PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Siddhartha Nagar, VIJAYAWADA - 520 010, Andhra Pradesh
Autonomous, NAAC A+ Grade, ISO Certified Institution
Since 1975
50 Years of Educational Excellence

NAAC - SSR IV CYCLE

M.Sc. CHEMISTRY

REGULATION 20

2020-22

PROGRAMME STRUCTURE &

SYLLABUS

Parvathaneni Brahmayya Siddhartha College of Arts & Science: Vijayawada-10.

(An Autonomous college in the jurisdiction of Krishna University)

Accredited at A+ grade by NAAC

2020 Batch M.Sc -Organic Chemistry

List of Courses

C CODE	COURSE TITLE	CREDITS	TOTAL	CIA	SEE
	MAY -2021 FIRST SEMESTER				
20CH1T1	GENERAL CHEMISTRY-I	4	100	30	70
20CH1T2	INORGANIC CHEMISTRY-I	4	100	30	70
20CH1T3	ORGANIC CHEMISTRY-I	4	100	30	70
20CH1T4	PHYSICAL CHEMISTRY-I	4	100	30	70
20CH1L1	INORGANIC CHEMISTRY LAB-I	4	100	30	70
20CH1L2	ORGANIC CHEMISTRY LAB-I	4	100	30	70
	TOTAL	**24**	**600**	**180**	**420**
	OCTOBER-2021 SECOND SEMESTER				
20CH2T1	ORGANIC SPECTROSCOPY	4	100	30	70
20CH2T2	INORGANIC CHEMISTRY-II	4	100	30	70
20CH2T3	ORGANIC CHEMISTRY-II	4	100	30	70
20CH2T4	PHYSICAL CHEMISTRY-II	4	100	30	70
20CH2L1	ORGANIC CHEMISTRY LAB-II	4	100	30	70
20CH2L2	PHYSICAL CHEMISTRY LAB	4	100	30	70
20OE01	**ENGLISH COMMUNICATION SKILLS (OPEN ELECTIVE)**	**4**	**100**	**30**	**70**
	TOTAL	**24**	**600**	**180**	**420**

	MARCH-2022 THIRD SEMESTER				
20CH3T1	ADVANCED ORGANIC SPECTROSCOPY	4	100	30	70
20CH3T2	ORGANIC REACTIONS & MECHANISMS	4	100	30	70
20CH3T3	ORGANIC SYNTHESIS	4	100	30	70
20CH3T4	CHEMISTRY OF NATURAL PRODUCTS	4	100	30	70
20CH3L1	ORGANIC PREPARATIONS LAB	4	100	30	70
20CH3L2	MIXTURE ANALYSIS LAB	4	100	30	70
20OE08	**FUNDAMENTALS OF ANALYTICAL INSTRUMENTS (OPEN ELECTIVE)**	**4**	**100**	**30**	**70**
	TOTAL	**24**	**600**	**180**	**420**
	JULY-2022 FOURTH SEMESTER				
20CH4T1	GREEN CHEMISTRY	4	100	30	70
20CH4T2	TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS	4	100	30	70
20CH4T3	ORGANO METALLIC REAGENTS	4	100	30	70
20CH4L1	ORGANIC ESTIMATIONS	3	100	30	70
20CH4P1	PROJECT WORK	6	200	50	150
20CH4M1	ORGANIC CHEMISTRY **(MOOCS)**	4	100	30	70
	TOTAL	**25**	**700**	**200**	**500**

Practical – I – Inorganic Chemistry (CH1L1)

S.No	COURSE OUTCOMES	
	After completion of the course, the student will be able to :	
1	To understand the importance of Inorganic qualitative analysis and its use in research and industry.	
2	To apply the procedures / tests for the identification of cations and anions.	
3	To interpret the need for separation of interfering radical in Inorganic qualitative analysis.	
4	To know that complexes can be synthesized by simple procedures.	

INORGANIC CHEMISTRY (PRACTICAL-I)

Qualitative Analysis:

Qualitative analysis of an inorganic mixture containing three cations (one less familiar cation) and three anions (one interfering anion)

Less familiar cations: Tl, Mo, Th, Zr, V and U.

Interfering anions: Oxalate, tartrate, phosphate and chromate.

Preparations of Inorganic complexes :1. Hexaamine Cobalt(III) chloride

2. Tris – Thiourea copper(I)Sulphate 3. Cis - Potassium di aqua bis oxalato Chromate(III)

4. Potassium tris oxalato Ferrate(III)

Note: Only Mixture Analysis is given for Practical Exam

P.B. Siddhartha College of Arts & Science : : Vijayawada – 520 010

CIA Practicals

Total Marks – 30 M

1. Lab Performance / per experiment – 20 Marks
   - Experiment – 10 Marks
   - Observation – 5 Marks
   - Result / Yield / Report – 5 Marks

2. Semester End Internal Exam – 10 Marks
   - Experiment – 7 Marks
   - Result / Yield / Report – 3 Marks

Practical – II – Organic Chemistry (CH1L2)

S.No	COURSE OUTCOMES	
	After completion of the course, the student will be able to :	
1	To understand the importance of organic compound synthesis and its use in research and industry.	
2	To comprehend the procedures for the different steps revolved in the organic compound synthesis.	
3	To understand the mechanisms for the synthesis of organic compounds in different steps.	
4	To applying the procedure of recrystallisation of organic compound.	

Preparation and purification (Recrystallisation) of organic compounds involving 1 & 2 steps.

Single step

1. Asprin
2. Iodoform
3. m-dinitrobenzene
4. p-bromo Acetanilide
5. Acetanilide

Two step

1. P-nitro acetanilide from aniline
2. P-nitro aniline from acetanilide
3. Benzanilide from Benzophenone.

M.Sc. DEGREE EXAMINATION

Internal Practical Model Paper

(Regulation 2017-2018)

Time: 6 hours **Maximum Marks: 30**

1. Experiment – 20 Marks
2. Result / Graphs / Yield / Report – 10 Marks

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Practical – III – Physical Chemistry (CH1L3)

S.No	COURSE OUTCOMES	
	After completion of the course, the student have an ability to	
1	Develop skills in problem solving, critical thinking and analytical reasoning in finding the CST of Phenol water system and partition coefficient of benzoic acid between benzene and water.	
2	Determine the rate constants of first and second order reactions.	
3	Communicate the results of analysis with ethics and responsibility.	

1. Determination of rate constant of the oxidation of iodide ion with persulphate ion.
2. Relative strengths of acids by studying the hydrolysis of ethyl acetate / methyl acetate.
3. Determination of equilibrium constant of KI3 ⇔ KI + I2 by partition coefficient method and determination of unknown concentration of potassium iodide.
4. Distribution coefficient of Benzoic acid between Benzene and water.
5. Determination of critical solution temperature of phenol-water system Study of the effect of electrolyte on the miscibility of phenol-water system

M.Sc. DEGREE EXAMINATION

External Practical Model Paper

(Regulation 2017-2018)

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

1. To write the principle and procedure / mechanism related to practical as listed in the practical syllabus – 5 M
2. Record – 10 M
3. Experiment (Procedure / Tabulation / calculation etc.,) – 50 M
4. Result / Graphs / Yield / Report – 5 M

Semester – I - SYLLABUS
W.E.F 2019 – 2020 Batch and Onwards
COURSE OUTCOMES

Paper – I – General Chemistry (CH1T1)

S.No	COURSE OUTCOMES	
	After completion of the course, the student will be able to :	
1	Demonstrate sound knowledge in fundamentals and application of titrimetry analysis, computers Fortran programming and basic statistical procedures.	
2	Experiment various titrations on their own by analytical techniques and finding the results by graphical methods and can also apply statistical principles on experimental data.	
3	Develop skills in problem solving, critical thinking and analytical reasoning of chemistry related problems.	
4	Implement the Fortran 77 programs for various chemistry related problems and draw the conclusions.	
5	Analyze the data obtained in quantitative analysis whether consistant or not as per the statistical rules.	

UNIT I

Treatment of analytical data : Classification of errors - Determinate and indeterminate errors - Minimisation of errors - Accuracy and precision - Distribution of random errors - Gaussian distribution - Measures of central tendency - Measures of precision - Standard deviation - Standard error of mean - student's t test - Confidence interval of mean - Testing for significance - Comparison of two means – F - test - Criteria of rejection of an observation - propagation of errors - Significant figures and computation rules - Control charts - Regression analysis - Linear least squares analysis.

UNIT-II

Titrimetric Analysis: Classification of reactions in titrimetric analysis- Primary and secondary standards-Neutralisation titrations-Theory of neutralisation indicators-Mixed indicators-Neutralisation curves-Displacement titrations-Precipitation titrations-Indicators for precipitation titrations-Volhard method-Mohr method- Theory of adsorption indicators-Oxidation reduction titrations-Change of electrode potentials during titration of Fe(II) with Ce(IV)- Detection of end point in redox titrations-Complexometric titrations- Metal ion indicators-Applications of EDTA titrations-Titration of cyanide with silver ion.

UNIT -III

Visible spectro photometry – Theory of spectrophotometry and colorimetry, Beer-Lambert's law - Deviations from Beers law. Classification of methods of colour measurement or comparison (standard series method, Duplication method, Dilution method, photoelectric-photometer method, spectrophotometer method)-Instrumentation – Applications-determination of phosphates, chlorides, Iron, Manganese, chromium - Photometric titrations-Spectrophotometric determination of pK value of an indicator

UNIT – IV

Potentiometry: Advantages of potentiometric methods - Reference electrode - Standard hydrogen electrode .Acid- alkali or Neutralisation titration, Oxidation – reduction titrations, Precipitation titrations, complexometric titrations, Methods of end point location (Graphical, Differentiation method, Pinkhof- Treadwell method). Calomel electrode -Indicator electrodes:

Metal-metal ion electrodes - Inert electrodes -Membrane electrodes - theory of glass membrane potential - Direct potentiometry , potentiometric titrations - Applications.

UNIT V

Programming in FORTRAN 77 - Flow charts-Constants and variables - Arithmetic expressions - Arithmetic statement - Replacement statement - Input and output statements - Format specifications -Termination statement - Branching statement - IF statement - Arithmetic and logical IF statement - GOTO statement - - Subscripted variable and DIMENSION Statement - DATA Statement. Control statements - DO statement - Rules for DO statements - Functions and subroutines – common statement

Flow charts and computer programs for

i) Summing of power series $1+x+x^2+x^3+\ldots.+x^n$
ii) Rate constant of First order reaction or Beer's law by linear least square method.
iii) Hydrogen ion concentration of a strong acid/Quadratic equation.
iv) Solution for Vander Waals equation or Hydrogen ion concentration of a monoprotic Weak acid.
v) Standard deviation and variance of univariant data.

REFERENCES:

1. Vogel's text book of quantitative analysis. (3^{rd} edition)Addition Wesley Longmann Inc.
2. Quantitative analysis R.A Day and A.L.Underwood. Prentice Hall Pvt.Ltd.
3. Principles of computer programming (Fortran 77 IBM PC)V.Rajaraman, Prentice Hall.
4. An introduction to Digital computers.V.Rajaraman and T.Radhakrishnan
5. Fundamentals of Analytical Chemistry – Skoog and West
6. Instrumental Methods of analysis – B K Sharma.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2019
FIRST SEMESTER

Paper-I :: General Chemistry - I

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

UNIT - I

1 (a)Explain the different between Accuracy & Precision with examples. (6M) – **CO - 1**
(b) Write notes on distribution of errors. (8M) – **CO- 1**

(Or)

(c) Explain how errors are propogated. (6M) – **CO- 1**
(d) What are the criteria for rejection of an observation? (4M) – **CO- 3**
(e) Write notes on significant figures. (4M) – **CO- 1**

UNIT - II

2 (a) What are 1^0 & 2^0 standards? (4M) – **CO- 1**
(b) Explain the theory of neutralization indicators. (6M) – **CO- 1**

(c) Explain the principle of displacement titrations. (4M) – **CO- 1**

(Or)

(d) Describe the Volhard & Mohr method in precipitation titrations. (8M) – **CO- 1**

(e) How is the end point detected in a redox titration? (6M) – **CO- 1**

UNIT - III

3 (a) Define Beer – Lambert's law. Give an account on deviations from Beer's law. (6M) – **CO- 1**

(b) Write a note on the following colour measurement or comparison in visible spectrophotometry (i) Duplication method (ii) Standard series method (8M)

(Or)

(c) Discuss the spectrophotometric method for the determination of phosphate. (6M) – **CO- 3**

(d) Explain the method for the determination of P^k value of an indicator spectrophotometrically. (8M) – **CO- 4**

UNIT - IV

4 (a) Discuss the construction and working of standard hydrogen electrode. (6M)–**CO- 1**

(b) Give a detailed account on glass membrane electrode. (8M)–**CO- 1**

(Or)

(c) Explain the role of potentiometry in oxidation – reduction titrations with necessary theory. (6M)

(d) Write a note on the following end point location methods in potentiometry (i) Graphical Method (ii) Pinkhof – Treadwell method (8M)–**CO- 2**

UNIT - V

5 (a) What are the rules of Do statements. (4M)–**CO- 1**

(b) Write a FORTAN programme and flow chart for H^+ ion concentration of a strong acid. (10M)–**CO- 4**

(Or)

(c) Write a FORTAN programme and flow chart for $1+x+x^2+x^3\ldots\ldots\ldots+x^n$. (14M) – **CO- 4**

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Paper – II – Inorganic Chemistry (CH1T2)

S.No	COURSE OUTCOMES	
	After completion of the course, the student will be able to :	
1	Memorize the basic concepts of quantum chemistry, co-ordination chemistry and chemical bonding.	
2	Comprehend the role of basic and advanced concepts of quantum chemistry, co-ordination chemistry and chemical bonding.	
3	Exercise the conceptual knowledge gained in the concepts of quantum chemistry, co-ordination chemistry and chemical bonding in future research, in chosen job role as well as in understanding other concepts in chemistry.	
4	Compare and distinguish one concept from the other in inorganic chemistry and in correlation with other chemistries as well.	
5	Assess that how far the contents of quantum chemistry, co-ordination chemistry and chemical bonding are useful in rendering theoretical explanations for the concepts in chemistry.	
6	Exploit core areas of quantum chemistry, co-ordination chemistry and chemical bonding to develop research strategies in chemistry.	

UNIT-I

Introduction to Exact Quantum Mechanical Results : Schrodinger equation importance of wave function ,Operators, Eigen values and Eigen functions, derivation of wave equation using operator concept . Discussion of solutions of Schrodinger's equation to some model systems viz. particle in one dimensional box (applications), three dimensional box, Rigid rotator system and the Hydrogen atom.

Approximate Methods - Variation theorem, linear variation principle perturbation theory, (first order and non degenerate) . Application of variation method to the Hydrogen atom.

UNIT-II

Metal π- complexes: preparation, structure and bonding in Nitrosyl, Dinitrogen and Dioxygen complexes

Chemistry of non- transition elements - Inter halogen compounds, Halogen oxides and oxyfluorides. Noble gas compounds with special reference to clathrates. Spectral and Magnetic properties of Lanthanides and Actinides. Analytical applications of Lanthanides and Actinides. Synthesis, properties and structure of B-N, S-N, P-N cyclic compounds and intercalation compounds.

UNIT-III

Structure and Bonding - pπ - dπ bonding - Evidences (in non-transition metal compounds).Concept of Hybridization, Bent's rule , energetics of Hybridisation, concept of Resonance. Non-valence cohesive forces, Hydrogen bonding. VSEPR theory, Walsh diagrams for linear (BeH_2) and bent (H_2O) molecules . Molecular Orbital theory, Symmetry of Molecular orbitals, Molecular orbitals in triatomic (BeH_2) molecules and ions (NO_2^-) and energy level diagrams.

UNIT-IV

Metal –ligand bonding - Crystal Field Theory of bonding in transition metal complexes – Splitting of d-orbitals in octahedral, tetrahedral, square plannar, Trigonal bipyramidal and Square pyramidal fields.Tetragonal distortions - Jahn Teller effect . Applications and limitations of CFT. Experimental evidences for covalence in complexes. .Molecular Orbital Theory of bonding for Octahedral, tetrahedral and square planar complexes. π- bonding and MOT - Effect of π-donor and π-acceptor ligands on Δo. Experimental evidence for π - bonding in complexes.

UNIT-V

Metal – ligand Equilibria in solutions - Step wise and over all formation constants. Trends in stepwise constants (statistical effect and statistical ratio). Determination of formation constants by Spectrophotometric method (Job's method) and pH metric method(Bjerrum's) . Stability correlations - Irwing – William's series. Hard and soft acids and bases – Acid-base strength and HSAB. Macrocyclic complexes - Crown ethers and Cryptates. Preparation and structures of Isopoly and Heteropoly acids and their salts.

Reference Books

1. Inorganic Chemistry Huheey, Harper and Row.
2. Physical methods in inorganic chemistry, R.S. Drago. Affliated East-West Pvt. Ltd.
3. Concise inorganic chemistry, J. D. Lee, ELBS.
4. Modern Inorganic Chemistry , W. L. Jolly, McGrawHill.
5. Inorganic Chemistry , K. F. Purcell and J. C. Kotz Holt Saunders international.
6. Concepts and methods of inorganic chemistry , B. E. Douglas and D.H.M.C. Daniel, oxford Press.
7. Introductory quantum mechanics , A. K. Chandra
8 . Quantum Chemistry ,R. K. Prasad.
9. Inorganic Chemistry ,Atkins, ELBS
10. Advanced Inorganic Chemistry ,Cotton and Wilkinson, Wiley Eastern
11. Quantum Chemistry ,R. K. Prasad.
12. Text book of Coordination chemistry ,K.SomaSekhar rao and K.N.K. Vani, Kalyani Publishers .
13. Theoretical Inorganic Chemistry by G.S.Manku, Tata Mc GrawHill, 2000, reprint.
14. Concise co-ordination chemistry, R.Gopal, Ramalingam, Vikas Publishing, House, 2014.
15. Inorganic Chemistry – Huheey, Keuter, L.Keiter, 4th edition, Pearson education, Asia.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2019
FIRST SEMESTER

Paper-II :: Inorganic Chemistry - I

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

UNIT - I

1 (a) Write down the wave equations for rigid rotaor and solve it to get eigen functions. (14M) – **CO-2**

(Or)

(b) Arrive at the expression for first order correction of eigen values in perturbation method. (8M) – **CO-1**

(c) Explain the basic concepts of variation method. (6M) – **CO-1**

UNIT - II

2. (a) Discuss the magnetic properties of actinides. (6M) – **CO-1**

(b) Write an account on phosphorus-nitrogen cyclic compounds. (8M) – **CO-1**

(Or)

(c) Give an account on dioxygen complexes. (6M) – **CO-1**

(d) Explain the structure and bonding in nitrosyl complexes. (8M) – **CO-2**

UNIT - III

3.(a) Explain the sailent features of VSEPR theory. (6M) – **CO-1**

(b) Draw and explain the molecular orbital energy level diagram for BeH_2 molecule. (8M) – **CO-2**

(Or)

(c) Give an account on energetic of hybridization. (4M) – **CO-1**

(d) Explain the evidences for $p\pi - d\pi$ bonding in non-transition metal compounds. (10M) – **CO-4**

UNIT – IV

4.(a) Draw and explain the crystal field splitting pattern in square pyramidal geometry. (4M) – **CO-2**

(b) Explain tetragonal distortion in an octahedral complex with a suitable example. (10M) – **CO- 3**

(Or)

(c) What are the drawbacks of crystal field theory? (4M) – **CO- 4**

(d) Why CN^- and CO cause greater crystal field splitting and I^- and Br^- cause lesser crystal field splitting? Explain. (10M) – **CO- 4**

UNIT - V

5.(a) Write the step-wise and overall formation constants for the following reactions

(i) $Ag^+ + 2NH_3 \rightarrow [Ag(NH_3)_2]^+$ (ii) $Fe^{+3} + 4Cl \rightarrow [FeCl_4]^-$ (6M) – **CO- 1**

(b) Describe the spectrophotometric method for the determination of a stability constant. (8M) – **CO- 2**

(Or)

(c) Discuss about Irwing – William series. (6M) – **CO- 1**

(d) Write an account on macro-cyclic ligands. (8M) – **CO- 1**

Paper – III – Organic Chemistry (CH1T3)

S.No	COURSE OUTCOMES	
	After completion of the course, the student will be able to :	
1	Recollect the basic concepts of aromaticity, reactive intermediates, stereo chemistry and hetero cyclic chemistry.	
2	Make out the basic and advanced concepts of aromaticity, reactive intermediates stereo chemistry and heterocyclic chemistry.	
3	Address high level concepts in organic chemistry with conceptual knowledge gained in aromaticity, reactive intermediates, stereo chemistry and hetero cyclic chemistry.	
4	Appraise how knowledge about aromaticity, reactive intermediates, stereo chemistry and hetero cyclic chemistry is useful in understanding the properties of organic compounds.	
5	Judge how far that the concepts of aromaticity, reactive intermediates, stereochemistry and heterocyclic chemistry in assessing the properties of products obtained in organic reactions.	
6	Design new strategic routes of organic synthesis with knowledge acquired on the concepts of organic chemistry.	

UNIT-I

Nature of Bonding in Organic Molecules: Localised and Delocalized, Delocalised chemical bonding conjugation, cross conjugation, hyper conjugation, Tautomerism.

Aromaticity: Concept of Aromaticity, Aromaticity of five membered, six membered rings .- Non benzonoid aromatic compounds:-cyclopropenylcation, Cyclobutadienyldication, cyclopentadienyl anion-tropyllium cation and cyclooctatetraenyl dianion. Homoaromaticity, Anti aromaticity.

UNIT–II

Reactive intermediates:

Generation, Structure, Stability, Detection and Reactivity of Carbocations, Carbanions, Free radicals, Carbenes, Nitrenes and Arynes.

Reactive Species: Generation and reactivity of Electrophiles, Nucleophiles, Dienophiles, Ylids.

UNIT–III

Heterocyclic Chemistry:- Synthesis and Reactions of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole; Skraup synthesis, Fisher indole synthesis.

Heterocyclic compounds more than one hetero atom:- Pyrazole, Imidazole, Oxazole Iso-Oxazole, synthesis and properties.

UNIT–IV

Stereochemistry:

Concept of Chirality: Recognition of symmetry elements and chiral structures (one and more than one chiral centers); D-L and R–S nomenclature, Inter-conversion of Fischer, Newman and Sawhorse projections. Threo and Erythro isomers, - stereo specific and

stereoselective synthesis. Asymmetric synthesis. – Methods of resolution, optical activity in the absence of chiral carbon (biphenyls, allenes and spiranes).Chirality due to helical shape.
Geometrical isomerism – E, Z- nomenclature – physical and chemical methods of determining the configuration of geometrical isomers.
Stereochemistry of compounds containing nitrogen, sulphur and phosphorous.

UNIT–V

Conformational analysis:

Conformation of acyclic molecules – alkanes and substituted alkanes –compounds having intramolecular hydrogen bonding, conformations around C-C and carbon hetero atom bonds having C–O & C–N. Conformations of monocyclic compounds – cyclohexane- chair, boat and twist boat cyclohexanes, energy profile diagram –Mono and di- substituted cyclohexanes.

Effect of conformation on reactivity in mono and di- substituted cyclohexane derivatives. Elementary treatment of fused and bridged ring systems – Decalines and Bornanes.

References:

1. Advanced organic chemistry – reaction, mechanism and structure, Jerry March, John Wiley.
2. Advanced organic chemistry, F.A.Carey and R.J.Sundberg,Plenum.
3. A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
4. Organic chemistry , I.L.Finar, Vol. I & II, Fifth ed. ELBS,1975.
5. Organic chemistry, Hendrickson, Cram and Hammond (Mc Graw – Hill).
6. Stereo Chemistry of carbon compounds – E.L. Eliel.
7. Modern organic Reactions, H.O.House, Benjamin.
8. An introduction to chemistry of Heterocyclic compounds, R.M.Acheson.
9. Structure and mechanism in organic chemistry, C.K.Ingold, Cornell University Press.
10. Principles of organic synthesis, R.O.C.Norman and J.M.Coxon, Blakie Academic & Professional.
11. Reaction Mechanism in Oganic Chemistry, S.M.Mukherji and S.P.Singh, Macmillan.
12. Basic Principles of Organic Chemistry by J. B. Roberts and M. Caserio.
13. Stereo Chemistry of Organic compounds, P. S. Kalsi, New Age International.

M.Sc. DEGREE EXAMINATION, NOVEMBER
FIRST SEMESTER

Paper-III :: Organic Chemistry - I

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

UNIT - I

1 (a) Define delocalized chemical bonding. What are different types of delocalized chemical bonding. (6M)– **CO- 1**

(b) Explain Non-Benzonoid aromatic compounds of the following.
(i) Cyclobutadienyldication (ii) Cyclopentadienyl anion
(iii) Tropyllium cation (iv) Cycloctatetraenyldianion (8M) – **CO- 2**

(Or)

(c) Explain the following terms (i) Cross Conjugation (ii)Hyper Conjugation. **(6M) – CO- 2**

(d) Briefly explain the aromaticity of six and five membered ring systems? (8M) – **CO- 2**

UNIT - II

2 (a) Define electrophiles and nucleophiles. Write examples. (6M)–**CO- 1**

(b) Discuss the generation, stability and reactivity of carbocations. (8M)-**CO- 2**

(Or)

(c) Discuss about dienophiles and Ylides. (6M)–**CO- 2**

(d) Explain synthesis and few reactions of the following
(i) Free radicals (ii) Carbenes (iii) Nitrenes (iv) Arynes (8M) – **CO-2**

UNIT - III

3 (a) Give an account on Skraup synthesis. (6M)–**CO-1**

(b) Explain the synthesis and reactions of the following (i)Furan (ii) Pyridine. **(8M) – CO-2**

(Or)

(c) Discuss the methods used in the synthesis of Isoquinoline and Indole. (6M)– **CO-2**

(d) Describe the synthesis and reactions of the following
(i) Imidazole (ii) Iso oxazole (8M)–**CO-2**

UNIT - IV

4. (a) Discuss the various methods of resolution of a racemic mixture. (6M)– **CO-1**

(b) Discuss the optical activity of biphenyls and allenes. (8M)–**CO-2**

(Or)

(c) Discuss the stereochemistry of compounds containing nitrogen with suitable examples. (6M)–**CO-2**

(d) What is geometrical isomerism? Discuss the determination of configuration of geometrical isomers with suitable examples. (8M)–**CO-2**

UNIT - V

5.(a) Discuss conformations with intramolecular hydrogen bonding using suitable examples. (6M) – **CO-2**

(b) Discuss the conformations of cyclohexane. Draw the energy profile diagram. Which form is more stable? (8M) – **CO-3**

(Or)

(c) Write a note on the conformations of Decalin and explain their stability. **(6M)** – **CO-2**

(d) Discuss the conformational analysis of disubstituted cyclohexanes. B (8M) – **CO-3**

Paper – IV – Physical Chemistry (CH1T4)

S.No	COURSE OUTCOMES	
	After the completion of the course, Students will be able to	
1	Recall the basic concepts of thermodynamics, surface chemistry, chemical kinetics and Radiochemistry in detail.	
2	Demonstrate the spontaneous and non spontaneous reaction and derive various thermodynamic and Chemical kinetic derivations.	
3	Utilise the physical significance of thermodynamics and chemical kinetics in explaining the chemical properties and reactivity of reactions.	
4	Analyse the important techniques of separation of isotopes with the help of Aston's, Dempster's Bainbridge mass spectrograph methods, analysis of surfaces with the help of ESCA, Auger electron spectroscopy.	
5	Determine the rate constant of complex reactions and decide the order of a reaction.	
6	Construct the reaction of electrochemical cells and can solve various problems present in it.	

UNIT-I

Thermodynamics - I

Classical thermodynamics - Brief review of first and second laws of thermodynamics - Entropy change in reversible and irreversible processes - Entropy of mixing of ideal gases - Entropy and disorder – Free energy functions - Gibbs-Helmholtz equation - Maxwell partial relations - Conditions of equilibrium and spontaneity - Free energy changes in chemical reactions: Van't Hoff reaction isotherm - Van't Hoff equation - Clausius Clapeyron equation - partial molar quantities - Chemical potential - Gibbs- Duhem equation - partial molar volume - determination of partial molar quantities - Fugacity - Determination of fugacity - Thermodynamic derivation of Raoult's law.

UNIT – II

Surface phenomena and phase equilibria - Surface tension - capillary action - pressure difference - across curved surface (young - Laplace equation) - Vapour pressure of small droplets (Kelvin equation) - Gibbs-Adsorption equation - BET equation - Estimation of surface area - catalytic activity of surfaces – ESCA , X- ray fluorescence and Auger electron spectroscopy.

Surface active agents - classification of surface active agents - Micellization - critical Micelle concentration (CMC) - factors affecting the CMC of surfactants, microemulsions - reverse micelles - Hydrophobic interaction.

UNIT - III

Electrochemistry – I - Electrochemical cells - Measurement of EMF - Nernst equation – Equilibrium constant from EMF Data - pH and EMF data - concentration cells with and without transference – Liquid junction potential and its determination - Activity and activity coefficients - Determination by EMF Method - Determination of solubility product from EMF measurements. Debye Huckel limiting law and its verification.

Effect of dilution on equivalent conductance of electrolytes - Anomalous behaviour of strong electrolytes. Debye Huckel-Onsagar equation - verification and limitations, conductometric titrations.

UNIT - IV

Chemical kinetics- Methods of deriving rate laws - complex reactions - Rate expressions for opposing, parallel and consecutive reactions involving unimolecular steps. Theories of reaction rates -collision theory - Steric factor - Activated complex theory - Thermodynamic aspects – Unimolecular reactions - Lindemann's theory - Lindemann-Hinshelwood theory. Reactions in solutions - Influence of solvent - Primary and secondary salt effects - Elementary account of linear free energy relationships - Hammet - Taft equation - Chain reactions - Rate laws of H_2-Br_2, photochemical reaction of H_2 - Cl_2, Decomposition of acetaldehyde and ethane - Rice-Herzfeld mechanism.

UNIT – V

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

REFERENCE BOOKS:

1. Physical chemistry, G.K.Vemulapalli (Prentice Hall of India).
2. Physical chemistry, P.W.Atkins. ELBS
3. Chemical kinetics - K.J.Laidler, McGraw Hill Pub.
4. Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.
5. Polymer Sceince, Gowriker,Viswanadham, Sreedhar
7. Elements of Nuclear Science, H.J.Arniker, Wiley Eastern Limited.
8. Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.
9. Physical Chemistry-G.W.Castellan, Narosa Publishing House, Prentice Hall
10. Physical Chemistry, W.J.Moore, Prentice Hall
11. Polymer Chemistry – Billmayer

M.Sc. DEGREE EXAMINATION, NOVEMBER 2019
FIRST SEMESTER
Paper-IV :: Physical Chemistry - I

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

UNIT - I

1 (a) Derive the Maxwell's thermodynamics relations. (14M)–**CO-2**

(Or)

(b) Derive the Gibbs – Duhem equation. (7M)–**CO-2**

(c) What is fugacity? Give its physical significance. Describe the different methods of determination of fugacity. (7M)–**CO-3**

UNIT - II

2. (a) Discuss the theory involved in ESCA, X – ray fluorescence and AES. How are these techniques used in the analysis of surfaces? (14M)–**CO-5**

(Or)

(b) How are surface active agents classified? Give examples. (4M) –**CO-1**

(c) What is CMC? How is it determined? What are the factors effecting CMC? (10M)–**CO-1**

UNIT - III

3. (a) How is solubility product determined from EMF measurements? (6M) – **CO-4**

(b) What is activity? How is activity coefficient determined from EMF? (8M) – **CO-4**

(Or)

(c) Explain the principle of conductometric titrations. (6M) – **CO-4**

(d) What is the effect of dilution on equivalent conductance of electrolytes? (8M) – **CO-1**

UNIT – IV

4. (a) Discuss the Lindemann's theory of unimolecular reactions. (6M) – **CO-3**

(b) Discuss the kinetics of consecutive reactions. (8M) – **CO-2**

(Or)

(c) Derive the rate law for decomposition of acetaldehyde. (5M) – **CO-2**

(d) Discuss structure-reactivity relationships using Hammet – Taft equation. (4M) – **CO-2**

(e) Discuss the kinetics of H_2 – Br_2 reaction. (5M) – **CO-2**

UNIT - V

5 (a) Describe the properties of α, β and $_{\gamma}$ – rays. (6M) – **CO-1**

(b) Explain the theory of radioactive disintegration. (8M) – **CO-1**

(Or)

(c) With the help of a diagram explain the Dempster's method. (6M) – **CO-5**

(d) Describe the different methods of separation of isotopes. (8M) – **CO-5**

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P.B. SIDDHARTHA COLLEGE OF ARTS & SCIENCE :: VIJAYAWADA-10
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam)

Instrumental Methods for chemical analysis

Total teaching Hours for semester: 15 Periods **No of lecture hours/ week: 2**
Max Marks: **Credits: 2**
Learning Outcome:

1. To develop expertise relevant to the professional practice of chemistry
2. To develop an understanding of the range and theories of instrumental methods available in analytical chemistry
3. To develop an understanding of the role of the chemist in measurement and problem solving in chemical analysis
4. To provide an understanding of and skills in advanced methods of separation and analysis
5. To provide practical experience in selected instrumental methods of analysis

SPECTROSCOPY

UNIT – I **4h**

Spectrophotometry: Interaction of electromagnetic radiation with matter-classification of methods-Beer Lambert Law-Deviation from Beer Lambert Law.

UV-Visible Spectroscopy: Origin of adsorption spectra, components of typical instrument-Source-Tungsten lamp-Hydrogen and Deuterium discharge lamps, Wavelength selectors-Filters-Prisms and Grating-Sample cell-Detectors-Single and double beam spectrophotometers

ELECTRO ANALYTICAL INSTRUMENTATION

UNIT-II **3h**

Potentiometric methods: Principle-technique and detection limit
PH using Electrometric method

SEPARATION TECHNIQUES

UNIT – III **5h**

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

UNIT –IV **3h**

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.

P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE :: VIJAYAWADA-10
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam)

Instrumental Methods for chemical analysis

Total Practical Hours for semester: 30 periods **No of Practical hours/ week: 3**
Max Marks:

1. Two Practical's based on spectrophotometer
2. One Practical using Potentiometer
3. Identification of Amino acids using TLC
4. Water analysis
5. Estimation of PH by Electrometric method

Add-on course in Chemistry (PG)

ORGANOMETALLIC CHEMISTRY & METAL MEDIATED ORGANIC SYNTHESIS

Overview

The course covers an advance level of organometallic chemistry and recent development of cross coupling reactions and their applications in organic synthesis,

UNIT – I

Introduction of Organometallic Chemistry, Ligand Substitution Reactions, Oxidative Addition [1.Concerted Mechanism], Oxidative Addition[2.SN2 Mechanism], Oxidative Addition[3.RadicalMechanism],Reductive Elimination, Insertion and elimination.

UNIT – II

Hydrogenation of Alkenes, Hydrosilation reaction, Hydroformylation reaction, Alkene dimerization, Alkene polymerization, Monsanto acetic acid process, Wacker process, Synthetic gasoline, Synthetic gas

UNIT - III

Asymmetric hydrogenation ,Kumada Coupling reaction ,Suzuki coupling reaction, Stille coupling reaction,Sonogashira coupling reaction, Heck coupling reaction

UNIT – IV

Metathesis of olefins and alkynes ,Buchwald-Hartwig coupling reaction ,Kulinkovich Reaction and its mechanism,Pauson–Khand reaction,Glaser coupling reaction,Nozaki-Hiyama-Kishi coupling reaction

Reference books

1. Organometallic Chemistry – R C Mehrotra and A Singh, New Age Publications
2. Inorganic Chemistry- Principles of Structure and Reactivity, James E Huheey, Ellen A. Keiter, Richard L. Keiter, Pearson Education
3. Advanced Inorganic Chemistry- F A Cotton, G Wilkinson, Carlos A. Murillo, Manfred Bochman- John wiley and Sons.
4. Inorganic Chemistry – Allan G Sharpe, Addison Wesley
5. Organic Synthesis – Michael B.Smith (2nd Edition – McGraw Hill
6. Name Reactions – Jie Jack Li – (2nd Edition – Springer)
7. Organic Chemistry – Clayden, Greeves, Warren and Wothers (Oxford University Press)
8. Advanced Organic Chemistry – Francis A.Carey and Richard J.Sundberg – Part B – Reactions and Synthesis. Kluwer Academic / Plenum Publishers.
9. Advanced Organic Chemistry – Francis A.Carey and Richard J.Sundberg – Part A – Structure and Mechanisms – Kluwer Academic / Plenum Publishers.

CH2L1: INORGANIC CHEMISTRY

Subject Code	CH2L1	I A Marks	30
No. of Practical Hours / Week	6	End Exam Marks	70
Total Number of Practical Hours	80	Total Marks	100
Seminar	----	Exam Hours	06

Course: Inorganic chemistry Lab (code CH2L1)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the basic principles involved in various methods of quantitative analysis.	1,7
2	Comprehend the significance of various methods used in quantitative determination.	1,2,5
3	Apply these methods for quantitative determination in their future Endeavors.	1,6
4	Interpret how far that these methods are useful in bringing out quantitative determination at various levels of constituent concentration.	1,3
5	Evaluate how far these methods are accurate in quantitative determination.	1,4

Quantitative analysis:

1) Determination of Zn(II) with potassium Ferro cyanide (Volumetric)
2) Complexometric titrations:
   - (a) Determination of Mg^{2+}
   - (b) Determination of Ni^{2+} and
   - (c) Determination of hardness of water using EDTA
3) Determination of Fe^{3+} by a) photochemical reduction method b) Chemical reduction method.
4) Gravimetry (a) Determination of nickel using dimethyl glyoxime,
   (b) Determination of Zn using di ammonium hydrogen phosphate

References:

1. Vogels Text Books of Qulitative analysis, Revised. J.asset, R.C. Denny, G.H. Jeffery and J.Mendhan.ELBS.
2. Vogels Text Book of Quantitative analysis, revised. J. Bassett, R.C. Denny, G.H. Jeffery and J.Mendhan, ELBS.
3. Synthesis and Characterizations of Inorganic Compounds, W.L.Jolly. Prentice Hall.
4. Practical Inorganic chemistry by G. Pass and H. Sutcliffe Chapman and Hall.
5. Practicle Inorganic Chemistry by. K. Somasekhar Rao and K.N.K. Vani.

M.Sc. DEGREE EXAMINATION

External Practical Model Paper

(Regulation 2017-2018)

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

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

2. Record – 10 M
3. Experiment (Procedure / Tabulation / calculation etc.,) – 50 M
4. Result / Graphs / Yield / Report – 5 M

CH2L2: ORGANIC CHEMISTRY

Subject Code	CH2L2	I A Marks	30
No. of Practical Hours / Week	6	End Exam Marks	70
Total Number of Practical Hours	80	Total Marks	100
Seminar	----	Exam Hours	06

Course: Organic chemistry Lab (code CH2L2)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Understand the solubility nature of organic substances of different functional groups.	1,7,2
2	Get acquainted with the tests involved in identification of various functional groups.	1,6,2
3	Apply the knowledge gained to identify various functional groups present in any organic compound.	1,6,2
4	Analyze and report the given organic compound by using a systematic procedure.	2,5,7

Qualitative Analysis of an organic compound.
Phenols, Carbonyl compounds (Aldehydes & Ketones), Acids, Nitro compounds, Amines, Amides, carbohydrataes and hydrocarbons. (one compound is to be given for analysis with preparation of one solid derivative).

M.Sc. DEGREE EXAMINATION

Interrnal Practical Model Paper

(Regulation 2017-2018)

Time: 6 hours **Maximum Marks: 30**

1. Experiment – 20 M
2. Result / Graphs / Yield / Report – 10 M

CH2L3: PHYSICAL CHEMISTRY

Subject Code	CH2L3	I A Marks	30
No. of Practical Hours / Week	6	End Exam Marks	70
Total Number of Practical Hours	80	Total Marks	100
Seminar	----	Exam Hours	06

Course: Physical Chemistry Lab (code CH2L3)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Remember the basic principle of redox titrations, P^H- metry of strong acids Vs bases, conductometry of strong acid Vs strong base and Beer's law.	1,2,7
2	Understand the basic principles of redox titrations, P^H- metry of strong acids Vs bases, conductometry of strong acids Vs strong bases and Beer's law.	1,2,7
3	To apply concepts of redox titrations, P^H- metry and conductometry of strong acids Vs bases and Beer's law in research and other allied fields.	1,2,4

1. Potentiometric determination of Fe(II) with Cr(VI)
2. P^H- metric determination of strong acid with strong base.
3. P^H - metric determination of strong acid + weak acid with strong base.
4. Conductometric titration of strong acid with strong base.
5. Conductometric titration of strong acid + weak acid with strong base
6. Verification of Beers Law using potassium permanganate/potassium dichromate.

Semester – II - SYLLABUS
W.E.F 2019 – 2020 Batch and Onwards
COURSE OUTCOMES
M.Sc.CHEMISTRY

CH2T1: GENERAL CHEMISTRY – II

Subject Code	CH2T1	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	---	Exam Hours	03

Objectives: 1. To provide the required knowledge on symmetry elements and symmetry perations and in turn their use in understanding the active and inactive modes of vibrations in IR & Raman Spectroscopies.
2. To emphasize the changes possible in matter and electromagnetic radiation as a result of interaction between them.
3. To furnish the students with fundamental principles of magnetic spectroscopic studies and their application in establishing the structure of molecules.

Course: General chemistry (code CH2T1)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	To remember the concepts of symmetry and group theory of chemistry, microwave spectroscopy, Infrared spectroscopy, Raman spectroscopy, visible and ultraviolet spectroscopy, nuclear magnetic resonance spectroscopy electron spin resonance spectroscopy.	2,7,1
2	To understand the concepts of symmetry and group theory in chemistry, microwave, Infrared, Raman, visible and ultraviolet, nuclear magnetic resonance and electron spin resonance spectroscopies.	1,7,2
3	To apply concepts of symmetry and group theory, microwave, infrared, raman, visible, ultraviolet, nuclear magnetic resonance, electron spin resonance sprectroscopies.	5,6,1
4	To analyse the role and significance of concepts of symmetry and group theory in chemistry, microwave, infrared, raman, nuclear magnetic resonance, electron spin resonance spectroscopies.	1,7,6

UNIT- I

Symmetry and Group theory in Chemistry - Symmetry elements, symmetry operation, definition of group, sub group, relation between order of a finite group and its sub group. Point symmetry group. Schoenflies symbols, representation of groups by Matrices (representation for the Cn, Cnv, Cnh, Dn etc. groups to be worked out explicitly). Character of a representation. The great orthogonality theorem (without proof) and its importance. Character tables and their use. Application of group theory in IR and Raman spectroscopy.

UNIT – II

Motion of molecules-Degrees of freedom –Energy associated with the degrees of freedom Types of spectra.

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

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

UNIT – III

Raman spectroscopy
Classical and quantum theories of Raman effects, pure rotational, vibrational and Vibrational – rotational Raman spectra, selection rules, mutual exclusion principle, Resonance Raman spectroscopy, coherent antistrokes Raman Spectroscopy (CARS).
Visible and ultraviolet spectroscopy: - Electronic Spectra of diatomic molecules, vibrational structure of an electronic transition, classification of bands, rotational fine structure of electronic vibrational transition. Electronic Spectra of Polyatomic Molecules.

UNIT – IV

Nuclear Magnetic Resonance Spectroscopy: -
Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, desheilding, spin – spin interactions, factors influencing, coupling constant J. Classification (ABX, AMX, ABC, A2, B2 etc.) Basic ideas about NMR studies of nuclei other than proton – 13C, 19F, 31P. Use of NMR in medical diagnostics, Instrumentation.

Unit V

Electron spin resonance spectroscopy:
Basic principles, zero field splitting and krammers's degeneracy, factors affecting the 'g' value. Isotropic and anisotropic hyperfine coupling constants, spin hamiltonian, Spin densities measurement techniques, Instrumentation, simple applications like methyl radical, ethyl radical etc.,

SUGGESTED BOOKS:
1.Fundamentals of Molecular spectroscopy: by C.N.Banwell
2.Introductory Group Theory for Chemists – George Davidson
3.Group theory for chemistry – A.K.Bhattacharya
4.Molecular spectroscopy by B.K.Sharma
5. Vibrational Spectroscopy by D.N.Sathyanarayana New Age Int. Pub.
6. Spectroscopy by Aruldas.
7. Atomic Structure & Chemical Bonding – Manaschanda, Tata McGraw Hill – 4th edition, 2000.

8. Group Theory for Chemistry – A.K.Bhatacharya, Himalaya Publishing House – 1999, revised.
9. Chemical Application of Group theory – F.A.Cotton, Wiley India Pvt. Ltd., - 3rd edition, 2008.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.
SECOND SEMESTER

Paper-I :: General Chemistry - II

(Regulation 2017-2018)

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

UNIT - I

1 (a) Explain the symmetry operations. (4M) – **L - 2**
(b) Explain the classification of point groups. (10M) – **L - 2**
(Or)
(c) Write the significance of symmetry elements. (4M) – **L - 2**
(d) Explain the construction of C_{2V} character table. (10M) – **L - 3**

UNIT - II

2 (a) Explain the electromagnetic spectrum. (4M) – **L - 2**
(b) Discuss the interaction of electromagnetic radiation with matter. (4M) – **L - 3**
(Or)
(c) Explain the applications of microwave spectroscopy. (8M) – **L - 2**
(d) Discuss the effect of isotopic substitution on the Rotational Transition frequencies. (6M) – **L - 3**

UNIT - III

3 (a) Explain the significance of mutual exculsion principle. (4M) – **L - 2**
(b) Give an account on classical and quantum theories of Raman effect. (10M) – **L - 2**
(Or)
(c) Explain the Rotational fine structure of electronic vibrational transitions.(6M) – **L - 2**
(d) Explain resonance Raman spectroscopy. (8M) – **L - 2**

UNIT - IV

4 (a) Explain nuclear resonance. (4M) – **L - 2**
(b) Explain the shielding and deshielding of magnetic nuclei. (10M) – **L - 2**
(Or)
(c) Write notes on the following (i) Chemical shift – **L - 2**
(ii) spin-spininteraction –**L-2** (14M)

UNIT - V

5. (a) Give basic principles of ESR spectroscopy. (4M) – **L - 2**

(b) Discuss the factors effecting the value of ‘g’. (10M) – **L - 3**

(Or)

(c) Discuss about krammer’s degeneracy. (6M) – **L - 2**

(d) Explain isotropic and anisotropic coupling constants in detail. (8M) – **L - 3**

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CH2T2: INORGANIC CHEMISTRY – II

Subject Code	CH2T2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	----	Exam Hours	03

Objectives: 1.To emphasize the need and role of organometallic compounds and complexes as catalysts in large scale manufacturing procedures.

2.To accentuate the role of metal ions and other non metallic elements like sulphur, Phosphorus etc., in enzymes, transportation and storage processes.

3. To enumerate the role of molecular spectroscopy in understanding the structures and bonding aspects of metal clusters.

Course: Inorganic chemistry (code CH2T2)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the fundamental concepts of Metallic & non metallic clusters, Inorganic reaction mechanisms, organo metallic chemistry, electronic spectra & magnetic properties of complexes and bioinorganic chemistry.	1,2
2	Comprehend the basic and advanced concepts of metallic & non metallic clusters, Inorganic reaction mechanisms, organo metallic chemistry, electronic & magnetic properties of complexes and bio inorganic chemistry.	1,6
3	Apply the conceptual knowledge gained in the concepts of metallic & nonmetallic clusters, inorganic reaction mechanisms, organo metallic chemistry, electronic & magnetic properties of complexes and bio inorganic chemistry in other fields of chemistry as well as in research.	1,2
4	Analyze the role of metallic & non metallic clusters / cages, inorganic reaction mechanisms, organo metallic chemistry, electronic & magnetic properties of complexes in understanding the similarities and differences among the concepts of chemistry.	1,3
5	Assess that how far the concepts of metallic & non metallic clusters, Inorganic reaction mechanisms, organo metallic chemistry, electronic & magnetic properties of complexes and bio inorganic chemistry are useful in rendering theoretical explanations for the concepts in chemistry.	1,7
6	Exploit the core areas of metallic & non metallic clusters, Inorganic reaction mechanisms, organo metallic chemistry, electronic & magnetic properties of complexes and bio inorganic chemistry to develop research strategies in chemistry.	1,5

UNIT-I

Non metal cages and metal clusters:

Structure and bonding in phosphorous-oxygen, phosphorous-sulphur cages; structure and bonding in higher boranes with (special reference to B_{12} icosahedra). Carboranes, metalloboranes, metallocarboranes.

Metal clusters:

Classification- LNCs and HNCs **,** Isoelectronic and Isolobal relationships , electron counting rules: Wade's and Lauher's rules. M-M multiple bonding; preparation, structrure and bonding in dinuclear $[Re_2Cl_8]^{2-}$ ion, trinuclear $[Re_3Cl_9]$, tetra nuclear $W_4(OR)_{16}$, hexa nuclear $[Mo_6Cl_8]^{4+}$ and $[Nb_6Cl_{12}]^{+2}$, Applications of clusters.

UNIT-II

Organ metallic chemistry of transition metals:

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

UNIT III

Reaction mechanism of transition metal complexes:

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

UNIT IV

Term symbols and their derivation. Microstates, Hunds rules to predict ground terms and ground states. List of ground energy and higher energy terms from d^1 to d^9 configurations

Electronic spectra of transition metal complexes Electronic configurations and Spectroscopic terms. Selection rules, Slator–Condon parameters, Racah parameters, Term separation energies for d^n configurations Orgel diagrams. Tanabe- Sugano diagrams for d^1 to d^9 configurations. Calculations of Dq, B and β parameters. Charge transfer spectra.

UNIT-V

Bio-inorganic chemistry and Magnetic properties of complexes

Storage and transport of dioxygen by Hemoglobin and Myoglobin. Vitamin B_{12} and its importance.

Magnetic properties of transition metal complexes Types of magnetism, factors affecting Para magnetism, anomalous magnetic moments - Orbital and spin contribution, spin - orbit coupling and magnetic moments. Chiro optical properties, Cotton effect and Faraday effect.

References:

1. Inorganic Chemistry, Huheey. Harper and Row.
2. Concise inorganic chemistry, J. D. Lee, ELBS.
3. Inorganic chemistry, K.F. Purcell and J.C. Kotz, Holt Saunders international
4. Organometallic chemistry, R.C. Mehrotra and A. Singh. New Age International.
5. Advanced Inorganic Chemistry, Cotton and Wilkinson, Wiley Eastern
6. Inorganic reaction mechanism, Basolo and Pearson, Wiley Eastern

7. Bioinorganic Chemistry, K. Hussan Reddy
8. Biological Aspects of inorganic chemistry, A. W. Addison, W. R. Cullen, D. Dorphin and G. J.James. Weliey Interscience.
9. Photochemistry of coordination compounds, V.Balzani and V.Carassiti. Academic Press.
10. Text book of Coordination chemistry by K.SomaSekhar rao and K.N.K. vani, Kalyani Publishers.
11. Concise Co-ordination Chemistry,Gopalan & Ramalingan Vikas Publishing House Pvt. Ltd., 2014.
12. Co-ordination chemistry, D.Banerjee Tata Mc Graw Hill, 1993.
13. Principles of Inorganic Chemistry, Puri Sharma & Kalia, Vishal Pub, 2008.
14. Inorganic chemistry, Huheey, A.Kieter, , L.Keiter, 4th edition, Pearson education, Asia.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.
SECOND SEMESTER

Paper- II :: Inorganic Chemistry - II
(Regulation 2017-2018)

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

UNIT - I

1. (a) Describe the bonding and structure in higher boranes. (6M) – **L - 2**
   (b) Write a note on metallo boranes. (8M) – **L - 1**

(Or)

   (c) Describe Isoelectronic and Isolobal relationships. (4M) – **L - 2**
   (d) Discuss the structure and bonding in $[Re_2Cl_8]^{2-}$ ion. (10M) – **L - 2**

UNIT - II

2. (a) Explain the applications of organometallic compounds in catalytic hydrogenation and hydro formylation. (10M) – **L - 3**
   (b) Define electron counting rules and hapticity. (4M) – **L - 1**

(Or)

   (c) Write the hapticity, structure and bonding of acetylene complexes.(7M) – **L - 2**
   (d) Explain oxidative addition, reductive elimination of organometallic compounds. (7M) – **L - 2**

UNIT - III

3. (a) Explain the outer sphere mechanism of redox reactions. (10M) – **L - 2**
   (b) Write about Anation reactions. (4M) – **L - 2**

(Or)

   (c) Discuss the direct and indirect evidences in favour of conjugate base mechanism. (10M)
   (d) Write the difference between complementary and non-complementary reactions. (4M)

UNIT - IV

3. (a) Define microstates and discuss how hunds rules can be used to predict ground terms and ground states. (4M) – **L - 3**

(b) Discuss the calculation of D_q and β parameters. (10M) – **L - 3**

(Or)

(c) Draw the orgel diagram and Tanabe Sugano diagram for d^2 and d^9 configuration. (8M) – **L - 2**

(d) Explain charge transfer spectra. (6M) – **L - 2**

UNIT - V

4. (a) Discuss the storage of dioxygen by myoglobin and write its importance.(8M)

(b) Explain cotton effect. (6M) – **L - 2**

(Or)

(c) Discuss the spin orbital coupling and magnetic moments of transition metal complexes. (4M) – **L - 2**

(d) Describe the factors affecting para magnetism. (10M) – **L - 2**

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CH2T3: ORGANIC CHEMISTRY – II

Subject Code	CH2T3	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	---	Exam Hours	03

Objectives: 1. To provide a good, solid ground in the basics of organic chemistry with a view to have application in various fields of advanced chemistry.
2. To impart sound knowledge on the role of various intermediates in well known named reactions.
3. To emphasize the need of protecting / deprotecting agents in organic synthesis.

Course: Organic chemistry (code CH2T3)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the mechanisms involved in various types of reactions in organic chemistry.	1,7,2
2	Understand the basic and advanced concepts of general methods for synthesis, named reactions, nucleophilic substitutions, elimination reactions and protecting groups.	1,7,2
3	Apply the knowledge gained in establishing new mechanisms encountered in organic synthesis.	5,6,1
4	Distinguish between the various types of organic reaction mechanisms involved in organic synthesis.	1,7,2
5	Evaluate the type of mechanism involved in a particular organic reaction.	1,7,6

UNIT – I

General Methods for synthesis:

Additions: Addition to carbon – carbon multiple bonds, HX, X2, HOX, stereo chemistry of addition, formation and reaction of epoxides, syn and anti hydroxylation, hydrogenation(catalytic and Non catalytic), synthetic reactions of CO and CN and Cram's rule.

UNIT – II

Named Reactions:

Aldol (normal, crossed), claisen, Perkin, Stobbe, Knovenagel, Darzen, Reformatsky and Benzoin condensations. Grignard, Cannizzaro, Wittig and Wittig-Horner reaction, Dakin reaction.

C-C and C=C bond forming reactions – Mannich, Reimer-Tiemann, Vilsmeier-Haack and Ullmann reactions. Stork-enamine reaction. Shapiro, Peterson, Heck, Stille and McMurray reactions. Ring formation by Dieckmann, Thorpe and Acyloin condensations. Robinson ring annulation. Synthesis of small rings. Simon-Smith reaction.

UNIT-III

Aliphatic Nucleophilic substitutions:

The SN^2, SN^1, mixed SN^1 and SN^2 and SN^i reactions : Mechanism, effect of structure, nucleophile, leaving group on substitutions. The neighbouring group mechanism, neighbouring group participation by σ and π bonds, anchimeric assistance.

Aromatic Nucleophilic substitution:

The SN^{Ar}, SN^1 mechanisms and benzyne mechanism. Reactivity- effect of substrate structure, leaving group and attacking nucleophile. The Von-Richter, Sommelet – Hauser and Smiles rearrangements.

UNIT –IV

Eliminations Reactions:

Types of elimination (E1,E1CB,E2) reactions, mechanisms, stereochemistry and orientation, Hofmann and Saytzeff's rules, Syn elimination versus anti elimination. Competitions between elimination and substitution.

Dehydration, dehydrogenation, decarboxylative elimination, pyrolytic elimination, molecular rearrangement during elimination.

UNIT – V

Protecting groups:

Theory and importance of functional group protection and deprotection in organic synthesis:-Protecting agents for the protection of functional groups: Hydroxyl group, Amino group, Carbonyl group and Carboxylic acid group

carbon-carbon multiple bonds; chemo- and regioselective protection and deprotection. Illustration of protection and deprotection in organic synthesis.

Books suggested:

1. Advanced organic chemistry – reaction, mechanism and structure, Jerry March, John Wiley.
2. Advanced organic chemistry, F.A.Carey and R.J.Sundberg,Plenum.
3. A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
4. Organic chemistry, I.L.Finar, Vol. I & II, Fifth ed. ELBS,1975.
5. Organic chemistry, Hendrickson, Cram and Hammond (Mc Graw – Hill).
6. Modern organic Reactions, H.O.House, Benjamin.
7. Structure and mechanism in organic chemistry, C.K.Ingold, Cornell University Press.
8. Principles of organic synthesis, R.O.C.Norman and J.M.Coxon, Blakie Academic & Professional.
9. Reaction Mechanism in Oganic Cemistry, S.M.Mukherji and S.P.Singh, Macmillan.
10. Basic Principles of Organic Chemistry by J. B. Roberts and M. Caserio.
11. Protecting groups in Organic chemistry, T.W.Greene, Wiley inferscience, publishers, New York.
12. Protecting Groups in Organic chemistry P.J.Kocienski, George thiemevers.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.
SECOND SEMESTER

Paper-III :: Organic Chemistry - II
(Regulation 2017-2018)

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

UNIT - I

1 (a) Define and explain CRAMS rule. (4M) – **L – 1**
(b) Give an account of the addition of the following to carbon carbon multiple bonds (i) HX (ii) HOX (10M) – **L - 2**

(Or)

(c) Write a note on the formation and reactions of epoxides. (6M) – **L - 2**
(d) Discuss in detail about the following
(i) Syn and Anti hydroxylation (ii) Hydrogenation (8M) – **L - 2**

UNIT - II

2. (a) Explain the mechanism and applications of Stork-enamine reaction. (4M) – **L - 2**
(b) Define and Discuss the mechanism of the following reactions
(i) Benzoin condensation (ii) Reformatsky reaction (10M) – **L - 2**

(Or)

(c) Explain the mechanism and stereochemistry of Wittig reaction. (6M) – **L - 2**
(d) Define and Discuss the mechanism of the following reactions
(i) Perkin condensation (ii) Dakin reaction (8M) – **L - 2**

UNIT - III

3 (a) What is anchimeric assistance. Discuss neighbouring group participation by σ and π bonds. (10M) – **L - 2**
(b) Write the mechanism of SN^2 reaction. (4M) – **L - 2**

(Or)

(c) Discuss factors affecting aromatic substitution reactions. (6M) – **L - 2**
(d) Explain the following (i) Benzyne mechanism (ii) SN^{Ar} mechanism. (8M) – **L - 1**

UNIT - IV

4 (a) Explain the mechanism and stereochemistry of E2 reaction with suitable examples. (6M) – **L - 2**
(b) (i) Discuss pyrolytic eliminations. (ii)Write a note on dehydration (8M) – **L - 2**

(Or)

(c) Explain Hoffmann and Saytzeff's rule with suitable examples. (6M) – **L - 2**
(d) Write an account of (i) E1CB mechanism (8M) – **L - 2**

UNIT - V

1 (a) Explain the importance of functional group protection in organic synthesis.(8M) – **L - 2**
(b) Discuss about the protecting agents to protect the following functional groups (i) AMINO group (ii) Carboxylic Acid. (6M) – **L - 3**

(Or)

(c) Write a short note on Chemo and Regio selective protection and deprotection of carbon carbon multiple bonds. (8M) – **L - 2**

(d) List out the reagents and apply them for the protection and deprotection of hydroxyl and carbonyl groups. (6M) – **L - 2**

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CH2T4: PHYSICAL CHEMISTRY – II

Subject Code	CH2T4	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	---	Exam Hours	03

Objectives: 1. The main objective of the course is to provide a basic understanding of the core areas of physical chemistry based around the systems, states and thermodynamic processes, chemical thermodynamics, kinetics.
2. The object of this course is to provide basic and applied knowledge of polymers and photochemical reactions happening around us in nature.

Course: Physical chemistry (code CH2T4)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Remember the concepts of thermodynamics, polymer chemistry, electro chemistry, chemical kinetics and photo chemistry.	1,2,7
2	Understand the concepts of thermodynamics, polymer chemistry, electro chemistry, chemical kinetics and photo chemistry.	1,2,7
3	Apply the concepts of thermodynamics, polymer chemistry, electro chemistry, chemical kinetics and photo chemistry in research and other allied fields.	1,2,4
4	Analyze the role and significance of concepts of thermodynamics, polymer chemistry, electro chemistry, chemical kinetics and photo chemistry.	1,2,7
5	Evaluated the role of concepts of thermodynamics, polymer chemistry, electro chemistry, chemical kinetics and photo chemistry in understanding the named concepts in chemistry.	1,2,7

UNIT – I

Thermodynamics II : Third law and Statistical thermodynamics-Nernst Heat theorem - Third law of thermodynamics - Its limitations - Determination of absolute entropy - concept of distribution - Thermodynamic probability and most probable distribution - Maxwell-Boltzmann distribution law - Partition function - Fermi-Dirac statistics - Bose Einstein statistics - Entropy and probability - Boltzmann-Plank equation - calculation of thermodynamic properties in terms of partition function - Application of partition function - Chemical equilibrium and partition function.

UNIT – II

Polymer chemistry:

Classification of polymers - Free radical , ionic and Zeigler -Natta Polymerisation - kinetics of free radical polymerisation - Techniques of polymerisation - Glass transition temperature - Factors influencing the glass transition temperature - Number average and Weight average, Molecular weights –molecular weights determination - End group analysis - Osmometry - Light scattering and ultra centrifugation methods.

UNIT – III

Electro Chemistry-II: Electrode potentials - Double layer at the interface - rate of charge transfer - Decomposition potential - Over potential - - Tafel plots - Derivation of Butler-Volmer equation for one electron transfer - electro chemical potential.

Electro catalysis - Fuel cells-Theory of polarography - Diffusion current - Ilkovic equation – Equation for half- wave potential –Applications of polarography - Amperometric titrations - Corrosion - Forms of corrosion - prevention methods.

UNIT – IV

Chemical kinetics and photo chemistry - Branching Chain Reactions - Hydrogen-oxygen reaction - lower and upper explosion limits - Fast reactions - Study of kinetics by flow methods - Relaxation methods - Flash photolysis - Mechanism of homogeneous catalysis - Acid base catalysis - protolytic and prototropic mechanism - Enzyme catalysis - Michelis-Menten kinetics – Electron transfer reactions – Marcus theory – Dynamics of electron tunneling in the Marcus theory, The Marcus cross relation.

UNIT – V

Photochemical reactions - Quantum yield and its determination - Actinometry - Reactions with low and high quantum yields - Photo sensitisation - Exciplexes and Excimers - Photochemical equilibrium - Chemiluminescence-Kinetics of collisional quenching-Stern - Volmer equation - Photo Galvanic cells, consequences of light absorption Jablonski diagram, Laws of photochemistry – Grotthuss draper law, Stank Einstein's law of photochemical equations.

REFERENCE BOOKS:

1. Physical chemistry, G.K.Vemulapalli (Prentice Hall of India).
2. Physical chemistry, P.W.Atkins. ELBS
3. Chemical kinetics - K.J.Laidler, McGraw Hill Pub.
4. Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.
5. Statistical Thermodynamics - M.C.Gupta.
6. Polymer Sceince, Gowriker,Viswanadham, Sreedhar
7. Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.
8. Physical Chemistry-G.W.Castellan, Narosa Publishing House, Prentice Hall
9. Physical Chemistry, W.J.Moore, Prentice Hall
10. Polymer Chemistry - Billmayer
11. Fundamentals of Physical Chemistry, K K Rohatgi-Mukherjee. Wiley Eastern Ltd publications.
12. Statistical Thermodynamics - M.C.Gupta.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

SECOND SEMESTER

Paper-IV :: Physical Chemistry - II

(Regulation 2017-2018)

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

UNIT - I

1. (a) Define third law of thermodynamics and write its limitations. (4M) – **L - 2**
   (b) Discuss the entropy of monoatomic gases. (10M) – **L - 3**

(Or)

   (c) Explain Fermi-dirac statistics. (6M) – **L - 3**
   (d) Describe thermodynamic probability and most probable distribution.(8M) – **L - 2**

UNIT - II

2. (a) What is glass transition temperature and discuss the factors influencing the glass transition temperature. (6M) – **L - 3**
   (b) Explain the differences between weight average and number average of a polymer in detail. (8M) – **L - 3**

(Or)

   (c) Describe Zeigler-natta polymerization. (6M) – **L - 2**
   (d) Explain the osmometry method of a molecular weight of a polymer in detail. (8M) – **L - 3**

UNIT - III

3.(a) Describe the potentiometric titrations and write its advantages. (7M) – **L - 2**
   (b) Write a note on over potential and tafel plots. (7M) – **L - 2**

(Or)

   (c) Discuss the metal-metal ion electrodes and membrane electrodes.(6M) – **L - 2**
   (d) Derive buttler – volmer equation. (8M) – **L - 3**

UNIT - IV

4 (a) Define quantum yield and write its determination. (6M) – **L - 2**
   (b) Describe the study of kinetics by flow methods. (8M) – **L - 3**

(Or)

   (c) Define acid-base catalysis and write protolytic and phototropic mechanism. (6M) – **L - 2**
   (d) Write a note on photo galvanic cells. (8M) – **L - 3**

UNIT - V

5 (a) Discuss quantum yield and explain its determination by actinometry. (6M) – **L - 3**
   (b) Derive stern-volmer equation. (8M) – **L - 2**

(Or)

   (c) Explain the following in detail (i) Chemiluminescence
   (ii) Exciplexes and Excimers. (14M)– **L - 2**

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CH3L1: ORGANIC PREPARATIONS

Course: Organic Preparations (CH3L1)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the principle involved in various organic preparations.	2,5,7
2	Understand the mechanism involved in organic preparation.	1,2
3	Apply the knowledge of organic preparations in their chosen field.	3,4,6

Preparation of organic compounds: Three stage preparations by reactions involving nitration, halogenation, oxidation, reduction, alkylation, acylation, condensation and rearrangement. (A student is expected to prepare at least five different organic compounds by making use of the reactions given above).

CH3L2: MIXTURE ANALYSIS

Course: Mixture Analysis (CH3L2)		
S.No	COURSE OUTCOMES	PO`S
	The post graduate will be able to	
1	Get familiarized with the tests involved in identification of various functional groups.	1,2,6
2	Understand the theory involved in identification and separation of the given organic mixture based on the solubility.	1,5,7
3	Apply the knowledge to identify various functional groups present in the given organic compound by using a systematic procedure.	1,3,4

Analysis of organic binary mixtures: Separation and identification of organic binary mixtures (The students must be given training in atleast 6 mixtures with different functional groups).

Note: For semester end examinations the student has to submit at least two solid derivatives for each individual component.

CH3L3: GREEN ORGANIC PREPARATIONS

Practical : Green Organic Preparations (CH3L3)		
S.No	COURSE OUTCOMES	PO`S
	The post graduate will be able to	
1	Memorize the principles of green chemistry	2,7
2	Understand the mechanism of some of the green synthetic methods.	1,6,7
3	Apply principles of green chemistry in designing organic synthesis.	5,1,3

Green Procedures for organic qualitative analysis and organic compound preparations (atleast 6 preparations).

M.Sc.CHEMISTRY - III - SEMESTER

CH3T1: ORGANIC SPECTROSCOPY

Course: Organic Spectroscopy (code CH3T1)		
S.No	COURSE OUTCOMES	PO`S
	The graduate will be able to	
1	Memorize the basic principles and theory involved in molecular absorption spectroscopy.	2,7
2	Comprehend the advanced concepts of molecular absorption spectroscopy.	1,2,5
3	Apply the knowledge of spectroscopy in establishing the structure of organic molecules.	1,5,7
4	Analyze the spectral data to ascertain the structure of unknown molecules.	1,4,2

UNIT- I

UV- Visible Spectroscopy:

Mechanics of measurement – Energy transitions – Simple chromophores – Auxochrome, Absorption shifts (Bathochromic shifts, Hypsocromic shift, Hyper chromic shift, Hypo chromic shift). UV absorption of Alkenes – polyenes, unsaturated cyclic systems .

UV absorption of Carbonyl compounds α,β-unsaturated carbonyl systems - UV absorption aromatic systems – solvent effects – geometrical isomerism – acid and base effects – typical examples – calculation of λmax values for simple molecules using Woodward -Fieser rules.

UNIT – II

IR Spectroscopy:

Mechanics of measurement – Fundamental modes of vibrations -Stretching and bending vibrations – Factors effecting vibrational frequency-hydrogen bonding.

Finger print region and its importance. Typical group frequencies for – CH, -OH, -NH, -CC, -CO and aromatic systems - Application in structural determination Examples – simple problems.

UNIT – III

Nuclear Magnetic Resonance Spectroscopy (1HNMR – First Order PMR):

Introduction:

Nuclear spin- Basic principle of -NMR - nuclear resonance –saturation-Larmor's frequency-Relaxation- Instrumentation(Cw and FT) shielding and de shielding of magnetic nuclei- chemical shift and its measurements, factors influencing chemical shift, spin–spin interactions and factors influencing spin -spin coupling- Dynamic NMR- coupling constant J. and factors effecting J value.

UNIT – IV

Mass Spectrometry I

Introduction- ionization methods-EI, CI, ES, MALDI and FAB – advantages and disadvantages-molecular ion peak and its importance, meta stable peak, Nitrogen rule and extension of nitrogen rule. Determination of Molecular weight and determination of molecular formulae- Isotopic Peaks- Identification of single chlorine atom and double chlorine atom single bromine atom and double bromine atoms in organic compounds. Instrumentation.

UNIT – V

Mass Spectrometry II

Fundamental fragmentation process- Stevenson's rule- radical site initiated cleavage-charge site initiated cleavage- two bond cleavage- Retrodielalder cleavage- Mc-Lafferty rearrangement and other cleavages. Mass spectral fragmentation of alkanes, cycloalkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, thiols, ethers, carbonyl containing compounds (Aldehydes, ketones, esters and carboxylic acids), nitrogen compounds, alkyl chlorides and alkyl bromides, Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

References:

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

► The highlighted syllabus will be taught online due to COVID – 19 pandemic.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.
III SEMESTER
Paper-I :: ORGANIC SPECTROSCOPY
(Regulation 2017-2018)

Code :CH3T1 **Time: 3 hours** **Maximum Marks: 70**

UNIT - I

1. (a) Briefly explain the theory of electronic spectroscopy of organic compounds. (6M) – **CO- 2(L–2)**

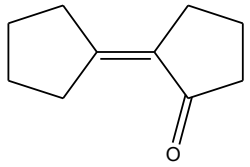
   (b) Explain the factors which influence absorption wave length. (8M) – **CO- 2(L–2)**

   (Or)

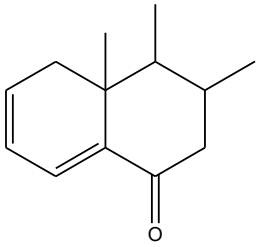
   (c) write a note on the following i) K band ii) R band, iii) Chromophore iv) auxochrome (6M)

   (d) calculate the λ_{max} of the following compounds (8M) – **CO- 3 (L–3)**

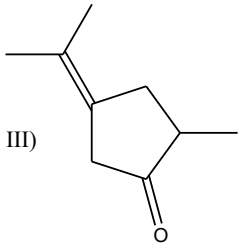
I)



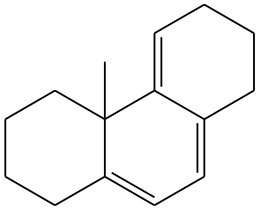
II)



III)

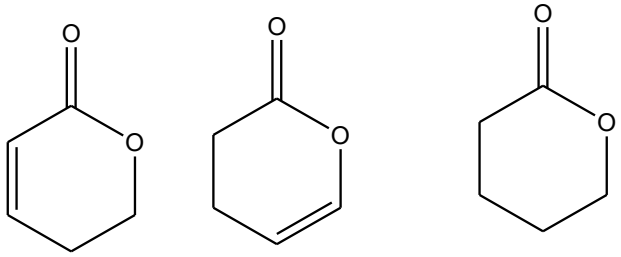


IV)



UNIT - II

2. (a) The carbonyl stretching absorptions for the following lactones are 174; 1720; 1760 cm-1 . Match the absorptions with the appropriate structure and give a reason for each choice (4M) – **CO- 4 (L–4)**



   (b) How do you distinguish the following pairs of compounds by using IR spectroscopy? (10M) – **CO- 4(L–4)**

   I) Maleic acid and Fumaric Acid

   II) CH_3CH_2CHO and CH_3COCH_3

   III) CH_3COOH and $HCOOCH_3$

   IV) Benzene and Cyclohexane

V) p-Nirto aniline and o- Nitro aniline

(Or)

(c) Discuss about the following

i) Fermi resonance ii)Finger print region iii)Bending vibrations(8M) – **CO- 2(L–2)**

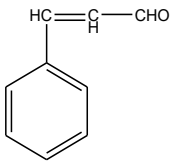
(d) How do you distinguish $1^0,2^0,3^0$ amines by using IRspectroscopy

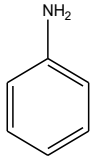
(6M) – **CO- 2(L–2)**

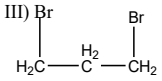
UNIT - III

3. (a) Define Chemical shift. Give an account on Chemical exchange in NMR(6M)

(b) Predict the number of signals and their chemical shift in each of the following compounds (8M) – **CO- 3(L–3)**

I) 

II) 

III) 

(Or)

(c) A compound of Molecular weight 122, in its PMR Spectrum shows 1.4(T,3H) .0(Q,2H),6.8-7.2(M,5H). Write structure of compound using above data. (6M) – **CO- 3(L–3)**

(d) Explain the coupling constant in NMR and describe about various types of coupling constants (8M) – **CO- 3(L–3)**

UNIT - IV

4 (a) The mass spectrum of an unknown compound shows a molecular ion peak at m/z =78 with a relative intensity of 23.6 and the relative intensities of the isotopic peaks are as follows m/z 79(1.00), 80(7.55), 81(.25) .what is the molecular formula of this unknown? (8M) – **CO- 3(L–3)**

(b) Write explanatory notes on I) Molecular ion II) Rearrangement ions III) Base peak (6M) – **CO- 2(L–2)**

(Or)

(c) what is the principle of mass spectrometry?. Discuss some quantitative and qualitative applications of mass spectrometry (8M) – **CO- 2(L–2)**

(d) Write a note on the following

(i) Nitrogen rule (ii) FAB ionization method (6M)

UNIT - V

5 (a) In the mass spectrum of 1-hexanol , a very weak molecular ion peak appears at m/z = 102 . Some other prominent peaks appear at m/z values of 00,99,84 56(base peak) and 31 . What are the most probable species responsible for the above mentioned peak positions. (8M) – **CO- 3(L–3)**

(b) Discuss the prominent peaks at m/z = 78, 77,53,51,50 and 39 in mass spectrum of benzene (6M) – **CO- 3(L–3)**

(Or)

(c) How mass spectrum is useful to distinguish between 1^0,2^0,3^0 aliphatic amines? (8M) – **CO- 4(L–4)**

(d) Illustrate Mc Lafferty rearrangement with suitable examples (6M) – **CO- 2(L–2)**

CH3T2: ORGANIC REACTIONS, MECHANISMS & GREEN CHEMISTRY

Course: Organic Reactions, Mechanisms & Green Chemistry (code CH3T2)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Acquire sound knowledge of methods for determining organic reaction mechanisms, photochemistry, pericyclic reactions and green chemistry.	2
2	Understand the concepts involved in methods for determining organic reaction mechanisms, photochemistry, pericyclic reactions and green chemistry.	1,7
3	Apply the concepts learnt in predicting the detailed mechanisms pertaining to various concepts like methods for determining organic reaction mechanisms, photochemistry, pericyclic reactions and green chemistry.	1,5
4	Analyze and differentiate the pattern of mechanism involved in methods for determining organic reaction mechanisms, photochemistry, pericyclic reactions and green chemistry.	1,7

UNIT-I

Methods for determining Reaction mechanisms by kinetic and non-kinetic studies:

Kinetics of reaction, Energy profile diagram, Intermediate versus transition state, Reaction rate and rate limiting step, kinetic versus thermodynamic control, Identification of products,

Testing possible intermediates, trapping of intermediates, Cross over experiments, Isotopic labeling.

UNIT-II

Photo chemistry:

Photochemical processes: Energy transfer, sensitization and quenching. Singlet and triplet states and their reactivity. Photochemistry of olefins – conjugated olefins, Aromatic compounds–isomerisation–additions. Photochemistry of carbonyl compounds – Norrish type I and II reactions –Paterno – Buchi Reaction.

Photo reduction, Photochemical rearrangements – Photo Fries rearrangement, Di-π-methane rearrangement, Barton reaction and photo-Fries rearrangement reaction.

UNIT-III

Pericyclic Reactions – I:

Definition, classification of pericyclic reactions, MO theory, electronic configuration in ground and first excited states of aliphatic conjugated polyene system like 1,3-Butadiene, 1,3,5 – Hexatriene, allyl system.

Electro cyclic reactions, Mechanism, Stereochemistry, conrotatory and disrotatory motions of 4n and 4n+2 systems. PMO & FMO methods, correlation diagrams, Woodward & Hoffmann rules.

Cyclo additions:

Mechanism, stereochemistry, Antarafacial and suprafacial additions, PMO & FMO and correlation diagram of (4n) and (4n+2) systems, Woodward and Hoffmann rules.

UNIT-IV

Pericyclic Reactions – II:

Sigmatropic rearrangements, classification, mechanism and FMO and 7 PMO approach under thermal and photochemical conditions, suprafacial and antarafacial shifts of Woodward and Hoffmann rules.

Detailed treatment of claisen, cope rearrangements fluxional molecules, aza-cope rearrangements.

UNIT-V

Green chemistry:

Green chemistry **:**Introduction, Principles & concepts of Green chemistry, Green Catalysis, Biocatalysis, renewable resources, Green Reagents, examples of green reactions-synthesis of Ibuprofen, Clean Fischer-Indole synthesis comparison of the above with conventional methods.

Introduction to Microwave organic synthesis: Applications: solvents (water and organic Solvents), solvent free reactions (solid state reactions).

References:

1. Mechanism and structure in Organic Chemistry " E.S.Gould Henry – Holt and Co, Newyork.
2. Advances in Organic Reaction mechanism and structure J. March (McGrew Hill)
3. Aguide Book to Mechanism in Organic Chemistry" by P.Sykes
4. Synthetic approaches in organic chemistry by R.K.Bansal(Narosa Publications)
5. Some modern methods of synthesis by Carruthers (Cambridge).
6. Green Chemistry by V.K.Ahulwalia
7. Green Chemistry by Rashmi Sanghi, M.M.Srivastava
8. New Trends in Green Chemistry by V.K.Ahulwalia, M.Kidwai.
9. Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall. "Pericyclic reactions a mechanistic study" S.M.Mukheji
10. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
11. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
12. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
13. Structure and Mechanism in Organic Chemistry, C.K.Inglod, Cornell University Press
14. Organic Photo chemistry and Pericyclic reactions' M.G.Arora Anmol Publications Pvt. Ltd.
15. Fundamentals of photochemistry by K.K.Rohatgi–Mukherjee New Age international publishers.

► **The highlighted syllabus will be taught online due to COVID – 19 pandemic.**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.
III SEMESTER
Paper-II :: ORGANIC REACTIONS, MECHANISMS & GREEN CHEMISTRY
(Regulation 2017-2018)

Code: CH3T2 **Time: 3 hours** **Maximum Marks: 70**

UNIT - I

1.a) Write a short note on isotopic labeling. 4M – **CO- 2(L–2)**

b) Explain the following: 10M – **CO- 2(L–2)**
i) Cross over experiments
ii) Intermediate stage

(Or)

c) Explain the following: 10M – **CO- 2(L–2)**
i) Trapping of intermediates
ii) Testing possible intermediates

d) Discuss Reaction rate and rate limiting step. 4M – **CO- 2(L–2)**

UNIT - II

2. a) Discuss norrish type – I and type – II cleavages. 6M – **CO- 2(L–2)**

b) Discuss the following : 8M – **CO- 2(L–2)**
i) Photochemistry of aromatic compounds
ii)Peterno-Buchi Reaction

(Or)

c) Write the mechanism of the following photochemical rearrangements. 8M – **CO- 3 (L–3)**
i) Barton reaction
ii) Photo-Fries rearrangement

d) Give a detailed account of photoreduction. 6M – **CO- 2(L–2)**

UNIT - III

3. a) 1,3-butadiene into cyclobutene allows thermally conrotation, but not disrotation. Suggest it by correlation diagram method. 8M – **CO- 3 (L–3)**

b) Define the words 6M– **CO- 1 (L–1)**
i) Disrotation
ii) Conrotation
iii) Suprafacial addition

(Or)

c) Discuss the application of FMO method in cycloaddition to 4n+2 system. 8M – **CO- 2(L–2)**

d) State woodward and Hoffmann rules for thermal and photo cycloaddition of 4n and 4n+2 electron system. 6M– **CO- 1 (L–1)**

UNIT - IV

4.a) Explain briefly Aza-Cope rearrangement reaction with examples. 6M – **CO- 2(L–2)**

b) What is suprafacial and antrafacial process?. Apply PMO method for the analysis of [1,5] sigma tropic shift. 8M – **CO- 3 (L–3)**

(Or)

c) Explain briefly claisen rearrangement reaction with suitable examples. 8M – **CO- 2(L–2)**

d) What is PMO method? .Apply this method to 1,3 sigma tropic shift and write selection rules by PMO method. 6M – **CO- 3 (L–3)**

UNIT – V

5.a) Write notes on green reagents. 4M– **CO- 2(L–2)**

b) Explain the principles of green chemistry. 10M

(Or)

c) Explain the theory and principle of Microwave (MW) organic synthesis. 8M – **CO- 2(L–2)**

d) Write the green synthesis of Ibuprofen and compare with the conventional method. 6M – **CO- 4 (L–4)**

CH3T3 B: ASYMMETRIC SYNTHESIS, PHOSPHORUS & SULPHUR REAGENTS, SYNTHETIC POLYMERS, BIOMOLECULES & BIO ORGANIC CHEMISTRY

Course: ASYMMETRIC SYNTHESIS, PHOSPHORUS & SULPHUR REAGENTS, SYNTHETIC POLYMERS, BIOMOLECULES & BIO ORGANIC CHEMISTRY (code CH3T3B)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the concepts of asymmetric synthesis, formation of carbon double bond, synthetic polymers, biomolecules and bio inorganic chemistry.	1,2,4,7
2	Comprehend various organic synthesis.	1,2,4,7
3	Apply the conceptual knowledge gained in determining the mechanism involved in asymmetric synthesis, as well as reactions involving various reagents.	1,2,7
4	Analyse as to how far various reagents are useful in carrying out asymmetric synthesis and other organic reactions.	1,3,4
5	Evaluate the role of various reagents in asymmetric synthesis and other organic reactions.	1,2,6,7

UNIT – I

Asymmetric Synthesis

Topocity - Prochirality- Substrate selectivity - Diastereoselectivity and enantioselectivity-Substrate controlled methods-use of chiral substrates - examples

Auxiliary controlled methods-Use of chiral auxiliaries-Chiral enolates-alkylation of chiral imines – Stereoselective Diels-Alder reaction

Reagent controlled methods-Use of chiral reagents-Asymmetric oxidation-Sharpless epoxidation-Asymmetric reduction-Use of lithium aluminium hydride and borate reagents.

UNIT – II

Phosphorus Reagents

Formation of carbon-carbon double bonds-Functional group transformations – deoxygenation reactions-reactivity as electrophiles- conversitoon of alcohols to alkyl halides, Witting reaction and nucleophiles - Corey-Winters reaction, Michaelis-Arbusov reaction-Perkow reaction and Mitsnobu reaction.

Sulphur Reagents- Sulphur ylides, stabilized and non-stabilized – Preparation and reactivity Pummerer reaction – sulphonyl carbanions-Julia reaction.

UNIT – III

Synthetic Polymers

Polymer Reactions-Addition and condensation polymerization processes- Bulk, Solution, Suspension and Emulsion polymerization.

Stereospecific Polymers-Preparation and significance- classification of polymers based on physical properties-Thermoplastics-Thermosetting plastics-Fibers and elastomers- General applications.

Preparation of Polymers-Preparation of Polymers based on different types of monomers Industrial applications-olefin polymers-Diene polymers-nylons-Glyptal resins-Urea-formaldehyde, phenol-formaldehyde and melamine resins- Epoxy resins - Ion exchange resins.

UNIT – IV

Biomolecules

Peptides and Proteins-Methods of peptide synthesis, sequence determination, structure of oxytocin, proteins-classification, structure, conformation and properties. Nucleic acids- Nucleosides, Nucleotides, DNA and RNA, structure and conformations, replication, translation of genetic material, genetic code, gene expression, gene mutation, protein synthesis.

ons, replication, translation of genetic material, genetic code, gene expression, gene mutation, protein synthesis.

UNIT – V

Bioorganic Chemistry

Carbohydrates: Structure and biological functions of mucopolysaccharides, glycoproteins, and glycolipids- Role of sugars in biological recognition- Blood group substances

Enzymes: Nomenclature and classification, properties, factors affecting enzyme catalysis, enzyme inhibition- reversible and irreversible inhibition. Uses of enzymes in food drink industry and clinical laboratories.

References:

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Polymer Chemistry by V.R.Goweriker, N.V.Viswanathan, Jayader Sreedhar, New Age International (P) Limited, Publishers.
3. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
4. Principles of Organic Synthesis, R.O.C. Norman and J.M Coxon, Blackie
5. Structure and Mechanism in Organic Chemistry C.K.Inglod, Cornell University Press.
6. Modern Synthetic Reactions, H.O. House, W.A. Benjamin.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.

III SEMESTER

PAPER – III: ASYMMETRIC SYNTHESIS, PHOSPHORUS & SULPHUR REAGENTS, SYNTHETIC POLYMERS, BIOMOLECULES & BIO ORGANIC CHEMISTRY

(Regulation 2017-2018)

Code: CH3T3 B **Time: 3 hours** **Maximum Marks: 70**

UNIT– I

1. a) Explain Diastereo selectivity and enantio selectivity 6M
   b) Briefly explain substrate controlled methods 8M

Or

   c) Explain the following : i) chiral auxiliaries, ii)alkylation of chiral imIres. 6M
   d) Explain Diels-alder reaction. 8M

UNIT – II

2. a) Explain functional group transformations and deoxygenation reactions. 6M
   b) Write note on i) corey-winters reaction ii) michaelis – arbusov reaction. 8M

Or

   c) Discuss about witting reaction with example. 6M
   d) Explain the following 8M
      i) Pummerer reaction ii)Julia reaction

UNIT – III

3. a) Discuss about : i) condensation polymerization, ii)emulsion polymerization. 6M
   b) How to classify the polymers based on physical properties. Explain. 8M

Or

   c) Give a Brief note on thermo plastic and thermo setting plastics. 6M
   d) Discuss about 8M
      i) polymers – nylon – gliptol ii) Apoxyresin

UNIT – IV

4. a) Define peptides. Write peptide synthesis. 10M
   b) How do you classify the proteins? 4M

Or

   c) Draw the structures of DNA and RNA. 6M
   d) Write brief note on : 8M
      i) Genetic code ii) Gene expression

UNIT – V

5. a) Write structure of neucopolysaccarides. 6M
   b) Explain biological functions of glycoprotiens and glycolipids. 8M

Or

   c) How Enzymes can be classified. 6M
   d) What are the uses of enzymes in food, drink, industry and clinical laboratories. 8M

CH3T3A: ORGANIC SYNTHESIS

Course: Organic Synthesis (code CH3T3A)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Acquire knowledge and understanding of essential facts, concepts, principles and theories related to formation of C – C single bond and double bond, Diel's Alder related reactions, unactivated C – H bonds and disconnection approach in organic synthesis.	2
2	Understand the role and significance of formation of C – C single bond and double bond, Diel's Alder related reactions, unactivated C – H bonds and disconnection approach in organic synthesis.	1,7
3	Apply the conceptual knowledge gained in formation of C – C single bond and double bond, Diel's Alder related reactions, unactivated C – H bonds and disconnection approach in organic synthesis to synthesize organic molecules.	1,6
4	Analyze the role of various reagents in carrying out the organic reactions like formation of C – C single bond and double bond, Diel's Alder related reactions, unactivated C – H bonds and disconnection approach in organic synthesis.	1,7

UNIT-I

Formation of carbon-carbon single bonds:

Alkylations of relatively acidic methylene groups, alkylations of ketones, enamine and related reactions, umplong (dipole inversion).

Allylic alkylation of alkenes, alkylation of α-thicarbonions- α-selenocarbonions, formation of carbon carbon single bonds by the addition of free radicals to alkenes, synthetic applications of carbenes and carbenoids.

UNIT-II

Formation of carbon-carbon double bonds

Pyrolytic syn elimination reactions sulphoxide-sulphonate rearrangement, synthesis of allyl alcohols, the witting reaction, alkenes from sulphones, decarboxylation of β-lactones, alkenes.

Stereo selective synthesis of tri and tetra substituted alkenes, oxidative decarboxylation of carboxylic acids, stereospecific synthesis from 1,2-diols, reductive dimerization of carbonyl compounds.

UNIT-III

Diels–Aider and related reactions: The dienophile, heterodienophile, oxygen as dienophile, The diene, acyclic dienes, heterodienes, 1,2-dimethylene cycloalkanes, vinyl cycloalkenes, and vinyl arenes, cyclic dienes and furans.

Intra molecular Diels –Alder reactions, stereochemistry and mechanism of Diels – Alder reaction, retro Diels – Alder reaction, catalysis by lewis acids, photosensitized Diels- Alder reactions and 1,3-dipolar cycloaddition reactions.

UNIT-IV

Reactions at unactivated C- H bonds

The Hoffmann – Loeffler – Freytag reaction. The Barton reaction and related processes, photolysis of organic nitrites and hypohalites, photolysis of Nnitrosoamides.

Reaction of monohydric alcohols with lead tetraacetate, Miscellaneous reactions unsaturated alcohols from hydroperoxides.

UNIT-V

Disconnection approach

Introduction to Retro-synthetic analysis, Disconnection approach with suitable examples, Definitions: FGI, Disconnection, synthons, synthetic equivalent, reagent, target molecule, General strategy: choosing a disconnection, greatest simplification, symmetry, high yielding steps, recognizable starting materials.

Chemo, regio and stereo selectivity with examples. One group C-C disconnections-Alcohols, carbonyl compounds, alkene synthesis, two group disconnections: 1,3 – dicarbonyl compounds, α,β – unsaturated carbonyl compounds.

References:

1. Modern methods of Organic synthesis , W. Carruthers Cambridge Press
2. Organic synthesis by H.O.House
3. Modern Method of Organic Synthesis,CarruthersandColdhamSachinkumarGhosh, Canbridge New Central Book Agency
4. Reduction, Techniques and Applications in Organic Synthesis, Robert L.Augustine,Marcel Dekker Inc
5. Pharmaceutical Organic Chemistry,RamaRaoNadendla, Vallabh Publications, New Delhi.
6. Advances in Organic Reaction mechanism and structure, J. March McGrew Hill
7. Organic Synthesis: The disconnection – stuart Warren Approach, Wiley Student Addition

►The highlighted syllabus will be taught online due to COVID – 19 pandemic.

M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.
III SEMESTER
Paper-III :: ORGANIC SYNTHESIS
(Regulation 2017-2018)

Code: CH3T3 A **Time: 3 hours** **Maximum Marks: 70**

UNIT – I

1.a) Write a note on alkylation of relatively acidic methylene group.6M– **CO- 2 (L–2)**
b) Explain enamine and related reactions. 8M – **CO- 2 (L–2)**

(Or)

c) Explain C-C single bonds formation by addition of free radicals to alkenes. 6M – **CO- 2 (L–2)**
d) Discuss in detail the synthetic applications of carbenes and carbenoids with examples. 8M– **CO- 3 (L–3)**

UNIT - II

2.a) Discuss the mechanism involved in Sulphoxide- sulphonate rearrangement 6M – **CO- 3 (L–3)**
b) Write a brief account of reductive dimerisation of carbonyl compounds with examples. 8M– **CO- 2 (L–2)**

(Or)

c) Explain the importance of Wittig reaction in the synthesis of C-C double bonded compounds. 6M – **CO- 2 (L–2)**
d) Discuss any three methods for the stereoselective synthesis of tri and tetra substituted alkenes. 8M– **CO- 2 (L–2)**

UNIT- III

3.a) What is heterodienophile? Explain with two examples. 6M – **CO- 1 (L–1)**
b) What is Diels Alder Reaction? Discuss the mechanism and stereochemistry. 8M – **CO- 2 (L–2)**

(Or)

c) Give an account of Retro-Diels Alder reaction with examples. 6M – **CO- 2 (L–2)**
d) Write note on 1,3 – dipolar cycloaddition reactions 8M – **CO- 2 (L–2)**

UNIT – IV

4.a) Write note on photolysis of organic nitrites. 6M – **CO- 2 (L–2)**
b) Explain Hoffmann – Hoeffler – Freytag reaction with example.8M – **CO- 2 (L–2)**

(Or)

c) Write note on reaction on mono hydric - alcohols with lead tetracetate.6M – **CO- 2 (L–2)**
d) Discuss the formation of unsaturated alcohol from hydroperoxides. 8M – **CO- 3 (L–3)**

UNIT-V

5.a) Explain the following terms with examples.
i) Synthon ii) Reagent 6M – **CO- 2 (L–2)**
b) Discuss the various methods of disconnection of alcohols. 8M – **CO- 3 (L–3)**

(Or)

c) Give an account of disconnections of 1,3- dicarbonyl compounds. 8M – **CO- 2 (L–2)**
d) Write various methods of disconnection of alkenes. 6M – **CO- 2 (L–2)**

CH3T4 A: ENVIRONMENTAL CHEMISTRY AND ANALYSIS

Course: ENVIRONMENTAL CHEMISTRY AND ANALYSIS (code CH3T4A)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the concepts of envirometry and its analysis.	
2	Understand the basic significance of segments of environment and soil erosion, soil fertility as well as soil analysis	
3	Apply the knowledge of environmental chemistry in addressing the present environmental conditions.	
4	Analyse different problems related to environmental issues.	
5	Evaluate that how far the existing solutions related to environmental issues can be useful to overcome the novel problems of environment.	

UNIT-I

Significance of basic segments of Environment-Nomenclature in the study of Environmental Chemistry., SOIL CHEMISTRY & POLLUUTION STUDIES:Principles of weathering-effect of temperature, water, air, plants and animals on weathering., Soil formation/development-factors affecting soil development-physical properties of soil; soil colloids-ion exchange proerties.,Soil fertility, productivity- Soil nutrients-micro and macro.

UNIT II

STUDY OF WATER POLLUTION AND MONITORING AND TREATMENT METHODS OF WATER POLLUTANTS: Hydrosphere-water resources-hydrological cycle-unique properties of water- water quality parameters., Pollution from Domestic water ,industrial, agricultural, solid waste, shipping, radioactive waste & thermal pollution , Effect of specific pollutants like mercury, lead, arsenic, selenium, nitrates, oil.,

Unit- III

Effects of soaps, detergents, pesticides, hydrocarbon with regard to water pollution., Techniques of water treatment-Primary, secondary and tertiary methods-use of coagulants-flash distillation-solar stills, ion exchange reverse osmosis, electro dialysis.

UNIT -IV

STUDY OF AIR POLLUTION AND MONITORING AND TREATMENT METHODS IN CASE OF AIR POLLUTION: Atmospheric sources and emission of air pollutants-carbon monoxide-sulphur ,oxides-oxides of nitrogen,organic pollutants and photo chemical smog-particulates-acid rain and radioactive substances. Continuous monitoring of air pollutants-Principles,Monitoring instruments,monitoring of sulphur dioxide,hydrogen sulphide,oxides of nitrogen, oxides of carbon, hydrocarbons, ozone and suspended particulate matter and radioactive substances.

UNIT-V

ENVIRONMENTAL CHEMICAL ANALYSIS: Analysis of soil: Sampling,determination of moisture,total nitrogen, phosphorus, silicon, lime, humus, nitrogen, alkali salts., Analysis of water samples : Dissolcved oxuygen,Chemical oxygen demand ,Biological oxygen demand,Phosphates,nitrogen compounds.analysis of metalic constitutents, Analysis of Air samples: carbon mono oxide,carbon dioxide,sulphur dioxide,hydrogen sulfide,oxides of nitrogen,ammonia,ozone, hydrocarbons and aromatic hydrocarbons.,

SUGGESTED BOOKS:,

1.Environmental Chemsitry by A.K.De, Wiley Eastern Limited, New Delhi
2.A Text Book of Environmental Chemistry by O.D.Tyagia and M.Mehra-Anmol Publicaitons, 3.Environmental Pollution Control and Engineering by C.S.Rao , Wiley Eastern Limited,

4.Environmental Chemistry by P.S.Sindhu,-New Age International Publishers
5.A Text Book of Environmental Chemistry and Poolution Control by S.S.Dara ,S.Chand & Co 6.Environmental Pollution Analysis by S.M.Khopkar, Wiley Eastern Limited, New Delhi
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 5harma, Kalyani Publishers, New Delhi
9.Environmental Chemistry by B.K.Sharma- Goel Publishing House, Meerut.
10.Soil Chemical Analysis by M.L.Jsackson,Prentice-Hall India Pvt Ltd, New Delhi

M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.
III SEMESTER
PAPER – IV: ENVIRONMENTAL CHEMISTRY AND ANALYSIS
(Regulation 2017-2018)

Code: CH3T4 A **Time: 3 hours** **Maximum Marks: 70**

UNIT– I

1. a) Write the nomenclature used in the study of environmental chemistry. 6M
   b) What is the significance of basic segments of environment? Explain 8M

Or

   c) Write principles of weathering. 6M
   d) How water, air and plants effect weathering. 8M

UNIT - II

2. a) Explain in brief about hydrosphere 6M
   b) Write note on i) solid waste ii) Thermal pollution 8M

Or

   c) How domestic water and industrial waste pollute water bodies? 6M
   d) Write note on i) Radioactive waste ii) Water quality parameters 8M

UNIT – III

3. a) How soaps & detergents lead to water pollution? 6M
   b) What are different techniques of water treatment? 8M

Or

   c) What are the methods used for coagulation? 6M
   d) Explain i) Ion Exchange reverse osmosis ii) Electrodialysis 8M

UNIT – IV

4. a) Briefly explain about the following air pollutants 6M
   i) Carbon monoxide ii) Sulphur oxides
   b) What are the atmospheric sources for emission of air pollutants? 8M

Or

   c) How the air pollutants Hydrogen sulphide, oxides of nitrogen, can be monitored? 6M
   d) Write note on : i) Ozone ii) Radioactive substances

UNIT – V

5. a) How to determine the moisture in soil sample? 6M

b) What are the different methods involved in the soil analysis? Explain. 8M **Or**

c) How to analyze the hydrocarbons and aromatic hydrocarbons in AIR? 6M

d) How to analyze the dissolved oxygen, COD, BOD and nitrogen compounds in water sample? 8M

CH3T4B: Organo Metallic Chemistry, Nanochemistry and Natural Products

Course: Organo Metallic Chemistry, Nanochemistry and Natural Products (code CH3T4B)		
S.No	COURSE OUTCOMES	PO`S
	The student will be able to	
1	Memorize the basic principle and concepts of organic synthesis.	1,2,7
2	Understand the role of organo boranes, organo silanes, organo metallic reagents, nanometallic natural products in organic chemistry.	1,2,5
3	Execute the conceptual knowledge of various reagents in organic synthesis.	1,6,7
4	Test the role of reagents in organic synthesis and the need of nanochemistry and natural products.	1,4

UNIT-I

Organoboranes:

Preparation of Organobornaes viz hydroboration with BH3-THF, protonolysis, oxidation, isomerization, cyclization of alkylboranes, alkenylboranes, disiamylborane, thexylborane, 9-BBN and catechol boranes.

Free radical reactions of organoboranes, reactions with α- bromoketones, α-bromoesters reactions of alkenylboranes and trialkenyl borates.

UNIT-II

Organosilanes:

Synthetic applications of organosilicon compounds, trimethylsilly ethers, trimethylsilyl chloride, dimethyl-t-butylsilyl chloride, trimetthylsilyl cyanide, trimethylsilyliodide, Peterson olefination.

Synthetic applications of α-silylcarbanion and β-silyl carbonyl compounds. The β-effect.

UNIT-III

Organo metallic reagents:

Preparation of Grignard reagents with alkyl, allyl halides, reaction with carbonyl compounds, esters, amines. Preparation of alkyllithium, reagents, lithium diisopropyl amide (LDA).

Organocopper reagents, Gilman reagents. Organo palladium reagents, preparation of Palladium reagents.

UNIT-IV

Nanochemistry:

Introduction, carbon nano tubes: structure of single and multi walled carbon nano tubes, synthesis-solid and gaseous carbon source-based production techniques, synthesis with controlled orientation.

Growth mechanism of carbon nano tubes-catalyst free growth, catalyst activated growth, general properties, electrical & optical, Mechanical, applications.

UNIT-V

Natural Products:

Terpenoids – Classification – sources, isolation, synthesis with special reference to Zingiberene, santonin, abietic acid.

Flavanoids - Classification, sources, isolation, chemistry and synthesis with special reference to quercetin and kampferol.

References:

1. Some Modem Methods of Organic Synthesis W. Caruthers, Cambridge University Press, Cambridge.
2. Organic Synthesis vizBoranes, Herbet C. Brown Gray, W. Kramer Alan B. Levy and M. Mark Midland John Wiely& Sons, New York.
3. An introduction to the Chemistry of Heterocyclic Compounds,R.M.Acheson, Interscience Publishers, New York
5. Principle of Organic Chemistry, Roc Norman, J.M.Coxan, Nelson Throms
6. Advanced OrganicChemistry,F.A Carey and R.J.Sundberg,Pelenum
7. Schlosser, M., Organometalllics in Synthesis, A manual, John Wiley, New York, 1996.
8. Hegedus, L.S.; Transition metals in the synthesis of complex organic molecules, second edition, University Science, Book, CA, 1999.
9. Astruc, D.; Organometallic Chemistry and Catalysis, Springer Verlag, 2007. 11.Davies, S. G.; Organotransition metal chemistry: Applications to organic synthesis, Pergamon Press, New York, 1986.

►The highlighted syllabus will be taught online due to COVID – 19 pandemic.

M.Sc. DEGREE EXAMINATION
III SEMESTER
Paper-IV :: Organo Metallic Chemistry, Nanochemistry and Natural Products
(Regulation 2017-2018)

Code: CH3T4 B **Time: 3 hours** **Maximum Marks: 70**

UNIT – I

1.a) Write a note on 9-BBN. 6M – **CO- 2 (L–2)**

b) Describe the preparation of organoboranes with BH_3-THF followed by oxidation with suitable example. 8M – **CO- 3 (L–3)**

(Or)

c) Write about reactions with α-Bromoketones. 6M – **CO- 2 (L–2)**

d) Explain the following reactions : 8M – **CO- 2 (L–2)**

i) alkenyl boranes ii) trialkenyl boranes

UNIT – II

2.a) Write note on synthetic applications of : 6M – **CO- 2 (L–2)**

i) trimethyl silylchloride ii) trimethyl silyl cyanide

b) Discuss Peterson Olefination. 8M – **CO- 3 (L–3)**

(Or)

c) Explain the following: 6M – **CO- 2 (L–2)**

i) α-silylcarbanion ii) β-silylcarbonyl compound

d) Write note on β-effect. 8M– **CO- 2 (L–2)**

UNIT – III

3. a) Discuss the preparation of Grignard reagent with 6M – **CO- 2 (L–2)**

i) Alkyl halides ii) Ally halides

b) Explain the reactions of Grignard reagent with : 8M – **CO- 2 (L–2)**

i) Carbonyl compounds ii) Esters with suitable examples

(Or)

c) Write a note on preparation and applications of lithium di isopropyl amide(LDA) 6M– **CO- 3 (L–3)**

d) Write note on: 8M– **CO- 2 (L–2)**

i) Palladium reagents ii) Gilman reagents

UNIT – IV

4. a) Write structures of single and multiwall carbon nano tubes 6M– **CO- 3 (L–3)**

b) Explain growth mechanism of carbon nano tubes. 8M– **CO- 3 (L–3)**

(Or)

c) Define nano, explain different types of nano tubes. 6M– **CO- 2 (L–2)**

d) Explain the synthesis of multiwalled carbon nano tubes by arc evaporation method and CVD method. 8M – **CO- 3 (L–3)**

UNIT – V

5.a) What are the sources of terpenoids? Explain classification of terpenoids.6M – **CO- 1 (L–1)**

b) Write the synthesis of the following i) Zingiberene ii) Santonin . 8M – **CO- 2 (L–2)**

(Or)

c) How to isolation of terpenoids. 6M– **CO- 2 (L–2)**

d) Write synthesis of the following. 8M – **CO- 2 (L–2)**

i) Quercepin ii) Kampferol

CH4L1: PAPER AND THIN LAYER CHROMATOGRAPHY TECHNIQUES

Subject Code	CH4L1	I A Marks	30
No. of Practical Hours / Week	6	End Exam Marks	70
Total Number of Practical Hours	80	Total Marks	100
Seminar	----	Exam Hours	06

Course: PAPER AND THIN LAYER CHROMATOGRAPHY TECHNIQUES (CH4L1)			
S.No	COURSE OUTCOMES	PO`s	
	The student will be able to		
1	Understand the significance of paper chromatography as well as thin layer chromatography in separation of components like sugars and amino acids	1,3,5	

Paper Chromatography: Atleast four practicals

Thin Layer Chromatography: Atleast four practicals

CH4L2: PROJECT WORK

Subject Code	CH4L2	CIA Marks	50
No. of Practical Hours / Week	12	Project +Viva Voce	100+50
Total Number of Practical Hours	160	Total Marks	200
Seminar	----	Exam Hours	06

Project: PROJECT WORK (code CH4L2)			
S.No.	COURSE OUTCOMES	PO`S	
	The student will be able to		
1	Acquire required skills to implement theoretical knowledge gained.	1,3,4,7	
2	Assimilate the required knowledge for future research through practical knowledge gained in the project work.	1,2,7	
3	Gain the required ability to start up own industry.	1,4,5,6	
4	Comprehend the ability to draft and communicate the practical work.	1,2,7	

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

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

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

S.No:1	Course Code: CHE T52	Title of the paper: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY-II	Mapping with PO'S
CO 1	To understand substitution reactions mechanisms of metal complexes & understand essential elements and their biological significance		1.7
CO 2	To evaluate basic principle of Kinetics and increase critical reading about laws of Photo Chemistry		1
CO 3	Identify the common organic functional groups and recognize structures and functions of carbohydrates		1
CO 4	Able to know the hetero atoms in ring compounds and preparation and properties of heterocyclic compounds		1
CO 5	Acquires the knowledge of biomolecules like amino acids & proteins		1.7

SEMESTER- V **Paper-VI** **No of Credits:3**

(INORGANIC, ORGANIC & PHYSICAL CHEMISTRY-II)

60 hrs (4 h / w)

INORGANIC CHEMISTRY

UNIT-I

1. Reactivity of metal complexes: (Online Classes) **6h**

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: (Online Classes) **6h**

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(Offline Classes) **12h**

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 half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

2. Photochemistry (Offline Classes) **10h**

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 (Offline Classes) 10h

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 (Offline Classes) 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 (Offline Classes) 8h

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

P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE :: VIJAYAWADA-10

(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam)

CHEMISTRY	CHET51	2017-'18	B. Sc. MPC, BZC

S.No:1	Course Code: CHE T51	Title of the paper: INORGANIC, ORGANIC & PHYSICAL CHEMISTRY-I	Mapping with PO'S
CO 1	Understanding basic concept on coordination Chemistry		1.7
CO 2	gain the Knowledge of spectral, magnetic properties and stability of metal complexes		1.
CO 3	Knowing the classification and synthesis of nitro Hydro carbons		1.7
CO 4	Knowing the classification synthesis and properties of Nitrogen compounds		1.7
CO 5	Basic concepts of thermodynamics and its laws		1.7

SEMESTER- V **Paper-V** **No of Credits:3**

(INORGANIC, ORGANIC & PHYSICAL CHEMISTRY-I) 60 hrs (4 h / w)

INORGANIC CHEMISTRY UNIT – I

Coordination Chemistry: (Offline Classes) **13h**

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: (Offline Classes) **6h**

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

2. Stability of metal complexes: (Offline Classes) **5h**

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: **(Offline Classes)** **6h**

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 : (Offline Classes) 15h

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(Online Classes) 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

CH4L1: PAPER AND THIN LAYER CHROMATOGRAPHY TECHNIQUES

Subject Code	CH4L1	I A Marks	30
No. of Practical Hours / Week	6	End Exam Marks	70
Total Number of Practical Hours	80	Total Marks	100
Seminar	----	Exam Hours	06

Course: PAPER AND THIN LAYER CHROMATOGRAPHY TECHNIQUES (CH4L1)			
S.No	COURSE OUTCOMES	PO`s	
	The student will be able to		
1	Understand the significance of paper chromatography as well as thin layer chromatography in separation of components like sugars and amino acids	1,3,5	

Paper Chromatography: Atleast four practicals

Thin Layer Chromatography: Atleast four practicals

CH4L2: PROJECT WORK

Subject Code	CH4L2	CIA Marks	50
No. of Practical Hours / Week	12	Project +Viva Voce	100+50
Total Number of Practical Hours	160	Total Marks	200
Seminar	----	Exam Hours	06

Project: PROJECT WORK (code CH4L2)			
S.No.	COURSE OUTCOMES	PO`S	
	The student will be able to		
1	Acquire required skills to implement theoretical knowledge gained.	1,3,4,7	
2	Assimilate the required knowledge for future research through practical knowledge gained in the project work.	1,2,7	
3	Gain the required ability to start up own industry.	1,4,5,6	
4	Comprehend the ability to draft and communicate the practical work.	1,2,7	

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

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

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

P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE
DEPARTMENT OF CHEMISTRY
M.Sc – CHEMISTRY (ORGANIC CHEMISTRY)
IV SEMESTER

CH4T1: ADVANCED ORGANIC SPECTROSCOPY

Subject Code	CH4T1	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	1	Exam Hours	03

Course: Advanced Organic Spectroscopy **(code CH4T1)**		
S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Sumarize the principle, theory and advanced aspects of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD & CD spectroscopic techniques.	2,7
2	Display the knowledge gained in the areas of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD & CD spectroscopic techniques in chosen job role.	1,2,3
3	Interpret the spectral data of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD & CD in elucidating the structure of the molecule.	1,2,7
4	Assess that how far the spectral data of ^{1}HNMR, ^{13}C NMR, 2D NMR, ORD & CD are useful in establishing the structure of the molecule.	1,7

UNIT – I

Proton NMR Spectrscopy:

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

Simplification of complex spectra- nuclear magnetic double resonance, chemical shift

reagents, solvent effects on PMR Spectrum . Nuclear Overhauser Effect (NOE).

UNIT-II

13C-NMR spectroscopy:

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

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

UNIT-III

ORD& CD Curves:

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

UNIT-IV

2D NMR spectroscopy:

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

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

UNIT –V

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

References :

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

M.Sc. DEGREE EXAMINATION
IV SEMESTER
Paper-I :: Advanced organic spectroscopy
(Regulation 2017-2018)

Code :CH4T1 **Time: 3 hours** **Maximum Marks: 70**

UNIT - I

1(a) Explain the following:I) Double irradiation II) AMX Spectra for styrene oxide.(8M) (CO–2)

(b) Explain the effect of solvent on PMR spectrum (6M) (CO–2)

(Or)

(c) Differentiate between first order and non first order PMR spectrums with Examples. (6M) (CO–4)

(d) How can you interpret complex PMR Spectrum (8M)(CO–3)

UNIT - II

2(a) Explain with the suitable examples the α, β & γ effects in 13 C NMR.(8M) (CO–3)

(b) what is the importance of off resonance decoupling CMR spectrum? (6M) (CO–2)

(Or)

(c) Discuss some important applications of 13 C NMR spectroscopy. (8M)(CO–2)

(d) A compound of MF C_4H_{10} in its CMR Spectrum show 17.1(q) 67.4(T). Determine the structure of compound by using CMR data (6M) (CO–3)

UNIT - III

3.(a) Define Cotton effect with examples (6M)(CO–1)

(b) Predict the sign of cotton effect in 3-methyl cyclo haxanone when substituent is in equatorial position (8M)(CO–3)

(Or)

(c) Explain the following i) Axial halo ketone rule ii) Types of optical rotatory dispersion curves. (8M) (CO–2)

(d) Explain the applications of Octant rule (6M) (CO–3)

UNIT - IV

4(a) What information is available from the COSY experiment? (8M) (CO–2)

(b) Write explanatory note on INDOR. (6M)(CO–2)

(Or)

(c) What information about a compound can be obtained from the 2D INADEQUATE experiment? (8M) (CO–2)

d) Discuss the impartence of NOESY technique with suitable example.(6M) (CO–2)

UNIT - V

5.(a) Deduce the structure of the compound consistent with the following data. Elemental analysis: C=32.14%H 5.35% and Cl 62.5% UV: No absorption above 210 nm, IR (CCl4) 2941,2265 and 1460cm-1PMR δ 2.72(septet,J=6.7,1H),1.33 (doublet, J=6.7,6H) (14M)(CO–3)

(Or)

(b) Deduce the structure of the compound consistent with the following data

Elemental analysis: C=32.14%H 5.35% and Cl 62.5% UV: No absorption above 210 nm IR (CCl_4) 2940,1265 and 690cm-1 andPMR δ 3.5(2H,D),3.3(1H,m) and 1.25(3H,d) (14M) (CO_{-3})

CH4T2: ORGANIC REACTIONS & MECHANISMS

Subject Code	CH4T2	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	1	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Get equipped with the required knowledge of oxidations and reductions of various functional groups and rearrangement reactions.	2,7
2	Apply the knowledge gained in the field of oxidations, reductions and rearrangements in the chosen job role.	1,2,3
3	Analyse and categorise the various types of oxidations, reductions and rearrangements in organic chemistry.	1,3,6
4	Evaluate how far the knowledge gained, will be useful in writing a mechanism for novel reactions.	1,2,5

UNIT-I

Oxidations

Introduction: Different oxidative processes. Hydrocarbons: alkenes, aromatic hydro carbons, saturated C-H groups (activated and unactivated), Alcohols, diols, alkenes, epoxides,
ozonolysis, aldehydes, Ketones, Carboxylic acids, Amines, hydrazines, sulphides.

UNIT-II

Reagents for Oxidations

Oxidations with ruthenium tetroxide, iodobenzenediacetate and Tl(III) nitrate, Lead tetra acetate, SeO_2, MnO_2, Ag_2CO_3, Oppenauer oxidation, peracids., perhydroxylation using $KMnO_4$, OsO_4, HIO_4, peracids, oxidation with iodine silver carboxylate.

UNIT-III

Reductions

Introduction: Reductive process of Hydrocarbons: alkenes, alkynes, and aromatic rings,
Carbonyl compounds – aldehydes, ketones, acids, Nitro, nitroso, azo and oxime group.

Catalytic hydrogenations – Heterogeneous hydrogenation, stereochemistry and mechanism, selectivity of reduction, homogeneous hydrogenation.

UNIT-IV

Reagents for Reductions

Reduction by dissolving metals: Reduction with metal and liquid ammonia (Birch Reduction of aromatic compounds), Reduction with metal acid: Clemensons reduction, Reduction by hydride transfer reagents, Aluminium alkoxide:Meerwein Pondorf Verley Reduction, $LiAlH_4$, $NaBH_4$, Diisobutylaluminium hydride(DIBAL), Sodium cyano borohydride ,trialkyl borohydrides, Reduction with diimide. Wolff-Kishner reduction.

UNIT-V

Molecular Rearrangements

Migration to electron deficient carbon atom**.** Pinacole-Pinacolone rearrangement, Wagner-
Meerwein rearrangement, Dienone-Phenol rearrangement, Benzil-Benzilic acid rearrangement, Favorski rearrangement and Claisen rearrangement.

Migration to electron deficient hetero atom:.Wolf, Hofmann, Curtius, Schmidt, Beckmann rearrangement, Baeyer-Villiger rearrangement,Stevens, Witting, Neber rearrangements. Fries, Fischer-Hepp, Orton, Bamberger, Benzidine, Cumene Hydroperoxide rearrangement.

References :

1. Molecular reactions and Photochemistry by Charles Dupey and O. Chapman, Prentice Hall.
2. “Pericyclic reactions a mechanistic study” S.M.Mukheji
3. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
4. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
5. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
6. Structure and Mechanism in Organic Chemistry, C.K.Inglod, Cornell University Press
7. ‘Organic Photo chemistry and Pericyclic reactions’ M.G.Arora Anmol Publications Pvt. Ltd.
8. Fundamentals of photochemistry by K.K.Rohatgi–Mukharjee Now Age international publishers.
9. Mechanism and structure in Organic Chemistry “ E.S.Gould Henry – Holt and Co, Newyork.
10. Advances in Organic Reaction mechanism and structure J. March (McGrew Hill)
11. .Aguide Book to Mechanism in Organic Chemistry” by P.Sykes
12. Synthetic approaches in organic chemistry by R.K.Bansal(Narosa Publications)
13. Some modern methods of synthesis by Carruthers (Cambridge).

M.Sc. DEGREE EXAMINATION

IV SEMESTER

Paper-II :: Organic Reactions & Mechanisms

(Regulation 2017-2018)

Code: CH4T2 **Time: 3 hours** **Maximum Marks: 70**

UNIT – I

1.a) Write note on oxidations of aromatic hydrocarbons. 6M (CO–1)

b) Write note on the oxidations of: 8M (CO–1)

i) Alcohols ii) Alkenes

(Or)

c) Write note on ozonolysis. 6M (CO–2)

d) Write note on the oxidations of: 8M (CO–2)

i) Amines ii) Hydrazines

UNIT – II

2.a) Write note on oxidation with Ruthenium tetroxide. 4M (CO–3)

b) Write the synthetic importance of the following: 8M (CO–3)

i) Lead tetra acetate ii) MnO_2

(Or)

c) Write note on oxidation with Thallium (III) nitrate 6M (CO–2)

d) Write the synthetic applications of the following reagents: 8M (CO–2)

i) OsO_4 ii) HIO_4

UNIT – III

3.a) Write a note on the reductive process of aromatic rings. 6M (CO–2)

b) Write note on the reductions of carbonyl compounds. 8M (CO–2)

(Or)

c) Write note on Homogeneous hydrogenation with suitable example. 6M (CO–2)

d) Write note on mechanism and stereochemistry of heterogeneous hydrogenation. 8M (CO–2)

UNIT – IV

4.a) Write note on Birch reduction. 10M (CO–1)

b) Explain Meerwein Pondorf Verley Reduction. 4M (CO–2)

(Or)

c) Write note on Wolf-Kishner reduction. 4M (CO–2)

d) How do the following reagents serve as reducing agents. 10M(CO–3)

i) Di isobutyl aluminium hydride ii) Diamide iii) Li AlH_4

UNIT – V

5.a) Define and discuss the mechanism of pinacol- pinacolone rearrangement. 6M(CO–1)

b) Discuss the mechanism of the following : 8M(CO–1)

i) Wagner Meerwein rearrangement

ii) Claisen rearrangement

(Or)

c) Give a detailed account of Hofmann rearrangement. 6M (CO–2)

d) Write note on the following : 8M (CO–2)

i) Baeyer-Villiger rearrangement ii) Neber rearrangement

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CH4T3A: GREEN CHEMISTRY

Subject Code	CH4T3A	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	10
Seminar	1	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
1	The importance of green chemistry and fundamentals	1,5,6
2	The use of renewable raw materials and atom efficiency in the course of reactions	1,5,6
3	The need of green solvents in organic synthesis as well as importance of catalysis	1,5,7
4	The significance of greener reagents and products	1,6,7
5	The role of ionic liquids in organic chemistry	1,2,5

UNIT – I

Fundamentals and Significance of Green Chemistry: Discussion of the current state of chemistry and the environment and the definition of green chemistry. Assessment of the impact of chemistry in the environment and definition of risk and hazard. An introduction to the tools of green chemistry and its fundamental principles.

UNIT – II

Use of Renewable Raw Materials: Evaluating feedstock and starting materials – their origins, toxicity, sustainability and the downstream implications of the choice of feedstock. Some examples of the use of green starting materials.

Atom Efficient Processes: Evaluating chemical reactions according to their yield and atom efficiency. Examples of efficient stoichiometric and catalytic processes.

UNIT – III

Greener Solvents: The use of volatile organic compounds and the need for innocuous replacements. The use of supercritical fluids, solventless, solid supported reagents and aqueous systems as alternative solvents.

Catalysis: Energy requirements and usage, optimization of the reaction by minimizing the energy requirements. Examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites and oxidations using molecular oxygen or hydrogen peroxide.

UNIT – IV

Greener reagents and products: Methods of designing safer chemicals such as structure-activity relationships, avoidance of toxic functional groups, minimising bioavailability and use of auxiliary materials. Examples of greener reagents including replacement of phosgene, methylations using dimethylcarbonate, solid state polymerisations, alternative nitrile synthesis. Evaluation of persistence in the environment and examples of biodegradable commercial products; polylactides, polyaspartates and antifoulants.

UNIT – V

Ionic Liquids: Definition of ionic liquid. Models of molten salt formation and the thermodynamics of melting. Structural influences on the melting point of a salt. Physical properties of molten salts and ionic liquids, polarity, interionic bonding, structure. Applications of ionic liquids to synthesis. Effects on reaction mechanisms. Acid catalysed reactions. Applications of ionic liquids in catalysis. Hydrogenations, oxidations and C-C coupling reactions.

References:

1. Green Chemistry: An Introductory Text *By M Lancaster,* RSC Books.
2. Introduction to Green Chemistry by Albert S. Matlack, Marcel-Decker, 2001.
3. Introduction to Green Chemistry by Albert S. Matlack.
4. Introduction to Green Chemistry by Mary Ann Ryan and Michael Tinnesand, 2003.
5. Ionic Liquids: Industrial Applications of Green Chemistry edited by Robin D. Rogers and Kenneth R. Seddon.
6. Ionic Liquids in Synthesis by Wasserscheid, Peter; and Thomas Welton.

M.Sc. DEGREE EXAMINATION
IV SEMESTER
PAPER – III: GREEN CHEMISTRY

(Regulation 2017-2018)

Code: CH4T3A **Time: 3 hours** **Maximum Marks: 70**

UNIT– I

1. a) Define green chemistry. Explain. 6M (CO – 1)
   b) Discuss the impacts of chemistry on environment. 8M (CO – 2)

Or

c) Write note on principles of green chemistry. 6M (CO – 2)

d) Explain how green methods are advantageous than normal chemical methods. 8M(CO – 3)

UNIT - II

2. a) Discuss green starting materials with examples. 4M (CO – 1)
   b) Explain how one can evaluate feedstock and starting materials. 10M(CO – 2)

Or

c) How do you evaluate chemical reactions according to their yield and atom efficiency? 8M(CO – 3)

d) Discuss about the following 6M (CO – 2)
   i) Efficiency stiochio chemistry ii) Catalytic processes

UNIT – III

3. a) Enumerate the significance of solvent less reactions in green chemistry with suitable examples. 6M (CO – 2)
   b) Discuss the importance of the following in green chemistry. 8M (CO – 1)

i) Supercritical fluids ii) Solid supported reagents

Or

c) Write note on oxidations brought about by molecular oxygen or H_2O_2. 6M (CO – 2)

d) Give account on energy requirements in green chemical processes. 8M(CO – 3)

UNIT – IV

4. a) Explain the following :
i) Structure activity relationship ii) Avoidance of toxic functional Group. 8M(CO – 1)

b) Give a brief account on greener reagents. 6M (CO – 2)

Or

c) Discuss about the following 8M (CO – 2)
i) Bio degradable commercial products ii) polyaspertates with suitable examples.

d) Explain the significance of polyactides and antifoulants with suitable examples. 6M (CO – 3)

UNIT – V

5. a) Define ionic liquid. Explain with example. 6M (CO – 2)

b) Discuss models of molten salt formation and thermo dynamics. 8M (CO – 1)

Or

c) Write applications of ionic liquid to synthesis. 6M(CO – 3)

d) Discuss acid catalyzed reactions and applications of ionic liquids in catalysis. 8M(CO – 2)

CH4T3B: ANTIBIOTICS, DRUGS, VITAMINS & STEROID HARMONES

Subject Code	CH4T3B	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	1	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Understand the role of Antibiotics, drugs, vitamins, harmones in human life.	1,2
2	Apply the knowledge gained about antibiotics, drugs, vitamins and steroids in their chosen fields.	1,2,3
3	Analyse that how far antibiots, drugs, vitamins, harmones are useful in enhancing the health of the humans.	1,2,7
4	Evaluate that how various compounds can function as antibiotics, drugs as anticancer agents.	1,2,5.

UNIT-I

Antibiotics:

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

UNIT-II

Drugs and Medicinal chemistry:

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

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

UNIT-III

Chemotherapy of Brain: Introduction – neurotransmitters

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

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

UNIT-IV

(I) Antimalarials: Paludrin – quinacrin – chloroquin – camoquin – pamaquin – sontoquine.

(II) Antiamoebic agents : Chiniofon – Resotren – Iodochlorohydroxyquin.

(III) Sulpha drugs: Sulphanilamide – Dihydrocurprine – Prontosil

(IV)Antiseptics: Diphenyl – Chlorophene-2,4,4-trichloro-2'-hydroxydiphenyl ether – aminocerine hydrochloride.

UNIT-V

Fat Soluble Vitamins: Chemistry, Synthesis of vitamin A1, and vitamin K

Water soluble Vitamins: Chemistry, Synthesis of B1 and C

Steroid Hormones:

Chemistry & synthesis of progestrone, testosterone.

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

TEXT BOOKS:

1. Introduction to Medicinal Chemistry – Wiley VCH

2. Text Book of Organic Medicinal and Pharmaceutical Chemistry, Wilson and Gisvild, (ed

Robert F. Dorge)

3. An introduction to drug design by SS Pandeya

4. Buger's Medicinal Chemistry and drug discovery Vol.I by (Ed) ME Wolff – John – Wileyby

A. Burger

5. The Organic Chemistry of drug design and drug action by RB Silverman, Academic press

6. Principles of Medicinal Chemistry by William O. Foye, Lea & Febiger,

Philadelphia/London,1989.

M.Sc. DEGREE EXAMINATION
IV SEMESTER

PAPER – III: ANTIBIOTICS, DRUGS, VITAMINS & STEROID HARMONES
(Regulation 2017-2018)

Code: CH4T3B **Time: 3 hours** **Maximum Marks: 70**

UNIT– I

1. a) What are the intribitors of cell wall biosynthesis? 6M(CO–1)
   b) Define β-lactams. Explain with suitable examples. 8M(CO–1)

Or

   c) Explain the synthesis of the following (i) Amplicillin (ii) Chloramphenicol. 8M(CO–2)
   d) Write about the following
      (i) Antibiotics (ii) Antibiotics inhibiting protein synthesis. 6M(CO–1)

UNIT - II

2. a) Explain about Chemotherapy and methodology for structure in drug design.

6M (CO–2)

b) Discuss the importance of structure activity relationship. 8M(CO–3)

Or

c) What are the methods used in treatment of cancer? 6M(CO–3)

d) Describe the structure elucidation of TAXOL. 8M(CO–4)

UNIT – III

3. a) Explain about neurotransmitters. 6M(CO–2)

b) Write CNS activity of the following

(i) Strychnine (ii) Picrotoxine 8M(CO–2)

Or

c) Write a brief note on general anesthetics. 6M (CO–2)

d) Discuss about sedatives and hypnotics. 8M (CO–1)

UNIT – IV

4. a) Write synthesis and activity of sulphanilamide. 8M (CO–1)

b) Given the synthesis of Diphenyl – Chlorophene and 2,4,4,-trichloro-2^1–hydroxydiphenyl ether. 6M (CO–1)

Or

c) Explain in detail the structure, activity and synthesis of antiamoebic agents, chiniofon. 8M (CO–1)

d) Give the synthesis of chloroquin and pamaquin. 6M (CO–1)

UNIT – V

5. a) Write chemistry & synthesis of vitamin K. 6M (CO–2)

b) Discuss structure elucidation of epinephrine 8M (CO–1)

Or

c) Write synthesis of vitamin C. 6M (CO–2)

d) Discuss structure elucidation of androsterone. 8M (CO–1)

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CH4T4A: TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS

Subject Code	CH4T4A	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	1	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	Understand the concepts of purification methods and chromatographic methods.	2,7
2	Apply the knowledge gained in purification and chromatographic techniques in their chosen job role.	1,2,3
3	Analyse that how far the purification and chromatographic techniques are useful in assessing the purity of the compound.	1,2,7
4	Evaluate that how far a compound is purified / separated using purification and chromatographic techniques.	1,2,6

UNIT-I

Classical Methods of purification

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

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

UNIT-II

Thin Layer chromatography:

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

UNIT-III

Paper chromatography:

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

UNIT-IV

Gas chromatography:

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

UNIT-V

High Performance liquid chromatography(HPLC):

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

SUGGESTED BOOKS:

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

M.Sc. DEGREE EXAMINATION
IVSEMESTER
Paper-IV :: Techniques for Modern Industrial Applications
(Regulation 2017-2018)

Code: CH4T4A **Time: 3 hours** **Maximum Marks: 70**

UNIT-I

1) a) Write a note on Recrystallization. 6M (CO–1)
b) Explain the following 8M (CO–2)
i) seeding ii) filtration iii) centrifugation iv) drying

or

c) Write about different types of distillations with examples? 6M (CO–2)
d) Explain the following 8M (CO–3)
i) Continuous distillation ii) steam distillation

UNIT-II

2) a) Explain basic principle of TLC. 6M (CO–2)
b) What are the methods that are involved in the preparation of TLC plates? 8M (CO–2)

Or

c) Write a note on development of TLC plates. 6M (CO–1)
d) Explain application of TLC. 8M (CO–3)

UNIT-III

3) a) What is the basic principle of paper chromatography? Explain. 6M (CO–1)
b) Explain Ascending and Descending paper chromatography. 8M (CO–2)

Or

c) Explain different types of two dimensional paper chromatography. 6M (CO–2)
d) Write applications of paper chromatography. 8M (CO–3)

UNIT-IV

4) a) Write basic principle of GC and Explain different types of GC techniques. 6M (CO–2)
b) Explain different types of columns used in GC. 8M (CO–2)

Or

c) Draw schematic diagram of GC. Explain 6M (CO–1)

d) Explain few applications of GC. 8M (CO–3)

UNIT –V

5) a) Explain different phases in HPLC 6M (CO–2)

b) Describe instrumentation of HPLC and explain the selection of the column 8M (CO–2)

or

c) Explain different types of detectors used in HPLC. 6M (CO–1)

d) Explain few applications of HPLC 8M (CO–2)

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CH4T4B: SEPARATION TECHNIQUES AND ELECTRO ANALYTICAL TECHNIQUES

Subject Code	CH4T4B	I A Marks	30
No. of Lecture Hours / Week	4	End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Seminar	1	Exam Hours	03

S.No	COURSE OUTCOMES	PO`s
	The student will be able to	
1	The need and importance of separation techniques in chemical analysis	2,7
2	The significance of chromatography in separation of components and quantitative determination	1,2,3
3	The role of chromatography in chemical analysis	1,2,7
4	The significance of the technique of coulometry in quantitative and qualitative analysis	1,2,6
5	The importance of voltametry technique in chemical analysis	2,5

UNIT-I

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

UNIT - II

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

UNIT III

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

Unit IV

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

UNIT –V

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

SUGGESTED BOOKS:,

1. B.K.Sharma -- Instrumental methods of chemical analysis,Goel Publishers,

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

M.Sc. DEGREE EXAMINATION
IVSEMESTER

Paper-IV :: SEPARATION TECHNIQUES & ELECTRO ANALYTICAL TECHNIQUES
(Regulation 2017-2018)

Code:CH4T4B Time:3hours Maximum Marks: 70

UNIT-I

1) a)	Write the principle of solvent extraction.	6M (CO–2)
b)	Discuss the technique and factors affecting solvent extraction.	8M (CO–1)
	or	
c)	Explain ion exchange phenomenon with suitable theory.	6M(CO–3)
d)	Write application of ion exchange.	8M (CO–2)

UNIT-II

2) a)	Write basic principle of column and paper chromatography	6M (CO–1)
b)	Discuss the application of TLC and GC	8M (CO–3)
	Or	
c)	Briefly explain about exclusion chromatography	6M (CO–2)
d)	Write application of Gas liquid chromatography	8M (CO–3)

UNIT-III

3) a)	Write a brief note on electro analysis.	6M (CO–1)
b)	Explain i) polaristion ii) over voltage	8M (CO–2)

Or

c) What is the basic principle involved in electro gravimetric analysis? 6M (CO–3)

d) Explain separation of metals by electrolysis. 8M (CO–2)

UNIT-IV

4) a) Give a brief account on coulometry. 6M (CO–1)

b) What are the different types of coulometric analysis? 8M (CO–2)

Or

c) Write note on coulometric titrations 6M (CO–3)

d) How cobalt and Nickel can be separated by coulometry? 8M (CO–2)

UNIT –V

5) a) write the principle of polarography 6M (CO–1)

b) write a note on dropping mercury electrode and factors effecting the limiting current. 8M (CO–2)

or

c) Discuss about organic polarography 6M(CO–3)

d) What are amperometric titration? Explain advantages & disadvantages with suitable examples. 8M (CO–2)

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P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE :: VIJAYAWADA-10
(An Autonomous college in the jurisdiction of Krishna University, Machilipatnam)

CHEMISTRY	CHE P	B. Sc. MPC, BZC

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;

CO1 Use glassware, equipment and chemicals and follow experimental procedures in the laboratory

CO2 Understand and explain the volumetric analysis based on fundamental concepts learnt in ionic equilibria

CO3 Learn and identify the concepts of a standard solutions, primary and secondary standards

CO4 Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

Volumetric analysis *50 M*

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard. Determination of Cu (II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard.
3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$

Practical reference books:

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

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

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

PARVATHANENI BRAHMAYYA SIDDHARTHA COLLEGE OF ARTS & SCIENCE :: VIJAYAWADA-10
(An Autonomous college in the jurisdiction of Krishna University Machilipatnam)

CHEMISTRY	CHE P41	B. Sc. MPC, BZC

SEMESTER- IV **PRACTICAL PAPER-IV** **Credits : 2**

S.No:1	Course Code: CHE P41	Title of the paper: Physical Chemistry & IR Spectral Analysis	Mapping with PO'S
CO 1	To acquire the practical knowledge in the case of CST for phenol-water system		1.
CO 2	To study the effect of electrolyte on CST		1
CO 3	Application of theoretical knowledge to conductometric titrations		1.6
CO 4	Delineate the important spectroscopic methods of analysis and interpretation of spectral data (UV & IR)		1.7
CO 5	Apply spectroscopic methods to analyze the structure of simple organic molecules		1.7

45 Hrs (3 H/W)

Physical Chemistry & IR Spectral Analysis

Physical Chemistry **20 M**

1.Critical Solution Temperature- Phenol-Water system

2. Effect of NaCl on critical solution temperature (Phenol-Water system)

3.Determination of concentration of HCl conductometrically using standard NaOH solution.

4.Determination of concentration of acetic acid conductometrically using standard NaOH Solution.

IR Spectral Analysis **20 M**

5. IR Spectral Analysis of the following functional groups with examples
   a) Hydroxyl groups
   b) Carbonyl groups
   c) Amino groups
   d) Aromatic groups

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;

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

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

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

CO4 Correlate and describe the stereo chemical properties of organic compounds and reactions.

ORGANIC CHEMISTRY *36h*

UNIT-I

Recapitulation of Basics of OrganicChemistry

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

UNIT-II

Carbon-Carbon pi Bonds(Alkenes and Alkynes)

12h General methods of preparation ,physical and chemical properties. Mechanism of E1,E2,E1cbreactions,Saytzeff and Hoffmann eliminations, Electrophilic Additions, mechanism(Markownikoff/Antimarkownikoff addition) with suitable examples,,*syn*and*anti*-addition; addition ofH_2,X_2,HX. Oxy mercuration- demercuration,

hydroboration-oxidation, ozonolysis, hydroxylation, Diels Alderreaction,1,2- and1,4-addition reactions in conjugateddienes. Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III

Benzene and its reactivity **12h**

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenylcation, cyclopentadienyl anion and tropyliumcation) 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 NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups

(ii) Halogens

(Explanation by taking minimum of one example from each type)

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.

2. Chemical Bonding *6h*

Valence bond theory, hybridization, VB theory as applied toClF_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).

3. ***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 examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 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 ClassTests, Worksheets and Quizzes Presentations,Projects and Assignments and GroupDiscussions: Enhances criticalthinking skills and personality

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

List of Reference Books Theory:

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

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

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

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

Additional Resources:

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

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

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

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

WEB Links:

1. https://www.khanacademy.org/science/class-11-chemistry-india/xfbb6cb8fc2bd00c8:in-in-organic-chemistry-some-basic-principles-and-techniques
2. https://pa01000125.schoolwires.net/cms/lib/PA01000125/Centricity/Domain/366/Chap9%20Aromatics.pdf
3. https://ncert.nic.in/ncerts/l/lech105.pdf
4. https://www.visionlearning.com/en/library/Chemistry/1/Chemical-Bonding/55
5. https://www.uou.ac.in/lecturenotes/science/MSCCH-17/CHEMISTRY%20LN%201%20STERIOCHEMISTRY.pdf

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-II

CHEMISTRY COURSE -II: ORGANIC & GENERAL CHEMISTRY

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

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

1. 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 ClF_3 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 10 = 50 Marks

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

9.(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.

10(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 alkne.

11.(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.

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

(or)

(b). Construct the Molecular Orbital diagram for O_2 and NO and explain their bond order and magnetic property.

13.(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.

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S.No:1	Course Code: CHE T41	Title of the paper: SPECTROSCOPY & PHYSICAL CHEMISTRY	Mapping with PO'S
CO 1	Knowledge of spectrophotometric analysis and its applications-**L1**		1.7
CO 2	Illustrating the principle , instrumentation and applications of NMR spectroscopy- **L2**		1.7
CO 3	Understand the properties of phase equilibrium of one component and two component system- **L1**		1
CO 4	Basic concept of Electrochemistry and its applications – **L2**		1.7
CO 5	To learn the important of colligative properties in dilute solutions- **L1**		1.7

SEMESTER- IV **PAPER-IV** **No of Credits:3**

(SPECTROSCOPY & PHYSICAL CHEMISTRY)
60 hrs (4 h / w)

SPECTROSCOPY **30 hrs (2h / w)**

UNIT-I **6h**

General features of absorption - Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of 1. Chromium in $K_2Cr_2O_7$
2. Manganese in Manganous sulphate

Electronic spectroscopy: **8h**

Interaction of electromagnetic radiation with molecules and types of molecular spectra. 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 and auxochrome.

UNIT-II

Infra red spectroscopy **8h**

Different Regions in Infrared radiations. Modes of vibrations in diatomic and polyatomic molecules. Characteristic absorption bands of various functional groups. Interpretation of spectra-Alkanes, Aromatic, Alcohols carbonyls, and amines with one example to each.

Proton magnetic resonance spectroscopy (^{1}H-NMR) **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.

PHYSICAL CHEMISTRY **30 hrs (2h / w)**

UNIT-III

Dilute solutions **10h**

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor.

UNIT-IV

Electrochemistry-I **10h**

Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorfs method. Application of conductivity measurements- conductometric titrations.

UNIT-V

1. Electrochemistry-II **4h**

Single electrode potential, sign convention, Reversible and irreversible cells Nernst Equation-Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements - Potentiometric titrations.

2.Phase rule **6h**

Concept of phase, components, degrees of freedom. Thermodynamic Derivation of Gibbs phase rule. Phase equilibrium of one component system - water system. Phase equilibrium of two-component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, simple eutectic diagram, desilverisation of lead., NaCl-Water system, Freezing mixtures.

List of Reference Books

1. Spectroscopy by William Kemp
2. Spectroscopy by Pavia
3. Organic Spectroscopy by J. R. Dyer
4. Modern Electrochemistry by J.O. M. Bockris and A.K.N.Reddy
5. Advanced Physical Chemistry by Atkins
6.Introduction to Electrochemistry by S. Glasstone
7.Elementary organic spectroscopy by Y.R. Sharma
8. Spectroscopy by P.S.Kalsi