Waals constants, Law of Corresponding states, Joule-Thomson effect, Inversion temperature.

2. Liquid State 4h

Liquid crystals, Mesomorphic state ,Differences between liquid crystals and solid/liquid, Classification of liquid crystals into smectic, nematic and cholesteric liquid crystals, Application of liquid crystals as LCD Devices.

UNIT- V

Solutions, Ionic equilibrium & dilute solutions

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 and their applications. Calculations based on solubility product.

3.Dilute solutions 7h

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 and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Work sheets and Quizzes
3. 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. 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. deAtkin'sPhysical ChemistryEd., Oxford UniversityPress 10thEd(2014).
10. Castellan, G.W. Physical Chemistry 4thEd.Narosa (2004).
11. Mortimer, R.G.Physical Chemistry3rdEd. Elsevier: NOIDA,UP(2009).
12. Barrow, G.M. Physical Chemistry
13. Chemistry for degree students by Dr.R.L.Madan

Theory of Internal Assessment

Internal (mid Test average)	Assignments	Seminar	Project	Total
10M	10M	10M	10M	40M

B.Sc Chemistry, Course -I, Semester -I
Blueprint

S.No	Units	Name of the chapter	8M	4M
		Inorganic chemistry		
1	Unit-I	Chemistry of p-block elements	2	2
2	Unit- II	Chemistry of d & f-block elements ,Theory of bonding in metals	2	2
		Physical chemistry		
3	Unit-III	Solid state	2	1
4	Unit-IV	Gaseous state Liquid state	1 1	1 1
5	Unit-V	Solutions ,ionic equilibrium Dilute solutions	2	3

MODEL PAPER

DEPARTMENT OF CHEMISTRY

SRR & CVR Govt . Degree College(A)Vijayawada ,Andhrapradesh,INDIA

(NAAC B+ (III Cycle with CGPA -2.6 & District Identified college)

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-I

CHEMISTRY Course-I: INORGANIC & PHYSICAL CHEMISTRY

Time: 3 hours **Maximum Marks: 60**

PART- A **5 X 4 = 20 Marks**

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

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

PART- B **5X 8 = 40 Marks**

Answer ALL the questions. Each carries EIGHT marks

11. Explain Classification, Preparations & uses of Silicones

(or)

12. (i) What are Pseudo halogens.
    (ii) Explain the Structures of any one AX3& AX5interhalogen compounds.

13. What is Lanthanide Contraction? Explain the Consequences of Lanthanide Contraction.

(or)

14. (i) Explain the magnetic properties of d- block elements.
    (ii) Explain about Conductors. Semi-Conductors& Insulators using Band Theory.

15. Write an essay on Crystal defects.

(or)

16. What is Bragg's Law. Explain the determination of structure of a crystal by powder method.

17. Derive the relationship between Critical constants & van der Waals constants

(or)

18. (i) Write any 5 differences between liquid crystals & liquids
    (ii) Write the applications of Liquid crystals.

19. (a). Explain Nernst distribution Law. Explain its applications

(or)

20. What are Colligative properties? Write experimental methods for determination of molar mass of a non-volatile solute by using Elevation in boiling point.

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

Practical-I

Analysis of Salt Mixture (At the end of semester-I)

Qualitative Inorganic Analysis (Minimum of six mixtures should be analyzed) 50M

Course out comes:

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

1. Understand the basic concepts of qualitative analysis of inorganic mixture.
2. Use glass ware, 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 Marks**

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

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

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

Practical scheme of valuation

Time : 3hrs

Marks: 25

Scheme for External Examination

Systematic procedure should be adopted :

Breakup of marks :

Part- A Preliminary Tests

Colour and appearance & Odour - 1M
Solubility -1M
Action of Heat - 1M
Flame test -2M

Part-B Test for each anion -3M

Two Anions 2 x 3 = 6M (Dry test with acids -1M + Confirmation with extract -2M)

Sodium carbonate Extract preparation -2M

Part- C

Test for each Cation - 5M
Two cations - 2 x 5 =10M
Break up of 5 marks for each cation
Identification of correct group in separation - 1M
Colour of the precipitate - 1M
General group separation table - 1M
Confirmation test in the group - 2M
For ammonium Cation
Test with NaOH - 2M
Test with Nessler's reagent - 3M

Part - D

Report for two Anions & two cations - 2M

Total Marks - 25 Marks

Internal assessment for Practical

Record	Project/viva	Fieldnotes /field trip	Total
10 M	10M	05M	25M

Department of Chemistry –
Semester -I Question bank

Short questions- 4 marks

1. Explain the preparation and structures of phosphonitrilic compounds
2 . Explain the structure of Diborane .
3. Write a short note on pseudo halogens.
4. Explain the structure of sulphurous acid & sulphuric acid
5. Explain in brief catalytic properties and stability of various oxidation States of d- block elements.
6. Write a short note on actinide contraction .
7. Explain valency bond theory and free electron theory.
8. Write a short note on Bravais lattices
9. Define law of constancy of interfacial angle.
10.Derive bragg's law.
11. write a short note on weiss indices and Miller Indices.
12. Explain last corresponding States.
13. Explain the Joule thomson effect.
14 .Write a short note on Inversion temperature.
15. Explain applications of liquid crystals.
16. Write an account on solubility product and common Ion effect.
17. Explain Nernst distribution law.
18. Write a short note on Van't Hoff factor.
19.write a short note on relative lowering of vapour pressure
20. write a short note on Azeotrope mixture

Essay Questions -8Marks

1. Explain classification , preparation & uses of silicones.
2. What are pseudo halogens text line The structures of of anyone AX3 andAX5 Inter halogen compounds.
3. What is Lanthanide contraction. Explain the consequences of Lanthanide contraction.
4. explain the magnetic properties of d- block elements. Explain about conductors semiconductors and insulators using Band theory.
5.Write an essay on crystal defects.
6. what is bragg's law.Explain determination of structure of a crystal bye powder method.
7. Derive the relation between Vanderwaal constants and Critical constants .
8.write an essay on Andrew's isotherm of carbon dioxide.
9. Write any two differences between liquid crystal and liquids ,solids .Explain The Classification of liquid crystals.
10. Write experimental methods for determination of molar mass of a non volatile solute by using Elevation in boiling point and Depression in freezing point

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VIJAYAWADA

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SEMESTER – II

Course II – (Organic & General Chemistry) 60 hrs (4h/w)

Course outcomes:

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

a) Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt.
b) Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
c) Learn and identify many organic reaction mechanisms including Free Radical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.
d) Correlate and describe the stereochemical properties of organic compounds and reactions.
e) Learn the concepts of hybridization and molecular orbital energy level diagrams to understand structure and bonding in molecules

ORGANIC CHEMISTRY 36h

UNIT-I

Recapitulation of Basics of Organic Chemistry

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

General methods of preparation of alkanes- Wurtz and WurtzFittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Isomerism and its effect on properties, Free radical substitutions; Halogenation(Mechanism), Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of ethane and butane). General molecular formula of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane Conformations with energy profile diagram.

References: Chemistry for degree students by Dr. R.L. Madan

UNIT-II

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

General methods of preparation, physical and chemical properties. Mechanism of E1, E2, reactions, Saytzeff Rule, Electrophilic Additions, mechanism (Markownikoff/Anti-Markownikoff addition)with suitable examples,, *syn and anti-addition*; addition of H_2, X_2, HX. Oxymercuration- de-mercuration, hydroboration-oxidation, ozonolysis, hydroxylation, Diels Alder reaction,1,2- and1,4-addition reactions in conjugated dienes.

Reactions of alkynes; acidity,

electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

References: Chemistry for degree students by Dr. R.L. Madan

UNIT-III

Benzene and its reactivity **12h**

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene and Anthracene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropylium cation)Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, 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 NO2 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)

References: Chemistry for degree students by Dr. R.L. Madan

GENERAL CHEMISTRY **24 h**

UNIT-IV

1. Surface chemistry and chemical bonding

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.

Chemical Bonding 6h

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

HSAB 2h

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

UNIT-V

Stereochemistry of carbon compounds 10h

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae. Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation. Chiral molecules- definition and criteria (Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with reference to Lactic acid and Tartaric acid Further examples- Glyceraldehyde, Alanine, 2,3-dibromopentane. D,L, R,S and E,Z- configuration with examples. Definition of Racemic mixture – Resolution of racemic mixtures (any 3 techniques)

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 Theory:

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling
2. Kindersley (India) Pvt. Ltd. (PearsonEducation).
3. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

5. Eliel, E. L. &Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994. Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

Practical:

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

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

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

Additional Resources:

1. Solomons, T. W. G.; Fryhle, C. B. &Snyder, S. A. Organic Chemistry, 12th Edition, Wiley. Bruice, P. Y. Organic Chemistry, Eighth Edition, Pearson.

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

3. Nasipuri, D. Stereochemistry of Organic Compounds: Principles and Applications, Third Edition, NewAge International.

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

Theory of Internal Assessment

Internal (mid Test average)	Assignments	Attendance	Seminar	Project	Total
10M	10M	05M	05M	10M	40M

B.Sc Chemistry ,Course –I Semester -II
Blueprint

S.No	Units	Name of the chapter	8M	4M
		Organic chemistry		
1	Unit-I	Carbon-Carbon sigma bonds	2	2
2	Unit- II	Carbon-carbon Pi bonds	2	2
3	Unit-III	Benzene and its reactivity	2	2
		General chemistry		
4	Unit-IV	Surface chemistry & Chemical bonding	1 1	1 1
5	Unit-V	Stereochemistry of carbon compounds.	2	2

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(NAAC Reaccredited B$^+$ Grade Institution & District Identified College)
Vijayawada- 520004, Andhra Pradesh, INDIA

MODEL PAPER
FIRST YEAR B.Sc., DEGREE EXAMINATION
SEMESTER-II
CHEMISTRY COURSE -II: ORGANIC & GENERAL CHEMISTRY

Time: 3 hours Maximum Marks: 60

PART- A 5 X 4 = 20 Marks

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

1. Write different conformations of n-butane. Explain their relative stability.
2. Explain 1,2- & 1,4- addition reactions of conjugated dienes.
3. Explain the orientation effect of halogens on mono substituted benzene.
4. Explain the mechanism of $E1^{CB}$ elimination reaction.
5. Explain the structure of ClF3 by Valency Bond theory.
6. What are Hard & soft acids & bases? Explain with examples.
7. Draw the Wedge, Fischer, Newmann& saw-Horse representations for Tartaric acid.
8. Define Enantiomers and Diastereomers and give two examples for each.

PART- B **5** X 8 = 40 Marks

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

11. (a). (i) Write the preparation of alkanes by Wurtz and Corey-House reaction.
(ii) Explain Halogenation of alkanes. Explain the reactivity and selectivity in free radical substitutions.

(or)

(b). (i) Explain Baeyer Strain Theory.
(ii) Draw the conformations of Cyclohexane and explain their stability by drawing energy profile diagram.

11 (a). (i) Write any two methods of preparation of alkenes.

(ii) Explain the mechanism of Markownikiff and Anti-Markownikoff addition of HBr to alkene.

(or)

(b). (i) Explain the acidity of 1-alkynes.
(ii) How will you prepare acetaldehyde and acetone from alkynes?
(iii) Write alkylation reaction of terminal alkyne.

12.(a). Define Huckel rule of aromatic compounds. What are benzenoid and non- benzenoid aromatic compounds? Give examples.

(or)

(b). Explain the mechanisms of Nitration and Friedel-Craft's alkylation of Benzene.

13.(a). (i) Define Hardy-Schulze rule & Gold number.
(ii) Differentiate Physisorption& Chemisorption. Explain Langmuir adsorption isotherm.

(or)

(b). Construct the Molecular Orbital diagram for O2 and NOand explain their bond order and magnetic property.

14.(a). Define racemic mixture. Explain any two techniques for resolution of racemic mixture.

(or)

(b).(i) Define Optical activity and Specific rotation.

(ii) Draw the R- & S- isomers of Alanine, Glyceraldehyde.

(iii) Write the E- & Z- isomers of 2-butene.

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

Practical-II Volumetric Analysis

(At the end of Semester-II)

Course outcomes:

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

a. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory.
b. Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria
c. Learn and identify the concepts of a standard solutions, primary and secondary standards
d. 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.

50 M

Volumetric analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using KMnO4 with oxalic acid as primary standard.
3. Determination of Cu (II) using Na2S2O3 with K2Cr2O7 as primary standard.
4. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4

Practical External scheme of valuation

Time : 3 hrs **Practical Marks : 25 M**

Titrimetric analysis (25 M) :

1.Systamatic procedure : 05 M

2.Balanced chemical equation : 02 M

3.Table with details : 03 M

4.Burette reading : Error of < 1 % = 10 M, Error of 1 to 2 % = 7 M, Error of > 3% = 3 M

5.Calculations : 03 M

6. Result : 02 M

Internal assessment for Practical

Record	Project/viva	Fieldnotes /field trip	Total
10 M	10M	05M	25M

SEMESTER - III

B.Sc. Chemistry Revised Syllabus under CBCS - **w.e.f. 2020-21**

Structure of Chemistry Core Syllabus under CBCS

YEAR	SEMESTER	COURSE	TITLE	MARKS	CREDITS
II	III	III	Organic Chemistry and Spectroscopy	100	03
			Organic Qualitative analysis	50	02
	IV	IV	Inorganic, Organic and Physical- Chemistry	100	03
			Practical – III Organic preparations	50	02
		V	Inorganic & physical chemistry	100	03
			Conductometric and Potentiometric Titrimetry	50	02

III[rd] and IV[th] - Semester

Resolution:

1. It is proposed to include Organic Qualitative analysis as laboratory Course -III in III[rd] semester and Organic preparations as Practical Course-IV in IV[th] semester.
2. Some of the topics have been incorporated as additional inputs for Subject enrichment in Course III and Course V theory papers.

Course III: Organic Chemistry and spectroscopy	Unit- 1	Elimination reactions of alkyl halides, Test for alcohols and phenols
	Unit - 2	Test for aldehydes and ketons
	Unit - 3	Test for Carboxylic acids, **Synthetic applications** : Preparation of 1. Mono-carboxylic acid 2. Di-carboxylic acid 3. Keto-acids, 4. Unsaturated carboxylic acids 5. Heterocyclic compounds
	Unit - 4	----
	Unit - 5	λmax of compounds (Eg: 1, 3-butadiene, Benzene, 2,3-dimethyl- 1,3-butadiene, 2-cyclo-hexenone).

Course V: Inorganic & Physical Chemistry	Unit- 1	-----
	Unit - 2	----
	Unit - 3	----
	Unit - 4	**Coductometric SA Vs WB 2. WA Vs SB 3. WA Vs WB 4. WA+SA Vs SB**
	Unit - 5	----

Board Studies Meeting :: 2021-22

SEMESTER - III

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

Department of chemistry

Board of studies resolutions for

Conventional programmes

1. Mathematics, Physics & Chemistry (E.M)
2. Botany, Zoology, Chemistry (E.M)
3. Botany, Zoology, Chemistry (T.M)

Restructured programmes

1. Microbiology, Biochemistry, Chemistry (M.B.C)
2. Mathematics, Chemistry, Computer science (M.C.Cs)

SECOND YEAR SEMESTER - III

Course III

ORGANIC CHEMISTRY & SPECTROSCOPY

SEMESTER - III

Course III (ORGANIC CHEMISTRY & SPECTROSCOPY) –CHE-N-3304

60hrs (4 h / w)

Course outcomes:

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

1. Understand the preparation, properties and reactions of alkyl halides and oxygencontaining functional groups
2. Acquire the basic knowledge about the application of modern spectroscopic techniques
3. Write plausible mechanisms for any relevant reaction

ORGANIC CHEMISTRY 34h

UNIT – I

1. Chemistry of Halogenated Hydrocarbons: 6h

Alkyl halides: Methods of preparation (halogination of alkanes, PCl_5, PCl_3) and properties, nucleophilic substitution reactions– SN^1, SN^2 and SN^i mechanisms withstereo chemical aspects and effect of solvent etc.; Elimination reactions of Alkyl halides. Nucleophilic substitution vs elimination, Williamson's synthesis.

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

2. Alcohols &Phenols 6h

Alcohols: Preparation (Grignard reagent, ester hydrolysis), properties and Bouvaelt Blanc Reduction; Relative reactivity of 1°, 2°, 3° alcohols (with Lucas reagent, metals and acids), Pinacol- Pinacolone rearrangement with mechanism.

Phenols: Preparation (from diazonium salts, ary halides) and properties; Acidity and factors effecting it, Reimer–Tiemann and Kolbe's–Schmidt Reactions, with mechanism

Subject ENRICHMENT: Test for alcohols and phenols

UNIT-II

Carbonyl Compounds **10h**

Structure, reactivity, preparation (Cyanides, Alcohols) and properties; Nucleophilicadditions, Nucleophilic addition-elimination reactions with ammonia derivatives.

Mechanisms of Aldol and Benzoin condensation, Claisen-Schmidt, Perkin, Cannizzaroand Wittig reaction, Beckmann, haloform reaction.

Oxidation reactions: Baeyer Villiger oxidation, α-Substitution reaction **Reduction reactions:** (Clemmensen, wolf -kishner, with $LiAlH_4$ & $NaBH_4$). **Addition reactions** of α,β-unsaturated carbonyl compounds: Michael addition.

Active methylene compounds: Keto-enol tautomerism. Preparation of diethyl malonate (From acetic acid) and ethylacetoacetate (Claisen Condensation with mechanism).

Synthetic applications : Preparation of 1. Mono-carboxylic acid 2. Di-carboxylic acid 3. Keto-acids, 4. Unsaturated carboxylic acids 5. Heterocyclic compounds

Subject ENRICHMENT: Test for Aldehydes and ketones

UNIT-III

Carboxylic acids and their derivatives 1**2h**

General methods of preparation (Grignard reagent, acidic/alkaline - ester hydrolysis with mechanism. Acidic nature of Carboxylic acids and effect of substituents on acidic strength

Reactions of monocarboxylic acids: Hell- Volhard- Zelinsky reaction, Schimdt reaction, Arndt- Eistert synthesis, Huns-Diecker reaction, Esterification with mechanism

Preparation of acid chlorides, anhydrides, esters and amides : Inter conversion of one acid derivative to other acid derivative.

Subject ENRICHMENT: Test for Carboxylic acids

SPECTROSCOPY 26 h

UNIT-IV

Molecular Spectroscopy: 10h

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

Rotation spectroscopy: Selection rules, intensities of spectral lines, isotopic substitution.

Vibrational spectroscopy: Classical equation of vibration, vibrational degrees of freedom for polyatomic molecules, modes of vibration. Selection rules for vibrational transitions, Fundamental frequencies, overtones and hot bands.

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.

UNIT-V

Nuclear Magnetic Resonance (NMR) spectroscopy: 8h

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.

Application of Spectroscopy to Simple Organic Molecules 8h

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 (Eg: 1, 3–butadiene, Benzene, 2,3- dimethyl- 1,3-butadiene, 2-cyclo-hexenone).

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 (VALUES ONLY.)

Co-curricular activities and Assessment Methods

Continuous Evaluation: Monitoring the progress of student's learning by Class Tests, Work sheets and Quizzes Presentations, Projects, Assignments and Group Discussions, enhances the critical thinking skills and personality.

Semester End Examinations: Critical indicator of students learning, and teaching methods adopted by teachers throughout the semester.

Theory - Evaluation : 100 M

Theory of Internal Assessment - 40M

Internal (mid Test average)	Assignments	Seminar	Project	Total
10M	10M	10 M	10M	40M

External Assessment – 60M

List of Reference Books

1. A Text Book of Organic Chemistry by Bahl and Arun bahl
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 SilversteinFrancis XWebster
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)
13. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).

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SECOND YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-III

CHEMISTRY COURSE-III: ORGANIC CHEMISTRY & SPECTROSCOPY

S.No	Units	Name of the chapter	8M	4M
		ORGANIC CHEMISTRY		
1	Unit-I	Chemistry of halogenated hydrocarbons	1	2
		Alcohols and Phenols	1	
2	Unit- II	Carbonyl Compounds	2	2
3	Unit-III	Carboxylic acids and derivatives	2	2
		SPECTROSCOPY		
4	Unit-IV	Molecular Spectroscopy	2	2
5	Unit-V	NMR, Applications of spectroscopy	2	2

MODEL PAPER

SECOND YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-III

CHEMISTRY COURSE-III: ORGANIC CHEMISTRY &SPECTROSCOPY

Time: 3 hours | Maximum Marks: 60

PART- A | 5 X 4 = 20 Marks

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

1. Explain the mechanism for Pinacol-Pinacolone rearrangement.
2. What do you understand by walden invertion.
3. Discuss the mechanism for Bayer-villiger oxidation reaction.
4. Write a note on Aldol condensation reaction.
5. Explain the effect of substituents on acidic strength of mono-carboxylic acids.
6. Write the mechanism for Claisen Condensation reaction.
7. Write the selection rules in rotational spectroscopy.
8. Explain types of electronic transitions in UV spectroscopy.
9. Give the IR frequency ranges for halide, alcohols, carbonyl group, carboxylic functional groups.
10. Calculate the λmax of 1,3- butadiene.

PART- B | 5 X 8 = 40 Marks

Answer **ALL** the questions. Each carries **EIGHT** marks:

11. (a). Give the mechanism & stereochemistry of SN^1& SN^2 reactions of alkylhalides with suitable example. (or)

    (b). Explain the following reactions with mechanism.

    Reimer-Tiemann reaction (ii) Fries rearrangement.

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

    (i) Perkin reaction. (ii) Cannizaro reaction (or)

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

13. (a). Explain acid and base hydrolysis reaction of esters with mechanism. (or) (b). Explain the mechanisms of Curtius rearrangement & Arndt –Eistert reaction.

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

(ii) Discuss the principle of NMR spectroscopy.

15. (a). Write Woodward-Fieser rules for calculating λmax for conjugated dienes and α,β – unsaturated carbonyl compounds , and apply them for one example each. (or)

(b). (i) What is Fingerprint region. Explain its significance with an example.

(ii)Write IR spectral data for any one alcohol, aldehyde and ketone.

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

Practical Course-III Organic Qualitative analysis 50 M

(At the end of Semester- IV)

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

- Analyse the given organic compound by systematic procedure
- Understand the chemical reactions of organic compound by experimental procedure
- Correlate the theoretical and experimental knowledge of organic reactions

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

Scheme of valuation: Course -IV Practical :: Organic Compound Analysis – 50 M

I. Internal practical examination: 25M

S.No.	Scheme	Marks
i.	Record	10 M
ii.	Viva-voce	10M
iii.	Field visit	05M
	Total	25M

P Nallaya Reddy

07.06

II. **External practical examination: 25M**

Organic Compound analysis

S.No.	Scheme	Marks
1	Physical state, colour and solubility	1M
2	Combustion	1M
3	M.P / B.P	2M
4	Litmus test	1M
5	Element detection	3M
6	Test with $FeCl_3$	2M
7	Test with 2,4 D.N.P	2M
8	Test with $NaHCO_3$	1M
9.	Test with alcoholic $KOH+CHCl_3$	1M
10	Molisch Test	2M
11	Test with NaoH	1M
12	Specific test/ derivative (3M+3M)	6M
13	Report	2M
	Total	25M

SECOND YEAR SEMESTER - IV

Course IV

INORGANIC, ORGANIC ANDPHYSICAL CHEMISTRY

SEMESTER - IV

Course IV : (INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY) 60hrs (4 h / w)

Course outcomes: At the end of the course, the student will be able:

- To learn the laws of absorption of light energy by molecules and the subsequent photochemical reactions.
- To understand the preparation, properties and reactions of Nitrogen compounds and some multifunctional group organic molecules (Carbohydrates, Amino acids)
- To co-relate the basic concepts of thermodynamics to Chemical reactions

UNIT - I

Organometallic Compounds **8h**

Definition and classification of organometallic Compounds on the basis of bond type, concept of hapticity of organic ligands. Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d-series. General methods of preparation of mono and binuclear carbonyls of 3d-series.

Carbohydrates **8h**

Occurrence, classification and their biological importance, Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, Action of Phenylhydrazine - Osazone formation, determination of ring size of glucose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani- Fischer synthesis and Ruffs degradation; Disaccharides–Structures of maltose, lactose and sucrose. Polysaccharides–Structures of starch and cellulose.

UNIT – II

Amino acids and proteins **6h**

Introduction: Definition of Amino acids, , classification of amino acids into 1. Acidic, basic and neutral amino acids with examples 2. Essential and non-essential amino acids with examples. **Methods of synthesis:** 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.

Physical properties: Zwitter ion and isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating- peptide bond (amide linkage).

Heterocyclic Compounds **7h**

Introduction and definition: Classification - Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1, 4, - dicarbonyl compounds, Paul-Knorr synthesis.

Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. Comparison of electrophilic substitution at alpha-position over beta position.

UNIT- III

Nitrogen Containing Functional Groups

1. Nitro hydrocarbons **3h**

Nomenclature and classification-nitro hydrocarbons, structure-Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes (alkyl halides, alkanes), reactivity - reaction with HONO (Nitrous acid), Halogination, Nef reaction and Mannich reaction (without mechanism).

2. Amines: **11h**

Introduction, classification, importance and general methods of preparation.

Properties : Physical properties, Basicity of amines: solvent and steric effects. Separation of Primary, secondary and tertiary amines using Hinsberg's method and distinction of amines using nitrous acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann-Bromamide reaction, Carbylamine reaction, Hofmann-elimination reaction and Hoffmann's exhaustive methylation

UNIT- IV

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- Abnormal 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).

UNIT- V

Thermodynamics **12 h**

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- Kirchcoff'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

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.

Theory - Evaluation : 100 M

Theory of Internal Assessment - 40M

Internal (mid Test average)	Assignments	Seminar	Project	Total
10M	10M	10 M	10M	40M

External Assessment – 60M

List of Reference Books

2. Concise coordination chemistry by Gopalan and Ramalingam
3. Coordination Chemistry by Basalo and Johnson
4. Organic Chemistry by G.Mareloudan, Purdue Univ
5. Text book of physical chemistry by S Glasstone
6. Concise Inorganic Chemistry by J.D.Lee
7. Advanced Inorganic Chemistry Vol-I by Satyaprakash, 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 Finar Vol I
10. A Text Book of Organic chemistry by I L Finar Vol II
11. Advanced physical chemistry by Gurudeep Raj

Course IV : (INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY)

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SECOND YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-III

S.No	Units	Name of the chapter	8M	4M
1	Unit-I	Organometallic Compounds and Carbohydrates	2	2
3	Unit-II	Amino acids and proteins	2	2
		Hetero Cyclic Compounds		
4	Unit-III	Nitro- hydrocarbons	2	2
		Amines		
5	Unit-IV	Photochemistry	2	2
	Unit - V	Thermodynamic	2	2

SEMESTER-IV

CHEMISTRY COURSE -IV: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

MODEL PAPER

SECOND YEAR B.Sc., DEGREE EXAMINATION

Time: 3 hours Maximum Marks: 60

PART- A 5 X 4 = 20 Marks

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

1. Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples.
2. What are epimers and anomers. Give examples.
3. Discuss about iso electric point and zwitter ion.
4. Discuss the Paul-Knorr synthesis of five membered heterocyclic compounds.
5. Explain Tautomerism shown by nitro alkanes
6. Discuss the basic nature of amines.
7. Write the differences between thermal and photochemical reactions.
8. Derive heat capacities and derive $C_p - C_v = R$
9. Write a note on Photosensitized reactions
10. Explain Joule- Thomson effect

PART- B 5 X 8 = 40 Marks

Answer **ALL** the questions. Each question carries **EIGHT** marks

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

(b). Discuss the constitution, configuration and ring size of glucose. Draw the Haworth and Conformational structure of glucose.

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

(or)

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

13. Write the mechanism for the following.

(a) (i) Nef reaction (ii) Mannich reaction (or)

(b). (i) Explain Hinsberg separation of amines.

(ii)Discuss any three synthetic applications of diazonium salts.

14. (a). What is quantum yield? Explain the photochemical combination of HydrogenChlorine and Hydrogen - Bromine. (or)

(b). Discuss Jablonski Diagram

15. (a). Explain entropy and entropy changes in the reversible and irreversibleprocess. (or)(b). what is carnot theorm? Explain it.

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

Practical Course-IV Organic preparations

Course outcomes:

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

1. How to handle glassware, equipment, chemicals and follow experimental procedures in laboratory
2. How to calculate limiting reagent, theoretical yield, and percentage yield
3. How to dispose chemicals in a safe and responsible manner
4. How to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
5. How to create and carry out work up and separation procedures
6. How to critically evaluate data the collected to determine the identity, purity, and percent yield of products and to summarize findings in writing in a clear and concise manner.

Organic preparations: 50M

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

SECOND YEAR SEMESTER - IV

Course V

INORGANIC AND PHYSICAL CHEMISTRY

SEMESTER - IV

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

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

- Understand the concepts of bonding in Coordination compounds.
- Learn the factors effecting stability of complexes.
- Calculate the EMF and rates of chemical reactions.

INORGANIC CHEMISTRY 26 h

UNIT –I

Coordination Chemistry 12 h

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.

UNIT –II

Inorganic Reaction Mechanism: **4h**

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

Stability of metal complexes: 2h

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.

Bioinorganic Chemistry: 8h

Metal ions present in biological systems, classification of elements according to their action in biological system. Sodium/K- pump, carbonic anhydrase and carboxy peptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Iron and its application in bio-systems, Haemoglobin, Myoglobin. Storage and transfer of iron.

PHYSICAL CHEMISTRY 34 h

UNIT-III

Phase rule 6h

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 (Pattison's process) ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point , freezing mixtures.

UNIT-IV

Electrochemistry 14h

Specific conductance, equivalent conductance and molar conductance- Definition andeffect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number byHittorf's method. Debye-Huckel-Onsagar's equation for strong electrolytes (elementarytreatment only), Application of conductivity measurements- conductometric titrations.**Additional input : 1. SA Vs WB 2. WA Vs SB 3. WA Vs WB 4. WA+SA Vs SB**

Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal- metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insolublesalt-salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations.

UNIT-V

Chemical Kinetics: **14 h**

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction (1. Half life method, 2. Vant Hoff's differential method). 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).

Co-curricular activities and Assessment Methods

Continuous Evaluation: Monitoring the progress of student's learning Class Tests, Work sheets, quizzes, Presentations, Projects, 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.

Theory - Evaluation : 100 M

Theory of Internal Assessment - 40M

Internal (mid Test average)	Assignments	Seminar	Project	Total
10M	10M	10 M	10M	40M

External Assessment – 60M

List of Reference Books

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

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SECOND YEAR B.Sc., DEGREE

EXAMINATIONSEMESTER-III ::

CHEMISTRY COURSE-V: INORGANIC AND PHYSICAL CHEMISTRY

S.No	Units	Name of the chapter	8M	4M
1	Unit-I	Coordination Compounds	2	2
2	Unit- II	Inorganic Reaction Mechanism	1	1
		stability of metal complexes and Bio- inorganic Chemistry	1	1
3	Unit-III	Phase Rule	2	2
4	Unit-IV	Electro Chemistry	2	2
5	Unit-V	Chemical Kinetics	2	2

MODEL PAPER

SECOND YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-IV - CHEMISTRY COURSE V: INORGANIC & PHYSICAL CHEMISTRY

Time: 3 hours Maximum marks: 60

PART- A 5 X 4 = 20 Marks

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

1. Write note on Jahn-Teller distortion.
2. Write the postulates of Valency Bond Theory.
3. Explain Labile & inert complexes.
4. Explain Job's method for determination of composition of complex.
5. Explain Thermodynamic derivation of Gibb's phase rule.
6. Write a short note on Freezing mixtures.
7. Explain any two conductometric titrations.
8. Write note on Fuel Cells with examples and applications.
9. What is enzyme catalysis? Write any three factors effecting enzyme catalysis.
10. Derive Michaels- Menten equation.

PART- B 5 X 8= 40 Marks

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

11. (a). Explain Valence Bond theory with Inner and Outer orbital complexes. Write limitations of VBT. (or)

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

12. (a). Explain Trans effect. Explain the theories of trans effect and write any two applications of trans effect. (or)

(b). (i) Write the biological functions of Haemoglobin and Myoglobin. (ii) Write noteon use of chelating agents in medicines.

13. (a). Define Phase rule and terms involved in it. Explain phase diagram of Pb-Ag system. (or)

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

14. (a). Define Transport number. Write experimental method for the determination of transport number by Hittorf method. (or)

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

15. (a). Explain general methods for determination of order of a reaction. (or)(b).Explain Collision theory and Activated complex theory of bimolecularreactions.

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SEMESTER - IV

Course V LABORATORY COURSE 30hrs (2 h / w)

Practical-Course–V :: Conductometric and Potentiometric Titrimetry

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

- Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
- Apply concepts of electrochemistry in experiments
- Familiar with electro analytical methods and techniques in analytical chemistry

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 ina mixture using standard NaOH solution
4. **Potentiometric titration**- Determination of Fe (II) using standard $K_2Cr_2O_7$ solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis
6. PH metry: Determination of concentration of HCl solution using standard NaOH solution
7. PH metry: Determination of concentration of CH_3COOH Solution using standard NaOH solution.

Scheme of valuation

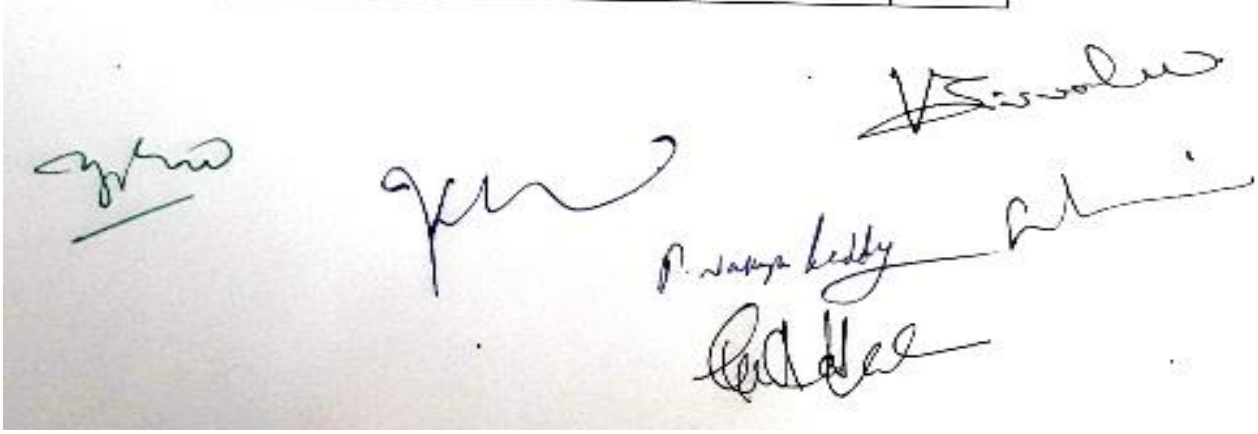
Practical Paper – VI :: **Physical Chemistry**

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M **Physical Chemistry**

S.No.	Content	Marks
1	Procedure	2M
2	Formula	2M
3	Tables	4M
4	For an error upto 1%	12M
5	For an error between 1% to 2%	10M
6	For an error above 2%	7M
7	Calculation	3M
8	Result	2M
	Total	25M



Structure of Chemistry Syllabus under CBCS
V and VI SEMESTERS

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
III	V	V	Inorganic ,Organic and Physical Chemistry	100	03
			Practical – V	50	02
		VI	Inorganic ,Organic and Physical Chemistry	100	03
			Practical – VI	50	02
	* Any one Paper fromVII A, B and C ** Any one cluster from VIII, A, B and C VI	VII (A)*	Elective	100	03
			Practical - VII A	50	02
		VII (B)*	Elective	100	03
			Practical - VII B	50	02
		VII (C)*	Elective	100	03
			Practical - VII C	50	02
		VIII (A)**	**Cluster Electives - I :** VIII-A-1 VIII-A-2 VIII-A-3	100 100 100 50 50 50	03 03 03 02 02 02
		VIII (B)**	**Cluster Electives - II ::** VIII-B-1 VIII- B-2 VIII-B-3	100 100 100 50 50 50	03 03 03 02 02 02
		VIII (C)**	**Cluster Electives - III ::** VIII-C-1 VIII-C-2 VIII-C-3	100 100 100 50 50 50	03 03 03 02 02 02

SEMESTER-V

Paper - V (INORGANIC, PHYSICAL & ORGANIC CHEMISTRY)
45 hrs (3 h / w)

INORGANIC CHEMISTRY

UNIT – I

Coordination Chemistry: 8h

IUPAC nomenclature - bonding theories - Review of Werner's theory and Sidgwick's concept of coordination - Valence bond theory - geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory - splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes - low spin and high spin complexes - factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

UNIT-II

1. Spectral and magnetic properties of metal complexes: 4h

Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility-Gouymethod.

2. Stability of metal complexes: 3h

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.

ORGANIC CHEMISTRY

UNIT- III

Nitro hydrocarbons: **3h**

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

UNIT – IV

Nitrogen compounds: 12h

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods –

1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism).

Reduction of Amides and Schmidt reaction. Physical properties and basic character - Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline - comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects.

Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophillic substitution of Aromatic amines – Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

PHYSICAL CHEMISTRY

UNIT- V

Thermodynamics **15h**

The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule-Thomson effect- coefficient. Calculation of w, for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation- Kirchoff s equation. Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes.

List of Reference Books

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

SEMESTER-V

Paper - VI (INORGANIC, ORGANIC & PHYSICAL CHEMISTRY)

45 hrs (3 h / w)

INORGANIC CHEMISTRY

UNIT-I

1. Reactivity of metal complexes: 4h

Labile and inert complexes, ligand substitution reactions - SN^1 and SN^2, substitution reactions of square planar complexes - Trans effect and applications of trans effect.

2. Bioinorganic chemistry: 4h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl^-. Metalloporphyrins – Structure and functions of hemoglobin, Myoglobin and Chlorophyll.

PHYSICAL CHEMISTRY

UNIT-II

1. Chemical kinetics 8h

Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time halfchange. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

2. 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, hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized reactions- energy transfer processes (simple example)

ORGANIC CHEMISTRY

UNIT- III

Heterocyclic Compounds 7h

Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1,4,- dicarbonyl compounds, Paul-Knorr synthesis.

Properties : Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan.

Pyridine – Structure - Basicity - Aromaticity - Comparison with pyrrole - one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

UNIT-IV

Carbohydrates **8h**

Monosaccharides: (+) Glucose (aldo hexose) - Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) - Pyranose structure (Haworth formula and chair conformational formula).

(-) Fructose (ketohexose) - Evidence of 2 - ketohexose structure (formation of pentaacetate, formation of cyanohydrin its hydrolysis and reduction by HI). Cyclic structure for fructose (Furanose structure and Haworth formula) - osazone formation from glucose and fructose – Definition of anomers with examples.

Interconversion of Monosaccharides: Aldopentose to Aldohexose (Arabinose to D- Glucose, D-Mannose) (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose (D-Glucose to D- Arabinose) by Ruff degradation. Aldohexose to Ketohexose [(+) Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose)

UNIT- V

Amino acids and proteins **7h**

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis.

Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups -lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mare loudan, Purdue Univ
4. Advanced Physical Chemistry by Atkins
5. Text book of physical chemistry by S Glasstone
7. Instrumentation and Techniques by Chatwal and Anand
8. Essentials of nano chemistry by pradeep
9. A Textbook of Physical Chemistry by Puri and Sharma
10. Advanced physical chemistry by Gurudeep Raj

LABORATORY COURSE – V
Practical Paper – V Organic Chemistry
(at the end of semester V) 30 hrs (2 h / W)

Organic Qualitative Analysis: 50M

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.

LABORATORY COURSE – VI
Practical Paper – VI Physical Chemistry
(at the end of semester V) 30 hrs (2 h/W)

1. Determination of rate constant for acid catalyzed ester hydrolysis**.**

2. Determination of molecular status and partition coefficient of benzoicacid in Benzene and water.

3. Determination of Surface tension of liquid

4. Determination of Viscosity of liquid.

5. Adsorption of acetic acid on animal charcoal, verification of Freundlisch isotherm.

SEMESTER-VI – Elective

ELECTIVE Paper – VII-(A) : ANALYTICAL METHODS IN CHEMISTRY

45hrs (3h / w)

UNIT-I

Quantitative analysis: 10h

a) Importance in various fields of science, steps involved in chemical analysis**.** Principles of volumetric analysis :. Theories of acid-base, redox, complexometric, iodometric and precipitation titrations - choice of indicators for these titrations.

b) Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and washing of precipitate, drying and ignition.

UNIT-II

Treatment of analytical data: **7h**

Types of errors, significant figures and its importance, accuracy - methods of expressing accuracy, error analysis and minimization of errors, precision - methods of expressing precision, standard deviation and confidence limit.

UNIT-III

SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS: **8h**

SOLVENT EXTRACTION : Introduction,principle,techniques,factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism., Application - Determination of Iron (III)

ION EXCHANGE :Introduction,action of ion exchange resins,separation of inorganic mixtuers,applications, Solvent extraction: Principle and process,

UNIT – IV **10h**

Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, R_f values, factors effecting R_f values.

Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.

UNIT -V **10h**

Thin layer Chromatography (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications

HPLC : Basic principles and applications.

List of Reference Books

1. Analytical Chemistry by Skoog and Miller
2. A textbook of qualitative inorganic analysis by A.I. Vogel
3. Nanochemistry by Geoffrey Ozin and Andre Arsenault
4. Stereochemistry by D. Nasipuri
5. Organic Chemistry by Clayden

SEMESTER-VI

ELECTIVE PAPER – VII-(B) : ENVIRONMENTAL CHEMISTRY

45 hrs (3 h / w)

UNIT-I

Introduction **9h**

Concept of Environmental chemistry-Scope and importance of environment in now adays – Nomenclature of environmental chemistry – Segments of environment - Natural resources – Renewable Resources – Solar and biomass energy and Nonrenewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydological cycle.

UNIT-II

Air Pollution **9h**

Definition – Sources of air pollution – Classification of air pollution – Acid rain – Photochemical smog – Green house effect – Formation and depletion of ozone – Bhopal gas disaster – Controlling methods of air pollution.

UNIT-III

Water pollution **9h**

Unique physical and chemical properties of water – water quality and criteria for finding of water quality – Dissolved oxygen – BOD, COD, Suspended solids, total dissolved solids, alkalinity – Hardness of water – Methods to convert temporary hard water into soft water – Methods to convert permanent hard water into soft water – eutrophication and its effects – principal wastage treatment – Industrial waste water treatment.

UNIT-IV

Chemical Toxicology **9h**

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.

UNIT-V

Ecosystem and biodiversity

9h

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 phosporus)

Biodiversity

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

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

LABORATORY COURSE – VI

Practical Paper – Elective VII B (at the end of semester VI) 30 hrs (2 h / W)

1. Determination of carbonate and bicarbonate in water samples (acidity and alkalinity)
2. Determination of hardness of water using EDTA
   a) Permanent hardness
   b) Temporary hardness
3. Determination of Acidity
4. Determination of Alkalinity
5. Determination of chlorides in water samples

SEMESTER-VI

ELECTIVE PAPER – VII-(C) GREEN CHEMISTRY

45 hrs (3 h / w)

UNIT-I **10h**

Green Chemistry: Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Green synthesis- Evalution of the type of the reaction i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).

UNIT-II **10h**

Selection of solvent:i) Aqueous phase reactions ii) Reactions in ionic liquids, Heckreaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis

Super critical CO_2: Preparation, properties and applications, (decaffeination, dry cleaning)

UNIT-III **10h**

Microwave and Ultrasound assisted green synthesis: Apparatus required, examples of MAOS (synthesis of fused anthro quinones, Leukart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldol condensation-Cannizzaro reaction-Diels-Alder reactions-Strecker's synthesis

UNIT-IV **5h**

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

UNIT V **10h**

Examples of green synthesis / reactions and some real world cases: 1. Green synthesis of the following compounds: adipic acid , catechol , disodium imino di acetate (alternative Strecker's synthesis) 2. 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. 3. Ultrasound assisted reactions – sonochemical Simmons –Smith reaction(ultrasonic alternative to iodine)

Reference books:

1. Green Chemistry Theory and Practice. P.T.Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Green Chemistry: Introductory Text, M.Lancaster
6. Principles and practice of heterogeneous catalysis, Thomas J.M.,Thomas M.J., John Wiley
7. Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava, Narosa Publications

LABORATORY COURSE – VII

Practical Paper – Elective VII C (at the end of semester VI) 30 hrs (2 h/W)

1. Determination of specific reaction rate of hydrolysis for methyl acetate catalysed by hydrogen ion at room temperature**.**

2. Determination of molecular status and partition coefficient of benzoicacidin Benzene and water.

3. Surface tension and viscosity of liquids.

4. Adsorption of acetic acid on animal charcoal, verification of Freundlisch isotherm.

CLUSTER ELECTIVES: Cluster Elective – I
Analytical and Physical
SEMESTER-VI
PAPER – VIII-A-1: POLYMER CHEMISTRY

45 hrs (3 h / w)

UNIT-I **12h**

Introduction of polymers:

Basic definitions, degree of polymerization ,classification of polymers- Natural and Synthetic polymers, Organic and Inorganic polymers, Thermoplastic and Thermosetting polymers, Plastics, Elastomers , Fibers and Resins, Linear ,Branched and Cross Linked polymers, Addition polymers and Condensation Polymers, mechanism of polymerization. Free radical, ionic and Zeigler – Natta polymerization.

UNIT-II **10h**

Techniques of Polymerization : Bulk polymerization , solution polymerization , suspension and Emulsion polymerization.

Molecular weights of polymers: Number average and weight average molecular weights Determination of molecular weight of polymers by Viscometry , Osmometry and light scattering methods.

UNIT-III **6h**

Kinetics of Free radical polymerization, Glass Transition temperature(Tg) and Determination of Tg:

Free volume theory, WLF equation, factors affecting glass transition temperature (Tg).

UNIT-IV **9h**

Polymer additives:

Introduction to plastic additives – fillers, Plasticizers and Softeners , Lubricants and Flow Promoters, Anti aging additives , Flame Retardants , Colourants , Blowing agents , Cross linking agents ,Photo stabilizers , Nucleating agents.

UNIT-V **8h**

Polymers and their applications:

Preparation and industrial applications of Polyethylene, Polyvinyl chloride, Teflon, Polyacrylonitrile, Terelene , Nylon6.6 silicones.

Reference Books:

1. Seymour, R.B. & Carraher, C.E. *Polymer Chemistry: An Introduction,* Marcel Dekker, Inc. New York, 1981.
2. Odian, G. *Principles of Polymerization,* 4th Ed. Wiley, 2004.
3. Billmeyer, F.W. *Textbook of Polymer Science,* 2nd Ed. Wiley Interscience, 1971.
4. Ghosh, P. *Polymer Science & Technology*, Tata McGraw-Hill Education, 1991.34
5. Lenz, R.W. *Organic Chemistry of Synthetic High Polymers.* Interscience Publishers, NewYork, 1967.

SEMESTER-VI

PAPER – VIII-A-2: INSTRUMENTAL METHODS OF ANALYSIS

45 hrs (3 h / w)

UNIT – I

Introduction to spectroscopic methods of analysis: 4 h

Recap of the spectroscopic methods covered in detail in the core chemistry syllabus: Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental methods. Consideration of electromagnetic radiation.

UNIT – II

Molecular spectroscopy: 8h

Infrared spectroscopy:

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

UNIT – III 10h

UV-Visible/ Near IR – emission, absorption, fluorescence and photoaccoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters,laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoaccoustic, fluorescent tags).

UNIT – IV

Separation techniques

Chromatography: Gas chromatography, liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis. 46 *Immunoassays and DNA techniques* **8h**

Mass spectroscopy*:* Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations, Detection and interpretation (how this is linked to excitation). **8h**

UNIT – V

Elemental analysis: **10h**

Mass spectrometry (electrical discharges).

Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique), Detection of radiation (simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic species, matrix effects, other interferences).

NMR spectroscopy: **P**rinciple, Instrumentation, Factors affecting chemical shift, Spin coupling, Applications. **4h**

Electroanalytical Methods: Potentiometry & Voltammetry **4h**

Radiochemical Methods **4h**

X- ray analysis and electron spectroscopy (surface analysis)

Reference books:

1. Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
2. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. P.W. Atkins: Physical Chemistry.
4. G.W. Castellan: Physical Chemistry.
5. C.N. Banwell: Fundamentals of Molecular Spectroscopy.
6. Brian Smith: Infrared Spectral Interpretations: A Systematic Approach.
7. W.J. Moore: Physical Chemistry

SEMESTER-VI

PAPER – VIII-A-3 : ANALYSIS OF DRUGS, FOODS , DAIRY PRODUCTS & BIO-CHEMICAL ANALYSIS

45 hrs (3 h / w)

UNIT- I

Analysis of the following drugs and pharmaceuticals preparations:
(Knowledge of molecular formula, structure and analysis)
Analysis of anlgesics and antipyretics like aspirin and paracetamol
Analysis of antimalerials like choloroquine .
Analysis of drugs in the treatment of infections and infestations :Amoxycillin., chloramphenicol, metronidazole, penicillin, tetracycline, cephalexin(cefalexin).
Anti tuberculous drug- isoniazid.

UNIT - II

Analysis of the following drugs and pharmaceuticals preparations:
(Knowledge of molecular formula, structure and analysis)
Analysis of antihistamine drugs and sedatives like: allegra, zyrtec(citirizine), alprazolam, trazodone, lorazepem, ambien(zolpidem), diazepam,

UNIT - III

Analysis of anti epileptic and anti convulsant drugs like phenobarbital and phenacemide.
Analysis of drugs used in case of cardiovascular drugs:atenolol, norvasc(amlodipine),
Analysis of lipitor(atorvastatin) a drug for the preventin of productin of cholesterol.
Analysis of diuretics like: furosemide (Lasix), triamterene
Analysis of prevacid(lansoprazole) a drug used for the prevention of production of acids in stomach.

UNIT - IV

Analysis of Milk and milk products: Acidity, total solids, fat, total nitrogen, protenines,lactose, phosphate activity, casein, choride. Analysis of food materials- Preservatives: Sodium carbonate, sodium benzoate sorbic acid Coloring matters, - Briliant blue FCF, fast green FCF, tertrazine, erytrhosine , sunset yellow FCF.
Flavoring agents - Vanilla , diacetyl, isoamyl acetate, limonene, ethylpropionate , allyl hexanoate and Adulterants in rice and wheat, wheat floo0r, sago,coconut oil, coffee powder, tea powder, milk..

UNIT - V

Clinical analysis of blood:Composition of blood,clinical analysis,trace elements in the body.Estimation of blood chlolesterol,glucose,enzymes,RBC & WBC ,Blood gas analyser.

REFERENCE BOOKS :

1.F.J.Welcher-Standard methods of analysis,
2.A.I.Vogel-A text book of quantitative Inorganic analysis-ELBS,
3.F.D.Snell & F.M.Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,
4.J.J.Elving and I.M.Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,

5. Aanalytical Agricultrual Chemistry by S.L.Chopra & J.S.Kanwar -- Kalyani Publishers

6. Quantitative analysis of drugs in pharmaceutical formulations by P.D.Sethi, CBS Publishers and Distributors, New Delhi
7. G.Ingram- Methods of organic elemental micro analysis- Chapman and Hall.,
8. H.Wincciam and Bobbles (Henry J)- Instrumental methods of analysis of food additives.,
9. H.Edward-The Chemical analysis of foods;practical treatise on the examination of food stuffs and the detection of adulterants,
10. The quantitative analysis of drugs- D.C.Garratt-Chapman & Hall.,
11. A text book of pharmaceutical analysis by K.A.Connors-Wiley-International.,
12. Comprehensive medicinal chemistry-Ed Corwin Hansch Vol 5,Pergamon Press.,

I. LABORATORY COURSE – VIII

Practical Paper – VIII-A-1: (at the end of semester VI) **30 hrs (2 h / W)**

1. Preparation of Aspirin
2. Preparation of Paracetamol
3. Preparation of Acetanilide
4. Preparation of Barbutiric Acid
5. Preparation of Phenyl Azo β-naphthol

II. LABORATORY COURSE – VIII

Practical Paper – VIII-A-2 (at the end of semester VI)

30 hrs (2 h / W)

1.Green procedure for organic qualitative analysis: Detection of N, S andhalogens

2.Acetylation of 1° amine by green method: Preparation of acetanilide

3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement

4. Electrophilic aromatic substitution reaction: Nitration of phenol

5. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol

6. Green oxidation reaction: Synthesis of adipic acid

7. Green procedure for Diels Alder reaction between furan and maleic anhydride

List of Reference Books

1. Green Chemistry Theory and Practice. P.T.Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry, Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Green Chemistry: Introductory Text, M Lancaster
6. Principles and practice of heterogeneous catalysis, Thomas J.M ,Thomas M.J , John Wiley
7. Green Chemistry: Environmental friendly alternatives R S Sanghi and M.M Srivastava, Narosa Publications

VII-A-3 Practical:- Project Work

Cluster Elective –II

Fuels and Industrial Inorganic materials

PAPER – VIII-B-1 : FUEL CHEMISTRY AND BATTERIES

45 hrs (3 h / w)

UNIT –I **12h**

Review of energy sources (renewable and non-renewable) – classification of fuels and their calorific value. Coal: Uses of Coal (fuel and non fuel) in various industries , its composition , carbonization of coal - coal gas , producer gas and water gas – composition and uses – fractionation of coal tar – uses of coal tar based chemicals , requisites of a good metallurgical coke , coal gasification (Hydro gasification and catalytic gasification) coal liquefaction and solvent refining.

UNIT-II **6h**

Petroleum and petrol chemical industry:

Composition of crude petroleum , refining and different types of petroleum products and their applications.

UNIT-III **10h**

Fractional distillation (principle and process) , cracking (Thermal and catalytic cracking). Reforming petroleum and non petroleum fuels (LPG , CNG , LNG , biogas) ,fuels derived from biomass , fuel from waste , synthetic fuels (gaseous and liquids) , clear fuels , petro chemicals : vinyl acetate , propylene oxide , isoprene , butadiene , toluene and its derivative xylene.

UNIT-IV **10h**

Lubricants:

Classification of lubricants , lubricating oils(conducting and non conducting) , solid and semi solid lubricants , synthetic lubricants. Properties of lubricants (viscosity index , cloud point , pore point) and their determination.

UNIT-V **7h**

Batteries:

Primary and secondary batteries, battery components and their role, Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery. Fuel cells, Solar cell and polymer cell.

Reference books:

1. E.Stochi : Industrial chemistry , Vol-1,Ellis Horwood Ltd.UK
2. P.C.Jain , M.Jain: Engineering chemistry, Dhanpat Rai &sons , Delhi.
3. B.K.Sharma: Industrial Chemistry , Goel Publishing house , Meerut.

SEMESTER-VI

PAPER – VIII-B-2: INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE

45 hrs (3 h / w)

UNIT - I

Recapitulation of *s*- and *p*-Block Elements **8h**

Periodicity in *s*- and *p*-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electronegativity (Pauling, Mulliken, and Alfred - Rochow scales). Allotropy in C, S, and P. Oxidation states with reference to elements in unusual and rare oxidation states like carbides and nitrides), inert pair effect, diagonal relationship and anomalous behaviour of first member of each group.

UNIT – II **15h**

Silicate Industries

Glass: Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes carbon nanotubes and carbon fibre.

Cements*:* Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

UNIT – III **8h**

Fertilizers:

Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.

UNIT – IV **8h**

Surface Coatings:

Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings (electrolytic and electroless), metal spraying and anodizing.

UNIT – V **6h**

Alloys:

Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.

Chemical explosives:
Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.

Reference Books:

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
2. R. M. Felder, R. W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
3. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: *Introduction to Ceramics*, Wiley Publishers, New Delhi.
4. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
5. P. C. Jain & M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
6. R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry*, Vikas Publications, New Delhi.
7. B. K. Sharma: *Engineering Chemistry*, Goel Publishing House, Meerut

SEMESTER-VI

PAPER – VIII-B-3 : ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS

45 hrs (3 h / w)

UNIT-I

Analysis of soaps: moisture and volatile matter,cobined alkali,total fatty matter, free alkali, total fatty acid, sodium silicate and chlorides.

Analysis of paints :Vehicle and pigments ,Barium Sulphate ,total lead, lead chromate,iron pigments, zinc chromate

UNIT- II

Analysis of oils:saponification value,iodine value,acid value,ester value, bromine value, acetyl value.

Analysis of industrial solvents like benzene,acetone,methanol and acetic acid., Determination of methoxyl and N-methyl groups.,

UNIT-III

Analysis of fertilizers: urea,NPK fertilizer,super phosphate,

Analysis of DDT,BHC,endrin,endosulfone,malathion,parathion.,

Analysis of starch,sugars,cellulose and paper,

UNIT -IV

Gas analysis: carbon dioxide, carbon monoxide, oxygen, hydrogen, saturated hydro carbon, unsaturated hydrocarbons, nitrogen, octane number, cetane number

Analysis of Fuel gases like: water gas,producer gas,kerosene (oil) gas.

Ultimate analysis :carbon, hydrogen,nitrogen,oxygen,phosphorus and sulfur.,

UNIT - V

Analysis of Complex materials:

Analysis of cement- loss on ignition, insoluble residu, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydrid.

Analysis of glasses - Determinaiton of silica, sulphuur, barium, arsinic, antimony, total R_2O_3, calcium, magnesium, total alkalies,aluminium,chloride,floride

SUGGESTED BOOKS:

1.F.J.Welcher-Standard methods of analysis,

2.A.I.Vogel-A text book of quantitative Inorganic analysis-ELBS,

3.H.H.Willard and H.Deal- Advanced quantitative analysis- Van Nostrand Co,

4.F.D.Snell & F.M.Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,

5.J.J.Elving and I.M.Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,

6.G.Z.Weig - Analytical methods for pesticides,plant growth regulators and food additives - Vols I to VII,

7. Aanalytical Agricultrual Chemistry by S.L.Chopra & J.S.Kanwar -- Kalyani Publishers

8. Mannual of soil, plant, water and fertilizer analysis, R.M.Upadhyay and N.L Sharma,Kalyani Publishers

I. LABORATORY COURSE – VIII

Practical Paper – VIII-B-1: (at the end of semester VI) **30 hrs (2 h / W)**

1. Preparation of Aspirin
2. Preparation of Paracetamol
3. Preparation of Acetanilide
4. Preparation of Barbutiric Acid
5. Preparation of Phenyl Azo β-naphthol

II. LABORATORY COURSE – VIII

Practical Paper – VIII-B-2: (at the end of semester VI)

30 hrs (2 h / W)

1.Green procedure for organic qualitative analysis: Detection of N, S andhalogens

2.Acetylation of 1^0 amine by green method: Preparation of acetanilide

3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement

4. Electrophilic aromatic substitution reaction: Nitration of phenol

5. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol

6. Green oxidation reaction: Synthesis of adipic acid

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6. Principles and practice of heterogeneous catalysis. Thomas J.M ,Thomas M.J., John Wiley
7. Green Chemistry: Environmental friendly alternatives R.S Sarghli and M.M Srivastava, Narosa Publications

VII-A-3 Practical:- Project Work / Intern Ship

Cluster Elective –III
ORGANIC
PAPER – VIII-C-1 : ORGANIC SPECTROSCOPIC TECHNIQUES
45 hrs (3 h / w)

UNIT-I **10h**

NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

Nuclear spin, Principles of NMR-Classical and Quantum Mechanical methods, Magnetic moment and Spin angular momentum. Larmour Frequency. Instrumentation. Relaxation-spin-spin & spin lattice relaxation. Shielding constants, Chemical shifts, Shielding and Deshielding mechanism-Factors influencing Chemical shift. Spin-Spin interactions-AX, AX_2 and AB types. Vicinal, Geminal and Long range coupling- Factors influencing coupling constants.

UNIT – II **5h**

Spin decoupling, Spin tickling, Deuterium exchange, Chemical shift reagents and Nuclear overhauser effect. Applications in Medical diagnostics, Reaction kinetics and Mechanically induced dynamic nuclear polarization. FT NMR and its Advantages.

UNIT-III **10h**

UV & VISIBLE SPECTROSCOPY

Electronic spectra of diatomic molecules. The Born-oppenheimer approximation. Vibrational coarse structure: Bond association and Bond sequence. Intensity of Vibrational-electronic spectra: The Franck-Condon principle. Rotational fine structure of electronic vibration transitions. Electronic structure of diatomic molecules.

Types of transitions, Chromophores, Conjugated dienes, trienes and polyenes, unsaturated carbonyl compounds-Woodward – Fieser rules.

UNIT-IV **5h**

Electronic spectra of polyatomic molecules. Chemical analysis by Electronic Spectroscopy – Beer-Lambert's Law. Deviation from Beer's law. Quantitative determination of metal ions (Mn^{+2}, Fe^{+2}, NO_2^-, Pb^{+2}). Simultaneous determination of Chromium and Manganese in a mixture.

UNIT-V **15h**

Electron Spin Resonance Spectroscopy

Basic Principles, Theory of ESR, Comparison of NMR & ESR. Instrumentaion, Factors affecting the 'g' value, determination of 'g' value. Isotropic and Anisotropic constants. Splitting hyper fine splitting coupling constants. Line width, Zero field splitting and Kramer degeneracy. Crystal field splitting, Crystal field effects.

Applications:- Detection of free radicals; ESR spectra of (a) Methyl radical ($CH_3^{\cdot}$), (b) Benzene anion ($C_6H_6^{-}$) (c) Isoquinine (d) $[Cu(H_2O)_6]^{+2}$ (e) $[Fe(CN)_5NO]^{-3}$ (f)

REFERENCE BOOKS:

1. Electron Spin Resonance Elementary Theory and Practical Applications- John E. Wertz and James R. Bolton, Chapman and Hall, 1986.
2. Spectroscopic Identification of organic compounds – Silverstein, Basseler and Morril.
3. Organic Spectroscopy- William Kemp.
4. Fundamentals of Molecular Spectroscopy- C.N.Banwell and E.A. Mc cash 4th Edition, Tata Mc Graw Hill Publishing Co., Ltd. 1994.
5. Physical Methods in Inorganic Chemistry – R.S.Drago, Saunders Publications.
6. Application of MÖssbauer Spectroscopy – Green Mood.
7. NMR, NQR, EPR and MÖssbauer Spectroscopy in inorganic chemistry – R.V Parish, Ellis, Harwood.
8. Instrumental Methods of Chemical Analysis- H.Kaur, Pragathi Prakashan, 2003.
9. Instrumental Methods of Analysis, 7th Edition – Willard, Merrit, Dean, Settle, CBS Publications, 1986.
10. Molecular Structure and Spectroscopy – G. Aruldhas, Prentice Hall of India Pvt.Ltd, New Delhi, 2001.
11. MÖssbauer Spectroscopy – N.N. Green Wood and T.C. Gibb, Chapman, and Hall, Landon 1971.
12. Coordination Chemistry: Experimental Methods- K. Burger, London Butter Worths, 1973.
13. Analytical spectroscopy – Kamlesh Bansal, Campus books, 2008.
14. Structural Inorganic Chemistry MÖssbauer Spectroscopy – Bhide.
15. Principle of MÖssbauer Spectroscopy – T.C. Gibb, Chapman, and Hall, Landon 1976.

Cluster Elective –III
ORGANIC
PAPER – VIII-C-2 : ADVANCED ORGANIC REACTIONS
45 hrs (3 h / w)

UNIT – I

ORGANIC PHOTOCHEMISTRY

Organic photochemistry : Molecular orbitals, carbonyl chromophore–triplet states, Jablonski diagram, inter–system crossing. Energy transfer. Energies properties and reaction of singlet and triplet states of and transitions.
Photochemical reactions : (a) Photoreduction, mechanism, influence of temperature, solvent, nature of hydrogen donors, structure of substrates on the course of photo reduction,.

UNIT – II

ORGNAIC PHOTOCHEMISTRY

Norrisch cleavages, type I : Mechanism, acyclic cyclicdiones, influence of sensitizer, photo Fries rearrangement. Norrisch type II cleavage : Mechanism and stereochemistry, type II reactions of esters : 1: 2 diketones, photo decarboxylation., Di - π methane rearrangement, Photochemistry – of conjugated dienes, Decomposition of nitrites – Barton reaction.

UNIT – III

PROTECTING GROUPS AND ORGANIC REACTIONS

Principles of (1) Protection of alcohols – ether formation including silyl ethers – ester formation, (2) Protection of diols – acetal,ketal and carbonate formation, (3) Protection of carboxylic acids – ester formation, benzyl and t–butyl esters, (4) Protection of amines – acetylation, benzoylation, benzyloxy carbonyl, triphenyl methyl groups and fmoc, (5) Protection of carbonyl groups – acetal, ketal, 1,2–glycols and 1,2–dithioglycols formation.

UNIT – IV

Synthetic reactions : Mannich reaction – Mannich bases – Robinson annulations. The Shapiro reaction, Stork–enamine reaction. Use of dithioacetals – Umpolung, phase transfercatalysis – mechanisms and use of benzyl trialkyl ammonium halides. Witting reaction.

UNIT –V : NEW SYNTHETIC REACTIONS

Baylis–Hillman reaction, RCM olefm metathesis, Grubb catalyst, Mukayama aldol reaction, Mitsunobu reaction, McMurrey reaction, Julia–Lythgoe olefination, and Peterson's stereoselective olefination, Heck reaction, Suziki coupling, Stille coupling and Sonogishira coupling, Buchwald–Hartwig coupling. Ugi reaction, Click reaction.

Recommended Books

1. Molecular reactions and Photochemistry by Charles Dupey and O.L. Chapman.
2. Molecular Photochemistry by Turru.
3. Importance of antibonding orbitals by Jaffe and Orchin.
4. Text Book of Organic Chemistry by Cram,. Hammand and Henrickson.
5. Some modern methods of organic synthesis by W. Carruthers.
6. Guide Book to Organic Synthesis by R.K. Meckie, D.M. Smith and R.A. Atken.
7. Organic Synthesis by O.House.
8. Organic synthesis by Michael B. Smith.
9. Organic Chemistry Claydon and others 2005.
10. Name Reactions by Jie Jack Li
11. Reagents in Organic synthesis by B.P. Mundy and others.
12. Tandem Organic Reactions by Tse–Lok Ho.

Cluster Elective –III
ORGANIC
PAPER – VIII-C-3 : PHARMACEUTICAL AND MEDICINAL CHEMISTRY
45 hrs (3 h / w)

UNIT-I **8h**

Pharmaceutical chemistry Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief treartment) Metabolites and Anti metabolites.

UNIT-II **8h**

Drugs:

Nomenclature: Chemical name, Generic name and trade names with examples Classification: Classification based on structures and therapeutic activity with one example each, Administration of drugs

UNIT-III **12h**

Synthesis and therapeutic activity of the compounds:

a. Chemotheraputic Drugs

1.Sulphadrugs(Sulphamethoxazole) 2.Antibiotics - β-Lactam Antibiotics, Macrolide Antibiotics, 3. Anti malarial Drugs(chloroquine)

b. Psycho therapeutic Drugs:

1. Anti pyretics(Paracetamol) 2.Hypnotics, 3.Tranquilizers(Diazepam) 4.Levodopa

UNIT-IV **8h**

Pharmacodynamic Drugs:

1. Antiasthma Drugs (Solbutamol) 3. Antianginals (Glycerol Trinitrate)
4. Diuretics(Frusemide)

UNIT-V **9h**

HIV-AIDS:

Immunity - CD-4cells, CD-8cells, Retro virus, Replication in human body. Investigation available, prevention of AIDS, Drugs available - examples with structures: PIS: Indivanir (crixivan), Nelfinavir(Viracept).

List of Reference Books:

1.Medicinal Chemistry by Dr. B.V.Ramana

2.Synthetic Drugs by O.D.Tyagi & M.Yadav

3.Medicinal Chemistry by Ashutoshkar

4.Medicinal Chemistry by P.Parimoo

5.Pharmacology& Pharmacotherapeutics R.S Satoskar & S.D Bhandarkar

6.Medicinal Chemistry by Kadametal P-I & P.II

7.European Pharmacopoeia

SRR&CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
III YEAR BSC-(Examination at the end of V semester)

(Inorganic, Organic & Physical chemistry Paper-V

Weightage to Content
Fifth semester

S.No	Course Content	Long Answer 8M	ShortAnswer 4M	Total marks
	Inorganic Chemistry			
1	Coordination Chemistry	2	2	24
2 3	Spectral and magnetic Properties Stability of metal complexes:	 1	2 1	08 12
	Organic Chemistry			
1	Nitro hydro Carbons	1	1	12
2	Nitrogen Compounds	2	1	20
	Physical Chemistry			
1	Thermodynamics	2	3	28
	TOTAL	**8**	**10**	**104**

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THIRD YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-V

CHEMISTRY COURSE-V: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

S.No	Units	Name of the chapter	8M	4M
		INORGANIC CHEMISTRY		
1	**Unit-I**	COORDINATION CHEMISTRY	2	2
2	**Unit- II**	1.SPECTRAL AND MAGNETIC PROPERTIES OF METAL COMPLEXES 2. STABILITY OF METAL COMPLEXES	2	2
3	**Unit-III**	**ORGANIC CHEMISTRY**		
		NITRO HYDROCARBONS	2	2
4	**Unit-IV**	NITROGEN COMPOUNDS	2	2
5	**Unit-V**	**PHYSICAL CHEMISTRY** THERMODYNAMICS	2	2

SRR&CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
III YEAR BSC-(Examination at the end of V semester)
MODEL PAPER
(Inorganic, Organic & Physical chemistry)
Paper-V

Time: 2 1/2Hrs **Max.Marks:60**

Answer any Five questions each question carries 4 marks **4x5=20M**

1. Explain the factors affecting crystal field splitting energy.
2. Explain EAN rule with two examples.
3. What are low spin and high spin complexes- Give examples.
4. Explain the factors effecting the stability of metal complexes
5. Write about alkylation and acylation reactions of aniline
6. Prove that C_p-C_v=R
7. Write about Entropy
8. State and explain Joule- Thomson Effect
9. Explain Diazotization reaction.
10. Explain the electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$ ion

SECTION-II
Answer all questions question each question carries 8 Marks 5X8=40 M

11 a) Write the salient features of Crystal field theory and explain the crystal field splitting of d-orbitals in octahedral complexes.

Or

b) Explain the Formation of $[Fe(CN)_6]^{4-}$ and $[Fe(CN)_6]^{3-}$ on the basis of Valence bond theory.

12 a) Explain about the optical isomerism in complex compounds having coordination numbers 4 and 6. Or

b) Explain the determination of composition of metal complexes by Job's method.

13 a) Write note on

i) Nef reaction ii)) Mannich reaction Or

b) i) Tautomerism in nitro alkanes ii) Reaction of nitro alkane with nitrous acid

14 a) What are Amines? How the primary amines are prepared. Give the separation of amines by Hinsberg Method. Or

b) Write note on i) Schmidt ii) Gabriel phthalamide reaction.

15 a) i) State and explain 1^{st} law of thermodynamics ii) Show that PV^r = Constant

or

b) Derive Kirchhoff's equation and mention its units.

Scheme of valuation: Course –V Practical ::

Organic Compound Analysis – 50 M

I. Internal practical examination: 25M

S.No.	Scheme	Marks
i.	Record	10 M
ii.	Viva-voce	10M
iii.	Field visit	05M
	Total	25M

II. External practical examination: 25M

Organic Compound analysis

S.No.	Scheme	Marks
1	Physical state, colour and solubility	1M
2	Combustion	1M
3	M.P / B.P	2M
4	Litmus test	1M
5	Element detection	3M
6	Test with $FeCl_3$	2M
7	Test with 2,4 D.N.P	2M
8	Test with $NaHCO_3$	1M
9.	Test with alcoholic KOH+$CHCl_3$	1M
10	Molisch Test	2M
11	Test with NaoH	1M
12	Specific test/ derivative (3M+3M)	6M
13	Report	2M
	Total	25M

(Inorganic, Organic & Physical chemistry , Paper-VI

Weightage to Content
Fifth semester

S.No	Course Content	Long Answer 8M	Short Answer(SA)	Total marks
	Inorganic Chemistry			
1	Reactivity of Metal Complex	1	1	12
3	Bio inorganic Chemistry	1	1	12
	Organic Chemistry			
1	Hetero cyclic compounds	1	1	12
2	Carbohydrates	2	1	20
3	Amino Acids	1	1	12
	Physical Chemistry			
1	Chemical Kinetics	2	2	24
2	Photo Chemistry	1	1	12
	Total	**9**	**8**	**104**

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THIRD YEAR B.Sc., DEGREE EXAMINATION
SEMESTER-VI

CHEMISTRY COURSE-V: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY

S.No	Units	Name of the chapter	8M	4M
		INORGANIC CHEMISTRY		
1	**Unit-I**	1. REACTIVITY OF METAL COMPLEXES	2	2
		2. BIOINORGANIC CHEMISTRY		
2	**Unit- II**	**PHYSICAL CHEMISTRY** 1. CHEMICAL KINETICS 2. PHOTOCHEMISTRY	2	2
3	**Unit-III**	**ORGANIC CHEMISTRY** HETEROCYCLIC COMPOUNDS	2	2
4	**Unit-IV**	CARBOHYDRATES	2	2
5	**Unit-V**	AMINO ACIDS	2	2

SRR&CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA.

III BSC-(Examination at the end of V semester)
MODEL PAPER
(Inorganic, Organic & Physical chemistry)
Paper-VI

Time: 3 Hrs **Max.Marks:60M**

SECTION-I

Answer any Five questions Each question carries 4 marks **4x5=20M**

1. Discuss Chichibabin reaction
2. Explain muta rotation of Glucose.
3. Explain the formation of Glucozone.
4. Write a note on Grabial Phthalimide synthesis
5. Write about the effect of temperature on rate of a reaction.
6. Discuss about Zero order reaction.
7. Explain Fluorescence and Phosphorescence
8. What are labile and inert complexes? Give examples?
9. How is furan prepared Paal –knoor synthesis
10. Explain the ligand substitution reactions of square planar complexes

SECTION-II

Answer All questions each question carries 8 marks **5x8= 40 M**

11 a) Explain SN^1 and SN^2 substitution reactions in octahedral complexes.

OR

b) i) What is trans effect. Write any two applications of Trans effect.

ii)Explain the biological signification of Na, K

12. a) Establish the Open chain structure of Glucose with relevant chemical equations.

OR

b) Explain 1) Killiani fisher synthesis 2) Ruff degradation

13) What are Amino Acids. Write the preparation of −amino acids from

i) Streckers synthesis ii) Malonic ester synthesis

OR

b) Explain Isoelectric point and Zwitter ion in amino acids

14 a) Give any two methods of preparation of Pyrrole. Explain why electrophilic substitutionin Furan takes place at 2-position rather than 3-position

. OR

b) i) Explain Diels –Alder reaction with one example ii) Explain structure of Pyridine

15 a) Derive the rate constant for first order reaction.

And derive the half life period of I st order reaction

OR

.b) State and explain laws of photochemistry.

Explain Jablanski diagram of various processes occurring in the excited state.

Scheme of valuation

Practical Paper – VI :: **Physical Chemistry**

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M **Physical Chemistry**

S.No.	Content	Marks
1	Procedure	2M
2	Formula	2M
3	Tables	4M
4	For an error upto 1%	12M
5	For an error between 1% to 2%	10M
6	For an error above 2%	7M
7	Calculation	3M
8	Result	2M
	Total	25M

SRR&CVR GOVERNMENT DEGREE COLLEGE (A),VIJAYAWADA

SEMESTER – VI (CHEMISTRY)

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THIRD YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-VI

CHEMISTRY COURSE-VII : ENVIRONMENTAL CHEMISTRY

S.No	Units	Name of the chapter	8M	4M
1	Unit-I	INTRODUCTION	2	2
2	Unit- II	AIR POLUTION	2	2
3	Unit-III	WATER POLUTION	2	2
4	Unit-IV	CHEMICAL TOXICOLOGY	2	2
5	Unit-V	ECO SYSTEM AND BIODIVERSITY	2	2

SRR&CVR GOVERNMENT DEGREE COLLEGE (A), VIJAYAWADA
MODEL PAPER FOR SEMESTER – VI (CHEMISTRY)
Paper –VII B: ELECTIVE – B: ENVIRONMENTAL CHEMISTRY

Duration: 3 hrs. **Max. Marks: 60**

Section-I

Answer any **FIVE** questions. Each question carries **4** marks. **4X5=20Marks**

1. Explain the importance of environment in now-a-days.
2. Write about hydrological cycle.
3. Short note on acid rains.
4. What is Bhopal gas disaster?
5. Give about the hardness of water.
6. Explain the toxicity of mercury.
7. What are the functions of eco system?
8. Discuss briefly about food chain.
9. What are the toxic effects of cyanide on the environment?
10. What are the quality parameters of water?

Section-II

Answer All questions.Each question carries **8** Marks. **5x8=40 Marks**

11. a) Explain the segments of the environment

OR

b) Write about renewable energy sources.

12. a) Discuss in detail about air pollution.

OR

b) Describe the Greenhouse effect.

13. a) Give the methods to convert permanent hard water to soft water.

OR

b) Describe the types of ecosystem.

14 a) Give detailed account on biodiversity.

OR

15 a) Explain carbon and nitrogen cycles

OR

b) Explain bio geographical classification of india

SRR &CVR GOVERNMENT DEGREE COLLEGE (A) -VIJAYAWADA
SEMESTER – VI (CHEMISTRY)

BLUE PRINT

THIRD YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-VI

CHEMISTRY COURSE-VIII C 1: ORGANIC SPECTROSCOPIC TECHNIQUES

S.No	Units	Name of the chapter	8M	4M
1	**Unit-I**	NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY	2	2
2	**Unit- II**	NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY	2	2
3	**Unit-III**	UV&VISIBLE SPECTROSCOPY	2	2
4	**Unit-IV**	UV&VISIBLE SPECTROSCOPY	2	2
5	**Unit-V**	ELECTRON SPIN RESONANCE SPECTROSCOPY	2	2

SRR&CVR GOVERNMENT DEGREE COLLEGE (A)-VIJAYAWADA.
MODEL PAPER FOR SEMESTER – VI (CHEMISTRY)
Paper - VIII : CLUSTER-C I: ORGANIC SPECTROSCOPIC TECHNIQUES

Duration: 3hrs. **Max. Marks: 60**

Section-I

Answer any **FIVE** questions. Each question carries **FOUR** marks. **4X5=20Marks**

1. Describe the factors influencing the coupling constant.
2. Explain about spin decoupling.
3. Write about Franck-Condon principle.
4. What are the different types of electronic transitions?
5. State and explain Beer-Lambert law.
6. Write the quantitative determination of any metal ions.
7. How ESR studies are useful to study the structure of free radicals?
8. How ESR studies are useful to study the structure of benzene anion?
9. Discuss in detail the Nuclear Over Hauser effect.
10. How is Beer-Lambert's law useful in quantitative determination of Mn(II) and Fe(II)?

Section-II

Answer All questions each question carries 8 marks **5x8 = 40Marks**

11. a)i. Which type of atoms exhibit nuclear magnetic resonance?
    ii.) Write the principle involved in NMR spectroscopy.

    OR

    b) Define chemical shift. What are the factors influencing chemical shift?

12. a) Write about Born-oppenheimer approximation.

    OR

    b)What are the Woodward-Fieser rules of UV-Visible spectroscopy?

13.a) Explain principle and theory of ESR spectroscopy

    OR

    b) Explain about the experimental techniques involved in ESR studies.

14.a) Write notes on 'g' value OR b) hyperfine structure

15.a)Describe the factors influencing the coupling constant.

    OR

    b)Explain about spin decoupling.

SRR&CVR GOVERNMENTDEGREE COLLEGE (A)-VIJAYAWADA

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THIRD YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-VI

CHEMISTRY COURSE-VIII **C2 (ADVANCED ORGANIC REACTIONS)**

S.No	Units	Name of the chapter	8M	4M
1	Unit-I	ORGANIC PHOTOCHEMISTRY	2	2
2	Unit- II	ORGANIC PHOTOCHEMISTRY	2	2
3	Unit-III	PROTECTING DROUPS ANDORGANIC REACTIONS	2	2
4	Unit-IV	SYNTHETIC REACTIONS	2	2
5	Unit-V	NEW SYNTHETIC REACTIONS	2	2

SRR&CVR GOVERNMENTDEGREE COLLEGE(A)- VIJAYAWADA.
MODEL PAPER FOR SEMESTER – VI (CHEMISTRY)
Paper - VIII : CLUSTER-C-2: ADVANCED ORGANIC REACTIONS

Duration: 3 hrs. **Max. Marks: 60**

Section-I

Answer any **Five** questions. Each question carries **Four** marks. **5X4 = 20Marks**

1. Write notes on inter-system crossing.
2. Explain the nature of hydrogen donars in photochemical reactions
3. Explain about Photo Fries rearrangement.
4. Give a brief account on the protection of carboxylic acids by ester formation.
5. How does carbonate formation protect diols?
6. Write about Robinson annulation.
7. What is Stork-enamine reaction?
8. Write about Buchwald–Hartwig coupling
9. Explain Mitsnobu reaction
10. Explain Click reaction

Section-II

Answer All questions. Each question carries **8** marks. **5x8=40 Marks**

11. Write the mechanism of photo reduction reaction? How it is affected by temperature and solvent? OR
    Explain the following:
    i) Singlet and triplet states ii) Jablonski diagram
12. a) Discuss the Norrish type-I cleavage with an example.
    OR
    b) What do you know about the following:
    i) Di-π methane rearrangement ii) Barton reaction
13. a) Give a detailed account on the protection of carbonyl groups.
    OR
    b) How amine group is protected by acylation and benzoylation.
14. a) Write note on the following:
    i) Mannich reaction ii) Wittig reaction
    OR
    b) Write a note on the following:
    i) use of benzyl trialkyl ammonium halides ii) Phase transfer catalysis
15. a) Illustrate the following reactions:
    i) Baylis-Hillman reaction ii) Heck reaction
    OR .
    b) Write a short note on Peterson stereoselective olefination and Grubbs catalyst

SRR &CVR GOVERNMENTDEGREE COLLEGE (A),VIJAYAWADA

BLUE PRINT

THIRD YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-VI

CHEMISTRY COURSE-VIII C 3 (PHARMACEUTICAL AND MEDICINAL CHEMISTRY)

S.No	Units	Name of the chapter	8M	4M
1	Unit-I	PHARMACEUTICAL CHEMISTRYTERMINOLOGY	2	2
2	Unit- II	DRUGS	2	2
3	Unit-III	SYNTHESIS AND THERAPEUTICACTIVITY OF THE COMPOUNDS	2	2
4	Unit-IV	PHARMACODYNAMIC DRUGS	2	2
5	Unit-V	HIV-AIDS	2	2

SRR&CVR GOVERNMENT DEGREE COLLEGE (A)-VIJAYAWADA
MODEL PAPER FOR SEMESTER – VI (CHEMISTRY)
Paper - VIII : CLUSTER-C-3: PHARMACEUTICAL & MEDICINALCHEMISTRY

Duration: 3hrs. **Max. Marks: 60**

SECTION -1

Answer any **Five** questions. Each question carries **Four** marks. **5X4=20Marks**

1. Define pharmacy and pharmacology.
2. Define pharmacophore and give two examples.
3. Write the clinical, generic and trade names of paracetamol.
4. Describe the types of administration of drugs.
5. Write about the therapeutic activity of chloroquine.
6. Write the preparation method and uses of antiuritics
7. .Define hypnotics and antipyretics.
8. Write notes on retro virus.
9. Explain antiasthamatic drugs
10. Write a short notes on crixivan

Section-II

Answer All questions. Each question carries **8** marks. **5x8=40 Marks**

11. a) Give a detailed account on pharmacodynamics and pharmacokinetics.

OR

b) Explain the following terms with suitable examples.
i). Metabolites ii) Anti-metabolites

12. a) How drugs are classified according to their structure?

OR

b) Discuss the classification of drugs based on therapeutic activity.

13. a)Write about the synthesis of chloroquin

.OR

b) Write about the synthesis and therapeutic activity of Paracetamol.

14. a) Write about the synthesis of solbutamol.

OR

b) What do you know about CD-4 and CD-8 cells?

15. a) What are the drugs available for prevention of AIDS? Give their structures

OR

b) Explain virus replication in human body.

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.

Theory - Evaluation: 100 M

Theory of Internal Assessment - 40M

Internal (mid Test average)	Assignments	Attendance	Seminar	Project	Total
10M	10M	05	05 M	10M	40M

External Assessment – 60M

Practical Scheme of valuation

Practical Paper -ANALYTICAL METHODS IN CHEMISTRY

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M ANALYTICAL METHODS IN CHEMISTRY

S.No.	Content	Marks
1	Procedure	2M
2	Formula	2M
3	Tables	4M
4	For an error upto 1%	12M
5	For an error between 1% to 2%	10M
6	For an error above 2%	7M
7	Calculation	3M
8	Result	2M
	Total	25M

Scheme of valuation

Practical Paper – VIII C1 ::

Preparation of Organic compounds

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M Preparation of Organic compounds

S.No.	Content	Marks
1	Procedure	10 M
2	Equation	2M
3	Yield	4M
4	% percentage calculations	4 M
5	Submission of yield	3M
8	Melting point	2M
	Total	25M

Scheme of valuation

Practical Paper – VIII C2 ::

Preparation of Organic compounds by Green procedure

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M

Preparation of Organic compounds by green procedure

S.No.	Content	Marks
1	Procedure for detection of extra elements	5 M
2	Procedure for preparation of Organic compounds	10 M
3	Equations	2M
4	Yield	3M
7	% percentage calculations	3 M
8	Melting point	2M
	Total	25M

Scheme of valuation

Practical Paper – VIII C3 :: PROJECT

1. Internal practical examination: 25M

S.No.	Content	Marks
1	OBSERVATIONS IN PROJECT	15 M
3	Field visit	10 M
	Total	25M

2. External Practical Examination: 25M

SUBMISSION OF PROJECT	15 M
VIVA-VOCE	10 M
TOTAL	= **25 M**

S.R.R. & C.V.R. GOVT. DEGREE COLLEGE (A)

(Accredited at B+ Grade by NAAC (III cycle with CGPA 2.60)

&

District Identified College

Vijayawada- 520 004. Andhra Pradesh, INDIA.

Department of Chemistry

Board of Studies Meeting - NOVEMBER 2021

SYLLABUS OF B.Sc (Chemistry)

SEMESTERS I To II

UNDER CBCS FRAME WORK WITH EFFECT FROM 2021-22

Program outcomes:

On successful completion of the **B.Sc Chemistry (Honors)** Program students are able to:

(i). Understand Systematic and fundamental concepts of chemistry as a discipline.

(ii).Acquire Skill and related developments of specialization inthe subject.

(iii).Identify chemistry related problems, analysis and application of data usingappropriate methodologies.

(iv).Apply subject knowledge and skill to solve complex problems withdefined solutions.

(v).Find opportunity to apply subject-related skill for acquiring jobs and self-employment.

Program Specific Outcomes:

On successful completion of the **B.Sc Chemistry** Program students are able to: (i). Understand new frontiers of knowledge in chemistry for professional development.

(ii). Apply subject knowledge for solving societal problems related to application of chemistry in day-to-day life.

(iii). Develop industry focused skills to lead a successful career.

(iv). Express proficiency in oral and written communications to appreciate innovation in research.

STRUCTURE OF THE COURSE

SEMESTER	COURSE OPTED	COURSE NAME	CREDITS
I	AEC I COMPULSORY	ENGLISH COMMUNICATION	2
	CORE COURSE I	INORGANIC CHEMISTRY I	4
	CORE COURSE I PRACTICAL	INORGANIC CHEMISTRY -I LAB	2
	CORE COURSE II	PHYSICAL CHEMISTRY I	4
	CORE COURSE I PRACTICAL	PHYSICAL CHEMISTRY I LAB	2
	GE I GENERIC ELECTIVE I	MATHEMATICS/BOTANY	5/4
	GE I GENERIC ELECTIVE I PRACTICAL	MATHEMATICS TUTORIAL /BOTANY LAB	1/2
		TOTAL CREDITS	20

SEMESTER	COURSE OPTED	COURSE NAME	CREDITS
II	AEC II COMPULSORY	ENGLISH COMMUNICATION	2
	CORE COURSE II	ORGANIC CHEMISTRY I	4
	CORE COURSE I PRACTICAL	ORGANIC CHEMISTRY -I LAB	2
	CORE COURSE II	PHYSICAL CHEMISTRY II	4
	CORE COURSE I PRACTICAL	PHYSICAL CHEMISTRY II LAB	2
	GE I GENERIC ELECTIVE I	MATHEMATICS/BOTANY	5/4
	GE I GENERIC ELECTIVE I PRACTICAL	MATHEMATICS TUTORIAL /BOTANY LAB	1/2
		TOTAL CREDITS	20

SEMESTER I

CHE (H)-CC I: INORGANIC CHEMISTRY I - ATOMIC STRUCTURE & CHEMICAL BONDING

Learning objectives:

1. Learning scientific theory of atoms**,** concept of wave function.
2. Elements in periodic table; physical and chemical characteristics, periodicity.
3. To predict the atomic structure, chemical bonding, and molecular geometry based on accepted models.
4. To understand atomic theory of matter, composition of atom.
5. Physical and chemical characteristics of elements in various groups and periods according to ionic size, charge, etc. and position in periodic table.

Course Outcomes:

After completion of the course students are able to learn about:CO1.structure of atom, electronic configuration.

CO2.different types of bonds and bonding, types of structures. CO3.orbital diagrams of various homo and hetero atomic molecules.

CHE I: INORGANIC CHEMISTRY I - ATOMIC STRUCTURE &CHEMICAL BONDING (60H)

SYLLABUS

Unit-I: Atomic Structure *12H*

Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger's wave equation, significance of ψ and ψ^2. Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of *s*, *p*, *d* and *f* orbitals. Contour boundary and probability diagrams.

Unit-II: Periodicity of s, p, d- block elements *12H*

s, *p*, *d*,block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to *s* and *p*-block.

(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

(b) Atomic radii (van der Waals)

(c) Ionic and crystal radii.

(d) Covalent radii (octahedral and tetrahedral)

(e) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy. Applications of ionization enthalpy.

(f) Electronegativity, Pauling's/ Mullikan's/ electronegativity scales. Variation of electronegativity with bond order, partial charge, hybridization.

Unit-III: Periodicity of f-block elements *12H*

f-block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to *s* and *p*-block

(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table, (b)Atomic radii (van der Waals), (c) Ionic and crystal radii, (d) Covalent radii (octahedral and tetrahedral) (e) Electronegativity

Chemical bonding-1

Ionic bond: General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Landé equation with derivationand importance of Kapuscinski expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy.

Unit-IV: Chemical bonding-2 *16H*

(i) *Covalent bond:* Lewis's structure, Valence Bond theory (Heitler-London approach).Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent's rule, Resonance and resonance energy. Molecular orbital theory: Molecular orbital diagrams of diatomic and simple polyatomic molecules N_2, O_2, C_2, B_2, F_2, CO, NO, and their ions; HCl, BeF_2, CO_2, (idea of s-p mixing and orbitalinteraction to be given). Formal charge, Valence shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing lone pairs and

bond pairs of electrons, multiple bonding (σ and π bond approach) and bond lengths.

Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. Ionic character in covalent compounds: Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference.

Unit-V: Chemical bonding-3 *8H*

(iii) *Metallic Bond:* Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.

(iv) *Weak Chemical Forces:* van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions. Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment)

Reference Books:

1. Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
2. Atkins, P.W. & Paula, J. *Physical Chemistry*, 10th Ed., Oxford University Press, 2014.
3. Rodger, G.E. *Inorganic and Solid-State Chemistry*, Cengage Learning India Edition, 2002.

CHE -I: INORGANIC CHEMISTRY -I LAB

Hours per week: 3 Credits: 2

Continuous Evaluation: 50marks (External 25M & Internal 25 M)

(A) Titrimetric Analysis

(i) Calibration and use of apparatus

(ii)Preparation of solutions of different Molarity/Normality of titrants

(B) Acid-Base Titrations

(i) Estimation of carbonate and hydroxide present together in mixture.

(ii)Estimation of carbonate and bicarbonate present together in a mixture.

(C) Oxidation-Reduction Titrimetry

(i) Estimation of Fe (II) and oxalic acid using standardized $KMnO_4$ solution.

(ii)Estimation of oxalic acid and sodium oxalate in a given mixture.

(iii)Estimation of Fe (II) with $K_2Cr_2O_7$ using internal external (diphenylamine, anthranilic acid) and external indicator.

Reference text:

1. Mendham, J., A. I. Vogel's *Quantitative Chemical Analysis 6th Ed*. Pearson, 2009.

B.Sc Chemistry- Semester-I
Paper-I
BLUE PRINT

CHE -CC I: INORGANIC CHEMISTRY I – ATOMICSTRUCTURE &CHEMICAL BONDING

S.No	UNITS	Name of the chapter	8 Marks	4Marks
1.	UNIT-I	Atomic Structure	2	2
2.	UNIT-II	Periodicity of *s*, *p*, *d*-block elements	2	2
3.	UNIT-III	Periodicity of *f*-block elements	1	1
		Chemical bonding-1	1	1
4.	UNIT-IV	Chemical bonding-2	2	2
5.	UNIT-V	Chemical bonding-3	2	1

Scheme of Valuation

CHE-I: INORGANIC CHEMISTRY -I LAB

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M

Titrimetry

S.No.	Content	Marks
1	Procedure	2M
2	Formula	2M
3	Tables	4M
4	For an error upto 1%	12M
	For an error between 1% to 2%	10M
	For an error above 2%	7M
5	Calculation	3M
6	Result	2M
	Total	25M

MODEL PAPER

B. Sc, DEGREE FIRST YEAR EXAMINATIONS

Paper –I, SEMESTER- I

CHE-I: INORGANIC CHEMISTRY I - ATOMIC STRUCTURE &

CHEMICAL BONDING

Time:3hours **Maximum Marks:**60 Marks

PART- A

Answer any **FIVE** of thefollowingquestions. **5x 4= 20 Marks**

1. Explain Heisenberguncertainty principle.
2. Write about the shapes of s,p,d and f orbitals.
3. Write the variation effective nuclear charge in periodic table.
4. Define ionization enthalpy and electro negativity.
5. Explain slater rules.
6. Define Bents rule.
7. Write the postulates of Valence Shell Electron Pair Repulsion theory
8. Write about semiconductors.
9.

PART- B

Answer **ALL**thequestions 5x**8**= **4**0Marks

10.(a)Write the Bohr's theory, its limitations and atomicspectrum of H-atom.

(OR)

(b) Derive Schrodinger's wave equation and explain significance of Ψ and Ψ^2.

11. (a) Explain the following

(i) Atomic radii (ii) ionic radii (iii) covalentradii

(OR)

(a) Define electro negativity? write about electro negativity scales.

12.(a)Write any three properties f block elements.

(OR)

(b) Explain Born Haber Cycle and write its applications.

13. (a) Explain about VBT (Heitler- London approach).

(OR)

(b) Explain MOT diagrams of the following molecules

(i) N_2 (ii) CO_2

14.(a)Explain qualitative idea of band theories.

(OR)

(b) Explain thefollowing (i) VanderWaals forces (ii) Hydrogenbonding

CHE II CHEMISTRY I - STATES OF MATTER &IONIC EQUILIBRIUM (60H)
SYLLABUS

UNIT-I: Gaseous state: *15H*

Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, relation between mean free path and coefficient of viscosity, calculation of σfrom η; variation of viscosity with temperature and pressure.

Molecular velocities (average, root mean square and most probable) and average kinetic energy. Behavior of real gases: Deviations from ideal gas behavior, compressibility factor, *Z*, and its variation with pressure for different gases. Causesof deviation from ideal behavior. Vander Waals equation of state, its derivation and application in explaining real gas behavior.

UNIT-II: Liquid state *10H*

Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapor pressure, surface tension and coefficient of viscosity, and their determination. Temperature variation of viscosity of liquids. Qualitative discussionof structure of water.

UNIT-III: Solid state *10H*

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and

symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, powderpattern method.

UNIT-IV: Ionic equilibria-1 *15H*

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions- derivation of Henderson equation and its applications; and applications of buffers in analytical chemistry.

UNIT-V: Ionic equilibria-2 *10H*

Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations.

Reference Books:

1. Atkins, P. W. & Paula, J. de *Atkin's Physical Chemistry* 10th Ed., Oxford University

   Press (2014).

2 Ball, D. W. *Physical Chemistry* Thomson Press, India (2007).

3. Castellan, G. W. *Physical Chemistry* 4th Ed. Narosa (2004).
4. Mortimer, R. G. *Physical Chemistry* 3rd Ed. Elsevier: NOIDA, UP (2009).

CHE -II PHYSICAL CHEMISTRY -I LAB

Hours per week:3 Credits: 2

Continuous Evaluation: 50marks (External 25M & Internal 25 M)

1. **Surface tension measurements.**

Determination of the surface tension by drop number method.

2. *Viscosity measurement using Ostwald's viscometer.*

Determination of viscosity of aqueous solutions of

(i) ethanol and (ii) sugar at room temperature.

3. *pHmetry*

a. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
b. Preparation of buffer solutions of different pH
   i. Sodium acetate-acetic acid ii. Ammonium chloride-ammonium hydroxide
c. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
d. Determination of dissociation constant of a weak acid.

Reference Books

1. Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. *Experiments in Physical Chemistry8th Ed.*; McGraw-Hill: New York (2003).
3. Halpern, A. M. &McBane, G. C. *Experimental Physical Chemistry 3rdEd.;* W.H. Freeman & Co.: New York (2003).

B.Sc (Chemistry) - Semester-I
Paper-II
BLUE PRINT

CHE-II CHEMISTRY I - STATES OF MATTER & IONIC EQUILIBRIUM

S. No	UNITS	Name of the chapter	8 Marks	4 Marks
1.	UNIT-I	Gaseous state	2	2
2.	UNIT-II	Liquid state	2	2
3.	UNIT-III	Solid state	2	2
4.	UNIT-IV	Ionic equilibria-1	2	2
5.	UNIT-V	Ionic equilibria-2	2	2

Scheme of Valuation

CHE -II: PHYSICAL CHEMISTRY -I LAB

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M

Titrimetry

S.No.	Content	Marks
1	Procedure	2M
2	Formula	2M
3	Tables	4M
4	For an error upto 1%	12M
	For an error between 1% to 2%	10M
	For an error above 2%	7M
5	Calculation	3M
6	Result	2M
	Total	25M

MODEL PAPER
B. Sc. DEGREE FIRST YEAR EXAMINATIONS

Paper –II, SEMESTER- I

CHE -II CHEMISTRY I - STATES OF MATTER & IONIC EQUILIBRIUM

Time:3 hours *Maximum Marks:60Marks*

PART- A

Answer any **FIVE** of the following questions **5x**4**= 20 Marks**

1. Write collision diameter.
2. Define average and root mean square velocities.
3. Write short notes on vapor pressure.
4. Explain law of constancy of inter facial angles.
5. Explain miller indices.
6. Define degree of ionization.
7. Write about common ion effect.
8. Write about solubility product.
9. Discuss strong and weak electrolytes with examples.
10. Explain degree of dissociation and any 2 factors affecting it.

PART- B

Answer **ALL** the questions. 5x**8**= **4**0Marks

11.(a)Write the postulates and derivation of kinetic gasequation.

(OR)

(b)Derive Vander Waals equation of state and write application inexplaining in real gas behavior.

12.(a) Explain the determination of surface tension of liquids.

OR

(b) Explain the determination of coefficient of viscosity of liquids.

13.(a) Explain symmetry elements and symmetry operations.

OR

(b. Derive Bragg's equation and explain the experimental determinationby powder method.

14.(a) Write short notes on the following

(i) factors affecting degree of ionization (ii) pH scale

OR

(b) Derive Henderson equation and write its applications.

15.(a)Write the qualitative treatment of acid base titration curves.

(OR)

(b)Write the theory of acid base indicators.

SEMESTER II
CHE -III ORGANIC CHEMISTRY I -BASICS AND HYDROCARBONS

Learning objective:

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

1. Different types of hybridizations, Homolytic and Heterolytic fission
2. Types of organic reactions
3. Various projection formulae, stereo isomerism.
4. Preparations and chemical reactions of alkanes and alkenes.
5. The importance of aromaticity.

Course Outcomes:

After completion of the course students are able to learn about:

CO1. Different types of hybridizations, fissions and Types of organic reactions

CO2. Preparations and chemical properties of alkanes, alkenes and alkynes.

CO3. Stability of cyclo- alkanes.

CO4. Electrophilic aromatic substitution.

CHE -III ORGANIC CHEMISTRY I -BASICS AND HYDROCARBONS (60H)
SYLLABUS

Unit-I: Basics of Organic Chemistry *13H*

Organic Compounds: Classification, and Nomenclature, Hybridization.

Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation; Dipole moment.

Homolytic and Heterolytic fission with suitable examples. Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions (only Basics).

UNIT-II: Stereochemistry: *12H*

Fischer Projection, Newmann and Sawhorse Projection formulae; Geometricalisomerism: cis–trans and, syn-anti isomerism E/Z notations.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers,Molecules with two or more chiral-centres, Diastereomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

UNIT-III: Chemistry of Aliphatic Hydrocarbons-1 *10H*

Carbon-Carbon sigma bonds

Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-FittigReactions, Free radical substitutions: Halogenation.

Carbon-Carbon pi bonds:

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2,E1cb reactions. Saytzeff and Hofmann eliminations.

UNIT -IV Chemistry of Aliphatic Hydrocarbons-2 *15H*

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction. *Reactions of alkynes:* Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation ofterminal alkynes.

Cycloalkanes and Conformational Analysis

Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformation analysis of alkanes: Relative stability: Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms.

UNIT -V Aromatic Hydrocarbons *15H*

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Reference Books:

1. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Kalsi, P. S. *Stereochemistry Conformation and Mechanism*, New Age International, 2005.
3. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.

CHE -III ORGANIC CHEMISTRY LAB

Hours per week: 3 Credits: 2

Continuous Evaluation: 50marks (External 25M & Internal 25 M)

1. Checking the calibration of the thermometer
   a. Purification of organic compounds by crystallization using the following solvents: Water b. Alcohol c. Alcohol-Water
2. Determination of the melting points of above compounds and unknown organic Compounds.
4. Determination of boiling point of liquid compounds.
5. Chromatography
   a. Separation of a mixture of two amino acids by ascending and horizontal paper chromatography
   b. Separation of a mixture of two sugars by ascending paper chromatography
   c. Separation of a mixture of o-and p-nitro phenol or o-and p-aminophenol by thin layer chromatography (TLC)

Reference Books

1. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry,* Pearson Education (2009)
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical OrganicChemistry, 5th Ed.*, Pearson (2012)

B.Sc (Chemistry) - Semester-II
Paper-III
BLUE PRINT
CHE -III
ORGANIC CHEMISTRY I -BASICS AND HYDROCARBONS

S.No	UNITS	Name of the chapter	8 Marks	4 Marks
1.	UNIT-I	Basics of Organic Chemistry	2	2
2.	UNIT-II	Stereochemistry	2	2
3.	UNIT-III	Chemistry of Aliphatic Hydrocarbons-1	2	2
4.	UNIT-IV	Chemistry of Aliphatic Hydrocarbons-2	1	1
		Cycloalkanes and Conformational Analysis	1	1
5.	UNIT-V	Aromatic Hydrocarbons	2	2

07.06.16

Scheme of Valuation

CHE -III ORGANIC CHEMISTRY LAB

I. Internal practical examination: 25M

S.No.	Content	Marks
1	Record	10 M
2	Viva-voce	10M
3	Field visit	05M
	Total	25M

II. External Practical Examination: 25M

ORGANIC CHEMISTRY LAB

S.No.	Content	Marks
1	Procedure	2M
2	Formula	2M
3	Tables	4M
4	For an error upto 1%	12M
	For an error between 1% to 2%	10M
	For an error above 2%	7M
5	Calculation	3M
6	Result	2M
	Total	25M

MODEL PAPER

B. Sc, DEGREE FIRST YEAR EXAMINATIONS

Paper –III , SEMESTER- II

CHE -III ORGANIC CHEMISTRY I -BASICS AND HYDROCARBONS

Time: 3 hours **Maximum Marks:**75Marks

PART- A

Answer any **FIVE** of the following questions **5x5= 25Marks**

1. Define electrophiles and nucleophiles.
2. Define enantiomers. Give examples.
3. Write Saytzeff rule.
4. Write a short note on Diels-Alder reaction.
5. Explain carbocations and carbanions.
6. Explain specific rotation.
7. What is 1,4-Addition reaction in conjugated dienes.
8. Explain Huckel's rule and give examples.
9. Explain alkylation of terminal alkynes.
10. Explain the directing effect of halogens in Benzene.

PART- B

Answer **ALL** the questions 5x**10** = **5**0Marks

11. (a) Explain substitution reactions with suitable examples.

(OR)

(b)Define inductive effect and write its applications

12. (a) Explain geometrical isomerism with suitable examples.

OR

(b) Explain R-S configuration with suitable examples.

13. (a) Explain the following reactions

(i) Wurtz reaction (ii) Wurtz Fitting reaction.

OR

(b) Write an account of eliminations reactions and write their mechanisms.

14. (a) . Explain the following reactions

(i) Markownikoff's rule (ii)) Anti markownikoff's rule

OR

(b) Explain Baeyer's strain theory.

15. (a) Explain nitration and sulphonation reactions and their mechanisms.

(OR)

(b) Explain Friedel crafts alkylation and Friedel crafts acylation reactions andtheir mechanisms.

SEMESTER II

CHE-IV PHYSICAL CHEMISTRY II - CHEMICAL THERMODYNAMICS AND ITS APPLICATIONS

Learning objective:

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

1. The laws of thermodynamics.
2. Concepts of internal energy, entropy.
3. Gibb's Helmholtz equation and Maxwell relations
4. Concept of Fugacity.
5. Lowering of vapor pressure, elevation of boiling point etc., and their relation with the amount of solute.

Course Outcomes:

After completion of the course students are able to learn about:

CO1. zeroth law of thermodynamics,Concept of heat, work,internal energy, *U*,CO2.

Concept of entropy; Gibbs and Helmholtz energy.

CO3. Le Chatelier principle.

CO4. Depression of freezing point, osmotic pressure

CHE - IV PHYSICAL CHEMISTRY II - CHEMICALTHERMODYNAMICS AND ITS APPLICATIONS

Unit-I: Chemical Thermodynamics -1 11H

Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics.

First law: Concept of heat, *q*, work, *w*, internal energy, *U*, and statement of first law;enthalpy, *H*, relation between heat capacities(ideal) under isothermal and adiabatic condition.

Unit-II: Chemical Thermodynamics -2 10H

Thermochemistry: Heats of reactions: standard states; enthalpy of formation of molecules and ions; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data.

Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; Calculation of entropy change for reversibleand irreversible processes.

Unit-III: Chemical Thermodynamics -3 12H

Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules.

Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T,V, P; Free energy change and spontaneity. Gibbs-Helmholtz equation; Maxwell

relations; thermodynamic equation of state.

Unit-IV: Chemical Equilibrium: *12H*

Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants *Kp* , *Kc* and *Kx*. Le Chatelier principle (quantitative treatment).

Unit-V:Solutions and Colligative Properties: 15H

Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications.

Derive relations between the four colligative properties [(i) relative lowering ofvapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point,

(iv) osmotic pressure] and amount of solute.

Reference Books

1. Peter, A. & Paula, J. de. *Physical Chemistry* 10th Ed., Oxford University Press (2014).
2. McQuarrie, D. A. & Simon, J. D. *Molecular Thermodynamics* Viva Books Pvt. Ltd.: New Delhi (2004).
3. Levine, I .N. *Physical Chemistry* 6th Ed., Tata Mc Graw Hill (2010).
4. Metz, C.R. *2000 solved problems in chemistry,*Schaum Series (2006).

CHE -IV PHYSICAL CHEMISTRY – LAB

Hours per week:3 Credits: 2

Continuous Evaluation: 50marks (External 25M & Internal 25 M)

1. Determination of heat capacity of the calorimeter and enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
2. Calculation of the enthalpy of ionization of ethanoic acid.
3. Determination of heat capacity of the calorimeter and integral enthalpy (endothermic and exothermic) solution of salts.
4. Determination of basicity/proticity of a polyprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.
5. Determination of enthalpy of hydration of copper sulphate.
6. Study of the solubility of benzoic acid in water and determination of ΔH.

Reference Books

- Khosla, B. D.; Garg, V. C. & Gulati, A., *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
- Athawale, V. D. & Mathur, P. *Experimental Physical Chemistry* New Age International: New Delhi (2001).

Chemistry- Semester-II
Paper-IV
BLUE PRINT
CHE -IV
PHYSICAL CHEMISTRY II - CHEMICAL THERMODYNAMICS AND ITS APPLICATIONS (CC)

S.No	UNITS	Name of the chapter	8 Marks	4 Marks
1.	UNIT-I	Chemical Thermodynamics -1	2	2
2.	UNIT-II	Chemical Thermodynamics -2	2	2
3.	UNIT-III	Chemical Thermodynamics -3	2	2
4.	UNIT- IV	Chemical Equilibrium	2	2
5.	UNIT-V	Solutions and Colligative Properties	2	2

MODEL PAPER

B. Sc.DEGREE I YEAR EXAMINATIONS
PAPER IV, SEMESTER-II

CHE -CC-IV PHYSICAL CHEMISTRY II - CHEMICALTHERMODYNAMICS AND ITS APPLICATIONS

Time: 3 hoursMaximum Marks: 60

PART- A 5 X 4 = 20 Marks

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

1. Explain zero law of thermodynamics.
2. Write a short note on concept of entropy.
3. What is Gibbs' Helmholtz equation?
4. Explain Raoult's law.
5. Describe chemical equilibria in ideal gases and concept of fugacity
6. Write a short note on Henry's law.
7. Explain enthalpy and relation between heat capacities under isothermal and adiabatic condition.
8. Write about thermodynamic equation of state.
9. Explain Le-Chatelier principle with one example.
10. Derive the relation to calculate lowering of vapour pressure when a non volatile solute dissolved in solvent

PART- B 5X 8 = 40 Marks

Answer **ALL** the questions. Each carry **EIGHT** marks

11. (a). Give a detailed note on isolated, closed and open systems.

(or)

(b) State and derive first law of thermodynamics.

12. (a)Discuss the calculation of bond energy, bond dissociation and resonance energy from thermochemical data.

(or)

(b). State and derive Second law of thermodynamics.

13. (a) State and derive third law of thermodynamics.

(or)

(b) Describe Maxwell relations.

14.(a). Derive the thermodynamic relation between Gibbs, free energy of reaction and reaction quotient.

(or)

(b). Explain Le-Chatelier's principle.

15.(a). Derive the relation between elevation of boing point and amount of solute.

(or)

(b) Discuss the relation between osmotic pressure and the amount.

SRR and CVR GDC (A) – VijayawadaDepartment of Chemistry

IIIrd-Semester – Skill Development Course

ENVIRONMENTAL AUDIT

Skill Development Course

ENVIRONMENTAL AUDIT

Total - 30 hrs (02h/wk)
02 Credits
Max 50 Marks

Learning Outcomes: By successful completion of the course, students will be able to;

- *Understand the basic concepts Environmental health*
- *Learn and identify the industrial pollution*
- *Explain the highlights in the regulatory aspects of Environmental law and policy*
- *Understand the various phases of Environmental Audit*

UNIT – I

Industrial Pollution and its effects **06 h**

Climate – Weather and Air Pollution – Classification of water and water bodies – WaterQuality Parameters – Water Pollution – Sources – Classification, nature and Toxicology of water pollutants. - Soil parameters –Soil pollution and impacts – Soil conservation

UNIT - II

Environmental Law & Policy: *09 h*

Highlights of the Acts, Institutional arrangements for: (1) The Water (Prevention & Control of Pollution) Act, 1974 amended in 1988; (2) The Air (Prevention and Control of Pollution) Act, 1981 amended in 1987; (3) The Water (Prevention and Control of Pollution) Cess Act, 1977 amended in 1991; (4) The Environment (Protection) Act, 1986; (5) The Public Liability Insurance Act, 1991; – Indian Policy Statement for abatement of Pollution, 1992.

UNIT - III

Environmental Audit - Scope & Requisites: **10h**

Environmental Audit: Definition; Objectives; Scope, Coverage - GOI Notification on Environmental Audit - Benefits to Industry. Reporting Environmental Audit Findings - Importance of Environmental Audit Report to industry, public and the governments.

Co-curricular Activities Suggested: *05h*

Visit to understand Institutional arrangements and functioning of Pollution Control Boards.Visiting different Ecosystems

Soil analysis: Determination of soil type and texture, pH, Soil Moisture, Nitrogen, Potassiumand Phosphorous.

Water analysis: Determination of pH, Dissolved solids and suspended solids, DissolvedOxygen, COD, BOD.

Assignments, Group discussion, Quiz etc.

Reference books and websites:

Environmental Education in India by K.R. Gupta

Environmental Legislation in India by K.R. Gupta

https://parivesh.nic.in/ https://www.cpcb.nic.in/

https://www.free-ebooks.net/environmental-studies-academic

MODEL QUESTION PAPER FORMAT

Max. Marks: 50 *Time: 1½ hrs (90 Minutes)*

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.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

SECTION B (3x10M = 30 Marks)

Answer any three questions. Each answer carries 10 marks (At least 1 question should be given from each Unit)

1.	
2.	
3.	
4.	
5.	

Environmental Audit

MODEL QUESTION PAPER

Max. Marks: 50 *Time: 1½ hrs (90 Minutes)*

SECTION- A

(4x5M=20 Marks)

*Answer any **four** questions. Each answer carries **5 marks***

1. Write any three global environmental problems?
2. Write a short note on soil pollution and its impact?
3. What is BOD and explain its significance in determining the quality of water?
4. What are the objectives of the environmental Acts and the Institutional arrangements
5. Write a brief note on the environmental laws that governs the water pollution
6. Write a brief note on the functioning of central and state pollution control boards?
7. What are the objectives of environmental audit
8. What is GoI notification on environmental audit?

SECTION- B

(3x10M = 30 Marks)

*Answer any **three** questions. Each answer carries **10 marks***

9. What is water pollution and explain in detail about the water pollutants?
10. What is air pollution and explain in detail about the air pollutants?
11. Write an essay on the Water (Prevention & Control of Pollution) Act, 1974 amended in 1988
12. Write an essay on the Air (Prevention and Control of Pollution) Act, 1981 amended in 1987
13. What is environmental audit and explain the various stages involved in it and thebenefits of environmental audit to the industry?

FOOD ADULTERATION

LIFE SKILL COURSES UNDER CBCS

FRAMEWORKWITH EFFECT FROM

2020-21

YEAR	SEMESTER	HOURS PER WEEK	TITLE	MARKS	CREDITS
I	II	2	FOOD ADULTERATION	50	2

SRR & CVR GOVT. DEGREE COLLEGE (A)

(NAAC Reaccredited B+ Grade Institution & District Identified College)

ViJAYAWADA- 520004, Andhra Pradesh, INDIA

Semester- II

Syllabus of FOOD ADULTERATION

Total 30 hours (02hours/week) **02 Credits & Max Marks: 50**

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

- Get basic knowledge on various foods and about adulteration.
- Understand the adulteration of common foods and their adverse impact on health
- Comprehend certain skills of detecting adulteration of common foods.
- Extend their knowledge to other kinds of adulteration, detection and remedies.
- Know the basic laws and procedures regarding food adulteration and consumer protection.

SYLLABUS:

UNIT-I – Common Foods and Adulteration: **7 hours**

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

UNIT-II –: Adulteration of Common Foods and Methods of Detection: **10 hours**

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

UNIT-III –: Present Laws and Procedures on Adulteration: *8 hours*

Highlights of Food Safety and Standards Act 2006 (FSSA) –Food Safety and Standards Authority of India–Rules and Procedures of Local Authorities. Role of voluntary agencies such as, Agmark, I.S.I. Quality control laboratories of companies, Private testing laboratories, Quality control laboratories of consumer co-operatives. Consumer education, Consumer's problems rights and responsibilities, COPRA 2019 - Offenses and Penalties – Procedures to Complain – Compensation to Victims.

Co-curricular Activities (including Hands on Exercises): *05 hours*

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 first course in Food Analysis–A.Y.Sathe,New Age International(P)Ltd.,1999
2. Food Safety case studies–Ramesh.V.Bhat,NIN,1992
3. https://old.fssai.gov.in/Portals/0/Pdf/Draft_Manuals/Beverages and confectionary.pdf
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. Wikipedia
10. Vikaspedia

SRR&CVR GOVT.DEGREE COLLEGE(A)

(NAAC Reaccredited B+ Grade Institution & District Identified College)

Vijayawada- 520004, Andhra Pradesh, INDIA

Semester- II

FOOD ADULTERATION

Guidelines to the Paper Setter:

The syllabus of Food adulteration paper of semester-II consists of **Adulteration of Common Foods and Methods of Detection, Present Laws and Procedures on Adulteration** The question paper consists of 2 sections. In which,

Section-A consists of eight short answer questions, out of which **FOUR** questions to be answered and each question carries five marks

Section-B consists of FIVE essay questions, out of which **THREE** questions to be answered and each question carries 10 marks .

The examiner has to choose at least one question from each unit and he/she is requested to set question paper in such a way that the entire syllabus should reflect on the question paper.

FOOD ADULTERATION SEMESTER-II BLUE PRINT				
S.No	**UNIT**	**Name of the unit**	**5 marks**	**10 Marks**
1.	I	Common foods and Adulteration	3	2
2.	II	Adulteration of common foods and methods of detection	2	1
3.	III	Present laws and procedures on Adulteration	3	2