

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR
(Affiliated to Aadikavi Nannayya University)
Accredited by NAAC with 'A' Grade with a CGPA 3.41
I B.S.c Chemistry Paper – I (Inorganic & physical Chemistry)
(At the end of I semester) w.e.f 2020-2021 (2022-2025 batch)

UNIT – I (Inorganic Chemistry)

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

Group -13: Preparation and structure of Diborane and Borazine.

Group -14: Preparation, classification and uses of silicones.

Group-15: Preparation and structures of Phosphonitrilic halides $\{(\text{PNCl}_2)_n \text{ where } n=3,4\}$

Group -16: Oxides and Oxoacids of sulphur (structures only)

Group -17: Structures of Inter halogen compounds and pseudo halogens.

Chemistry of d-block elements : **6h**

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

Chemistry of f-block elements: **6h**

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

Theories of bonding in metals: **4h**

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

UNIT-II (Physical Chemistry)

Solid state: **10h**

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Miller indices, Definition of lattice point, space lattice, unit cell. Derivation of Bragg's equation. Defects in crystals. Stoichiometric and non-stoichiometric defects.

Gaseous state: **6h**

Vander Waal's equation of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule Thomson effect.

Liquid state:**4h**

Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

Solutions:**6h**

Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Azeotropes-HCl-H₂O, ethanol-water systems. Partially miscible liquids- phenol-water system. Effect of impurity on consolute temperature. Nernst distribution law. Applications of distribution law.

Ionic equilibrium:**3h**

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

Dilute solutions**7h**

Colligative properties- Relative lowering of vapour pressure, Osmotic pressure, Elevation of boiling point and depression of freezing point. Experimental methods for determination of depression in freezing point and osmotic pressure, Abnormal Colligative properties.

List of Reference Books

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Advanced physical chemistry by Bahl and Tuli
6. Inorganic Chemistry by J.E.Huheey
7. Basic Inorganic Chemistry by Cotton and Wilkinson
8. A textbook of qualitative inorganic analysis by A.I. Vogel
9. Atkins,P.W.&Paula,J.deAtkin'sPhysicalChemistryEd.,OxfordUniversityPress 10thEd(2014).
10. Castellan,G.W.PhysicalChemistry4thEd.Narosa(2004).
11. Mortimer,R. G.PhysicalChemistry3rdEd. Elsevier:NOIDA,UP(2009).
12. Barrow,G.M.PhysicalChemistry

Laboratory course:

Practical-I (At the end of Semester-I)

30 hrs (3 h / w)

ANALYSIS OF SALT MIXTURES

50 Marks

Qualitative Inorganic Analysis:

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

Anions: Carbonate, Sulphate, chloride, bromide, acetate, nitrate, borate and phosphate.

Analysis of Cations: Lead, copper, cadmium, iron, aluminum, zinc, manganese, nickel, calcium, strontium, barium, potassium and ammonium

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(At the end of I semester) w.e.f 2020-2021 (2022-2025 batch)

MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing at least **TWO** questions from each **SECTION - I & II.**

5X 10M = 50M

SECTION – I (INORGANIC CHEMISTRY)

1. Write any two preparations of Diborane. Explain the structure of Diborane.
డైబోరేన్ ను తయారుచేయుటకు ఏవేని రెండు పద్ధతులను వ్రాయుము. డైబోరేన్ నిర్మాణమును వివరించండి?
2. What are silicones? Give their classification and one preparation for each. Write any two uses of silicones.
సిలికోన్ లు అనగానేమి? వాటి వర్గీకరణను, ప్రతి వర్గమును తయారుచేయుటకు ఒక విధానమును ఇమ్ము. సిలికోనుల రెండు ఉపయోగాలను వ్రాయండి.
3. Explain the magnetic and catalytic properties of d- block elements.
d- బ్లాక్ మూలకాల యొక్క అయస్కాంత ధర్మాలు మరియు ఉత్ప్రేరక ధర్మాలు గూర్చి వివరించండి.
4. What is Lanthanide contraction? Explain its consequences.
లాంథనైడ్ సంకోచం అనగా ఏమి? దాని పర్యవసానాలు వివరించండి.
5. Explain valency bond theory and free electron theory for bonding in metals.
లోహ బంధాల యొక్క సంయోజకత బంధ సిద్ధాంతం మరియు స్వేచ్ఛ ఎలక్ట్రాన్ సిద్ధాంతం వివరించుము.

SECTION – II (PHYSICAL CHEMISTRY)

6. Write notes on defects in crystals
లోహ స్పటికాలలో లోపాలు గూర్చి వ్యాఖ్య వ్రాయుము.
7. Derive the relation between critical constants and vanderwall's constants.
వాండర్ వాల్ స్థిరాంకాలకు సందిగ్ధ స్థిరాంకాలకు మధ్య సంబంధమును రాబట్టుము.
8. Explain classification and applications of liquid crystals.
ద్రవ స్పటికాల వర్గీకరణ మరియు అనువర్తనాలను వివరించండి.
9. Explain Nernst's distribution law. Write its applications in solvent extraction.
నెర్న్స్ట్ వితరణ నియమమును వివరించండి. ద్రావణి నిష్కర్షణ విధానములో దాని అనువర్తనాలను వివరించండి?
10. What is osmosis and osmotic pressure? How to determine osmotic pressure by Berkeley and Hartely's method?
ద్రవాభిసరణం మరియు ద్రవాభి సరణ పీడనము అనగానేమి? బెర్కీ లీ మరియు హార్ట్లీ పద్ధతిన ద్రవాభి సరణ పీడనము ను ఏ విధముగా నిర్ణయిస్తారు?

PART – B

Answer **FIVE** of the following questions.

ఏవైనా ఇదు ప్రశ్నలకు సమాధానములు వ్రాయండి

5 X 5M = 25M

11. Explain the preparation & structures of Phosphonitrilic halides.
ఫాస్ఫోనైట్రిలిక్ హాలైడ్ ల యొక్క తయారీ మరియు నిర్మాణం వివరించండి.
12. What are pseudo halogens? Give two examples. Write one property of pseudo halogens.
మిథ్యా హలోజన్ లు అనగానేమి ? రెండు ఉదాహరణలనిమ్ము. మిథ్యా హలోజన్ల ఒక ధర్మాన్ని వ్రాయండి.
13. Explain the stability of various oxidation states of d-block elements.
d-బ్లాక్ మూలకాల వివిధ ఆక్సీకరణ స్థితుల స్థిరత్వాన్ని వివరించండి.
14. Write any five comparisons between lanthanides and actinides
లాంథనైడ్లు మరియు ఆక్టినైడ్లు మధ్యగల ఏవైనా ఐదు సారూప్యాలను వ్రాయండి.
15. Derive Bragg's equation
బ్రాగ్ సమీకరణాన్ని రాబట్టుము.
16. State and explain Law of corresponding states.
అనురూప స్థితుల నియమమును వ్రాసి వివరింపుము
17. State and explain Henry's law
హెన్రీ నియమాన్ని వ్రాసి వివరింపుము
18. Write about common ion effect and solubility product.
ఉమ్మడి అయాన్ ప్రభావం మరియు ద్రావణీయతా లబ్ధం గూర్చి వ్రాయండి

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I B.S.c Chemistry Paper – I (Inorganic & physical Chemistry)
(At the end of I semester) w.e.f 2020-2021 (2022-2025 batch)

S.No		10M	5M
Inorganic Chemistry			
1	p-block elements	2	2
2	d-block elements	1	1
3	f-block elements	1	1
4	Theories of bonding in metals	1	---
Physical Chemistry			
1	Solid state	1	1
2	Gaseous state	1	1
3	Liquid state	1	---
4	Solutions	1	1
5	Ionic equilibrium	---	1
6	Dilute solutions	1	---
	TOTAL	10	8

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I B.Sc. Chemistry Paper-II (Organic & General Chemistry
(At the end of II semester) (w.e.f. 2020-2021) (2022-2025 batch)

SYLLABUS

UNIT – I (Organic Chemistry)

Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

12h

General methods of preparation of alkanes- Wurtz and Wurtz Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Free radical substitutions(Halogenation). Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane). General methods of preparation of cycloalkanes and relative stability, Baeyer strain theory.

Carbon–Carbon pi Bonds (Alkenes and Alkynes)

12h

General methods of preparation, physical and chemical properties. Mechanism of E1,E2 reactions, Saytzeff and Hoffmann eliminations, Electrophilic additions, mechanism (Markownikoff /Anti markownikoff addition) with suitable examples, Syn and anti-addition-addition of H₂, X₂, HX. Oxymercuration – demercuration, hydroboration-oxidation, ozonolysis, hydroxylation, Diels alder reaction-1,2 and 1,4 addition reactions in conjugated dienes.

Reactions of alkynes; acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds.

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 NO₂ and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

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

UNIT-IV(General Chemistry)

Surface chemistry

6h

Colloids - Coagulation of colloids- Hardy-Schulze rule. Stability of colloids, Protection of Colloids, Gold number.

Adsorption - Physical and chemical adsorption, Langmuir adsorption isotherm, applications of adsorption.

Chemical Bonding

6h

Valence bond theory, hybridization, VB theory as applied to ClF₃, Ni(CO)₄, Molecular orbital theory - LCAO method, construction of M.O. Diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N₂, O₂, CO and NO).

HSAB**2h**

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

Stereochemistry of carbon compounds**10h**

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).

List of Reference Books**Theory:**

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

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

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

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

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

LABORATORY COURSE-II 30hrs (2 h / w)**Practical-II Volumetric Analysis**

(At the end of Semester-II)

Volumetric analysis 50 M

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using KMnO_4 with oxalic acid as primary standard.
3. Determination of Cu (II) using $\text{Na}_2\text{S}_2\text{O}_3$ with $\text{K}_2\text{Cr}_2\text{O}_7$ as primary standard.
4. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .

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(At the end of II semester) (w.e.f. 2020-2021) (2022-2025 batch)

MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing atleast **TWO questions** from each **SECTION - I & II.**

5X 10M = 50M

SECTION – I (ORGANIC CHEMISTRY)

1. Write any TWO methods of preparation and any THREE chemical properties of alkanes?
ఆల్కేన్లను తయారు చేయు ఏవేనీ రెండు పద్ధతులను మరియు ఏవేనీ మూడు రసాయన ధర్మాలను వ్రాయండి?
2. Write any TWO methods of preparation and any THREE chemical properties of alkenes?
ఆల్కీనులను తయారు చేయు ఏవేనీ రెండు పద్ధతులను మరియు ఏవేనీ మూడు రసాయన ధర్మాలను వ్రాయండి?
3. Write any TWO methods of preparation and any THREE chemical properties of Acetylene?
ఎసిటిలీన్ యొక్క ఏవేనీ రెండు తయారు చేయు పద్ధతులను మరియు ఏవేనీ మూడు రసాయన ధర్మాలను వ్రాయండి?
4. Write any two methods of preparations of Cyclo alkanes? Explain briefly Bayer's strain theory
సైక్లో ఆల్కేన్ లను తయారు చేయుటకు ఏవేని రెండు పద్ధతులను వ్రాయుము. బేయర్ ప్రయాస సిద్ధాంతం గూర్చి క్లుప్తంగా వ్రాయుము.
5. Explain the mechanism of Friedel-Craft alkylation and Nitration of benzene?
బెంజీనులోని ఫ్రీడెల్ క్రాఫ్ట్ ఆల్కైలేషన్ చర్యా విధానమును మరియు నైట్రేషన్ చర్యా విధానమును వివరింపుము?

SECTION – II (GENERAL CHEMISTRY)

5. Explain the bonding and magnetic properties of O₂ and CO using molecular orbital diagram
O₂ మరియు CO లలో బంధ స్వభావమును మరియు అయస్కాంత ధర్మాలను అణు ఆర్బిటాల్ చిత్రము ఆధారముగా వివరింపుము
6. Explain pearson HSAB principle. Write its applications.
పియర్సన్ HSAB సూత్రమును వివరించండి. దాని అనువర్తనాలను వ్రాయండి
7. Derive the expression for Longmuir adsorption isotherms?
లాంగ్ముయర్ అధిశోషణ సమోష్ఠోగ్రత రేఖా సమీకరణాన్ని ఉత్పాదించండి.
8. What are R and S configurations? Explain the sequence rules with examples?
R మరియు S విన్యాసాలు అనగానేమి? అనుక్రమణ సూత్రాలను ఉదాహరణలతో వివరించండి?
9. Discuss the optical isomerism of Tartaric acid.
టార్టారిక్ ఆమ్లము యొక్క ద్రుక్ సాద్రుస్యమును చర్చించుము

PART – B

Answer any **FIVE** of the following questions

5 X 5M = 25M

ఏవైనా ఐదు ప్రశ్నలకు సమాధానాలు వ్రాయుము

11. Write conformations of ethane. Explain their stability.
ఈథేన్ యొక్క అనురూపకాలు వ్రాసి వాటి స్థిరత్వాన్ని వివరించుము..
12. State and explain Markownikoff rule with example.
ఉదాహరణతో మార్కోవ్ నికొఫ్ నియమాన్ని వ్రాసి వివరింపుము.
13. Explain 1,2- and 1,4- addition reactions of conjugated diens.
సంయుగ్మ డయీన్లలో 1,2- మరియు 1,4- సంకలన చర్యలను వివరించండి
14. Explain aromatic character of benzene
బెంజీన్ యొక్క ఆరోమాటిక్ స్వభావాన్ని వివరించండి.
15. Write about Hardy-schulze rule and Gold number.
హార్డీ-షుల్జ్ నియమం మరియు గోల్డ్ సంఖ్య గూర్చి వ్రాయండి.
16. Write any five differences between physical adsorption and chemisorptions.
Explain the structure of $\text{Ni}(\text{CO})_4$
 $\text{Ni}(\text{CO})_4$ యొక్క నిర్మాణము ను వివరింపుము
18. What are Enantiomers and Diastereomers ? Give examples?
ఎనాన్టియోమర్లు మరియు డయాస్టీరియోమర్లు అనగానేమి? ఉదాహరణలు ఇవ్వండి.

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I B.S.c; Chemistry Paper – II
At the end of II semester
(Organic & General chemistry)

S.No		10M	5M
Organic Chemistry			
1	Alkanes and Cycloalkanes	2	1
2	Alkenes and Alkynes	2	2
3	Benzene and its reactivity	1	1
General Chemistry			
1	Colloids	---	1
2	Adsorption	1	1
3	Chemical Bonding	1	1
4	HSAB	1	---
5	chemistry of carbon compounds	2	1
Total questions		10	8

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II B.Sc. Chemistry Paper-III (Organic Chemistry & Spectroscopy)
(At the end of III semester) w.e.f 2021-2022 (2021-2024 batch)

SYLLABUS

(Organic Chemistry)

Chemistry of Halogenated Hydrocarbons: Alkyl Halides: Methods of preparation and properties, nucleophilic substitution reactions– SN_1 and SN_2 mechanisms with stereo chemical aspects. Aryl Halides: Preparation and properties, nucleophilic aromatic substitution; Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Alcohols & Phenols

Alcohols: preparation and properties, Bouvet Blanc Reduction; Oxidation Of Diols by Per iodic acid and lead Tetraacetate, Pinacol- Pinacolone Rearrangement;

Phenols: Preparation And Properties; Acidity of phenols, Reimer–Tiemann and Kolbe’s–Schmidt Reactions, Fries and Claisen Rearrangement with mechanism;

Carbonyl Compounds: Structure, reactivity, preparation and properties; Nucleophilic Addition, Nucleophilic Addition-elimination reactions with ammonia derivatives Mechanisms of Aldol and Benzoin Condensation, Claisan-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann Haloform Reaction And Baeyer Villiger oxidation, oxidations and reductions (Clemmensen, wolf –kishner, with $LiAlH_4$ & $NaBH_4$).

Active Methylene Compounds:

Ethyl acetoacetate: keto-enol tautomerism, preparation by Claisen condensation,

Synthetic applications: Preparation of a) monocarboxylic acids. b) Dicarboxylic acids.

c) Reaction with urea

Diethyl malonate: preparation from acetic acid.

Synthetic applications: Preparation of a) monocarboxylic acids (propionic acid and n-butyric acid). b) Dicarboxylic acids (succinic acid and adipic acid) c) α,β -unsaturated carboxylic acids (crotonic acid). d) Reaction with urea.

Carboxylic Acids and their Derivatives : General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituent acidic strength. Preparation And Reactions Of Acid Chlorides, anhydrides, esters and amides; Claisen Condensation, Reformatsky reactions and Curtius Rearrangement Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by

Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt- Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction.

(SPECTROSCOPY)

Spectrophotometry: 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

Vibrational Spectroscopy: Classical Equation of Vibration, computation of force constant, Harmonic and anharmonic oscillator, Morse Potential curve, vibrational degrees of freedom for polyatomic molecules, Modes of vibrations in diatomic and polyatomic molecules. Selection rules for vibrational transitions, Fundamental Frequencies, overtones and hot bands. functional group and fingerprint region.

Electronic spectroscopy: 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. bathochromic and hypsochromic shifts.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

Application of Spectroscopy to Simple Organic Molecules

Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Application of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes and α,β – unsaturated compounds.

Infrared radiation and types of molecular vibrations, IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on $>C=O$ stretching absorptions).

REFERENCE BOOKS:

1. A TextBook of Organic Chemistry by Bahl and Arunbahl
2. A Textbook of Organic chemistry by I L Finar Vol I
3. Organic chemistry by Bruice
4. Organic chemistry by Clayden
5. Spectroscopy by William Kemp
6. Spectroscopy by Pavia
7. Organic Spectroscopy by J. R. Dyer
8. Elementary organic spectroscopy by Y.R. Sharma

9. Spectroscopy by P.S.Kalsi

10. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)

11. Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster. 12.

Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed.

Pearson (2012) 13. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic

Chemistry: Preparation and Quantitative Analysis, University Press (2000)

LABORATORY COURSE -III

Organic preparations: 40M

i. Acetylation of one of the following compounds:

amines (aniline, o-, m-, p- toluidine and o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any one method:

a. Using conventional method.

b. Using green approach

ii. Benzoylation of one of the following amines

(aniline, o-, m-, p- toluidine and o-, m-, p-anisidine)

a. Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method

b. Salicylic acid by green approach (using ceric ammonium nitrate).

IR Spectral Analysis 10M

IR Spectral Analysis of the following functional groups with examples

a) Hydroxyl groups

b) Carbonyl groups

c) Amino groups

d) Aromatic groups

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
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II B.Sc. Chemistry Paper-III (Organic Chemistry & Spectroscopy)
(At the end of III semester) w.e.f 2021-2022 (2021-2024 batch)

Time: 3 Hrs

Max. Marks: 75M

MODEL PAPER

PART – A

Answer any **FIVE** questions choosing at least **TWO questions** from each **SECTION - I & II.**

సెక్షన్ I మరియు సెక్షన్ II లలో ప్రతి దాని నుంచి కనీసం రెండు ప్రశ్నలు ఎన్ను కుంటూ మొత్తం ఐదు ప్రశ్నలకు సమాధానము వ్రాయండి

5X 10M = 50M

SECTION – I (ORGANIC CHEMISTRY)

1. Discuss the mechanism of SN^1 and SN^2 reactions in Alkyl Halides.
ఆల్కైల్ హాలైడ్ లలో జరిగే SN^1 మరియు SN^2 చర్యా విధానమును చర్చించుము.
2. Explain the following reactions with mechanism.
క్రింది చర్యల చర్యా సంవిధానమును వివరించండి?
a) Kolbe – Schmidt reaction (ఎ) కోల్బే - స్మిత్ చర్య
b) Riemer -Tiemann reaction (బి) రీమర్ - టీమన్ చర్య
3. Discuss the mechanism for following reactions.
క్రింది చర్యల చర్యా సంవిధానమును చర్చించుము.
(i) Perkin reaction పెర్కిన్ చర్య (ii) Benzoin condensation బెంజోయిన్ సంఘననము
4. (a) Write any two methods of preparation for carboxylic acids.
కార్బాక్సిలిక్ ఆమ్లములను తయారు చేయు ఏవైనా రెండు పద్ధతులను వ్రాయండి.
(b) Explain hydrolysis of ester with mechanism?
ఎస్టర్ల జల విశ్లేషణ చర్యను చర్యా సంవిధానముతో వివరింపుము?
5. (a) Explain any method of preparation of Diethyl malonate.
డై ఇథైల్ మెలోనేట్ తయారీకి ఏదైనా ఒక విధానమును వివరింపుము
(b) How the following are prepared from malonic ester?
డై ఇథైల్ మెలోనేట్ నుండి క్రిందివానిని ఏ విధంగా తయారుచేస్తావు
(i) Succinic acid సక్సినిక్ ఆమ్లము (ii) Crotonic acid క్రోటోనిక్ ఆమ్లము.

SECTION – II (SPECTROSCOPY)

6. State and explain Beer Lamberts law? Write any one application of it?
బీర్ లాంబర్ట్ నియమాన్ని తెల్పి వివరించండి? దాని ఏదో ఒక అనువర్తనాన్ని వ్రాయండి?
7. Discuss various types of electronic transitions with relation to their order of energy
వివిధ రకాల ఎలక్ట్రానిక్ పరివర్తనాలను వాటి శక్తి క్రమము ఆధారముగా చర్చించండి.
8. Discuss various types of stretching and bending vibrations in IR spectroscopy
పరారుణ వర్ణపట శాస్త్రం లో సాగే మరియు వంగే కంపనములు గూర్చి వివరింపుము.
9. Explain the following properties ఈక్రింది ధర్మాలను వివరించండి
(a) Chemical Shift (ఎ) రసాయన స్థానాంతరణము
(b) Spin-Spin coupling (బి) భ్రమణ-భ్రమణ యుగళత్వము
10. Write Woodward-Fieser rules for calculating λ_{max} for conjugated dienes and α, β – unsaturated carbonyl compounds , With one example each.
ఒక్కొక్క ఉదాహరణతోసంయుక్త డయానులు మరియు అసంతృప్త కార్బోనైల్ సమ్మేళనాలో λ_{max} విలువలను గుణించడానికి ఉడ్ వర్డ్-ఫిషర్ నియమములను వ్రాయండి?

PART – B

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

5 X 5M = 25M

ఏవేని ఐదు ప్రశ్నలకు సమాధానములను వ్రాయుము

11. Write any two methods for preparation of aryl halides?
ఎరైల్ హేలైడ్లను తయారు చేయు ఏవైనా రెండు పద్ధతులను వ్రాయండి?
12. Explain the mechanism for Pinacol-Pinacolone rearrangement?
పినకాల్-పినకలోన్ పునరమరికను చర్యా సంవిధానముతో వివరింపుము?
13. Explain the mechanism for Baeyer-villiger oxidation reaction.
బేయర్ విల్లిగర్ ఆక్సికరణ చర్యను చర్యా సంవిధానముతో వివరించండి?
14. Trichloro acetic acid is more acidic than acetic acid. Explain. Why?
ట్రైక్లోరో ఎసిటిక్ ఆమ్లము ఎసిటిక్ ఆమ్లము కంటే బలమైన ఆమ్లము. ఎందువలన వివరింపుము?
15. Write about single beam and double beam spectrophotometers?
ఏక గుణ కిరణపుంజము, ద్విగుణ కిరణపుంజము స్పెక్ట్రో ఫోట్ మీటర్ లను గురించి వ్రాయండి?
16. What are Chromophores and Auxochromes? Give examples
వర్ణధారిణి మరియు వర్ణవర్ధిని అనగానేమి ఉదాహరణ లను ఇవ్వండి ?
17. What is Finger print region? What is its significance?
వేలు ముద్రా ప్రాంతం అనగానేమి? దాని ప్రాముఖ్యత ఏమి?
18. What are equivalent and non-equivalent protons in a molecule?
సమతుల్య, అసమతుల్య ప్రోటాన్లు అనగా నేమి? ఒక్కొక్క ఉదాహరణ ఇవ్వండి.

BLUE PRINT

II B.Sc. Chemistry Paper-III (Organic Chemistry & Spectroscopy)
(At the end of III semester) w.e.f 2021-2022 (2021-2024 batch)

S.No		10M	5M
Organic Chemistry			
1.	Chemistry of Halogenated Hydrocarbons	1	1
2.	Alcohols & phenols	1	1
3.	Carbonyl compounds	1	1
4.	Active methylene compounds	1	---
5.	Carboxylic acids and derivatives	1	1
Spectroscopy			
1.	Spectrophotometry	1	1
2.	Electronic spectroscopy	1	1
3.	Vibrational Spectroscopy	1	1
4.	Proton magnetic resonance spectroscopy (^1H -NMR)	1	1
5.	Application of Spectroscopy to Simple Organic Molecules	1	---
	Total questions	10	8

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II B.Sc. Chemistry Paper-IV (Inorganic, Organic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
SYLLABUS

(INORGANIC & ORGANIC CHEMISTRY)

Organ metallic Compounds: Definition and classification of organometallic compounds on the basis of bond type, Metal Carbonyls:18-electron rule, General methods of preparation of mono and binuclear carbonyls of 3d series. P-acceptor behaviour of carbon monoxide.

Carbohydrates: Classification and their biological importance, Monosaccharides: Constitution and absolute configuration glucose and fructose (open chain and cyclic structure), epimers and anomers, mutarotation, osazone formation from glucose and fructose Interconversions of Aldohexose to Ketohexose [(+) Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose) Kiliani-Fischer synthesis and Ruff degradation;

Amino acids and proteins: Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Essential and Non-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) Gabriel Phthalimide 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).

Heterocyclic Compounds: 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 - electrophilic 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.

(ORGANIC & PHYSICAL CHEMISTRY)

Nitro hydrocarbons

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.

Amines:

Introduction, classification, chirality in amines (pyramidal inversion), importance and general methods of preparation.

Properties : Physical properties, Basicity of amines: Effect of substituent, solvent and steric effects. Distinction between Primary, secondary and tertiary amines using Hinsberg's Method And Nitrous Acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann- Bromamide Reaction, Carbylamine Reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction and Cope elimination.

Photochemistry: Difference between thermal and photochemical processes, Laws of photochemistry- Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized reactions.

Thermodynamics: The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirchoffs equation, Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non- spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.

REFERENCE BOOKS:

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

8. A Text Book of Organic Chemistry by Bahl and Arunbahl
9. A Text Book of Organic chemistry by I L Finar Vol I
10. A Text Book of Organic chemistry by I L Finar Vol II
11. Advanced physical chemistry by Gurudeep Raj

LABORATORY COURSE -IV

Organic Qualitative analysis 50 M

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

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

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(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing at least **TWO questions** from each **SECTION - I & II.**

సెక్షన్ I మరియు సెక్షన్ II లలో ప్రతి దాని నుంచి కనీసం రెండు ప్రశ్నలు ఎన్నుకుంటూ మొత్తం ఐదు ప్రశ్నలకు సమాధానం వ్రాయండి

5X 10M = 50M

SECTION – I (INORGANIC & ORGANIC CHEMISTRY)

1. What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples.
సేంద్రీయ లోహ సమ్మేళనాలు అనగానేమి? బంధ స్వభావము ఆధారముగా వాటి వర్గీకరణను ఉదాహరణలతో చర్చించండి?
2. Give an account of open chain structure of glucose.
గ్లూకోజ్ యొక్క వివృత శృంఖల నిర్మాణమును గూర్చి వ్రాయుము.
3. Write about the formation of osazone in glucose? How do you convert an aldohexose to Ketohexose
గ్లూకోజ్ లో ఓసజోన్ ఏర్పడుటను గూర్చి వ్రాయుము. ఆల్డో హెక్సోజ్ ను కీటో హెక్సోజ్ గా ఏవిధంగా మార్చవచ్చు తెల్పుము?
4. Write any two methods of preparation and any three chemical properties for amino acids
ఎమినో ఆమ్లాలను తయారుచేయుటకు ఏవేని రెండు పద్ధతులను మరియు వాటియొక్క ఏవేని మూడు రసాయన ధర్మాములను వ్రాయుము.
5. How do you prepare pyrrole from Paul Knorr synthesis? Write any three chemical properties of pyrrole.
పాల్ నార్ సంశ్లేషణ ద్వారా పిర్రోల్ ను ఎలా తయారుచేస్తారు? పిర్రోల్ యొక్క ఏవైనా మూడు రసాయన ధర్మాలను వ్రాయండి?

SECTION – II (ORGANIC & PHYSICAL CHEMISTRY)

6. Write the mechanism for the following. (i)Nef reaction (ii) Mannich reaction
క్రింది చర్యల చర్యా సంవిధానమును వివరించండి? (1)నెఫ్ చర్య (2)మానిచ్ చర్య
7. Explain Hinsberg method for the separation of a mixture of 1°, 2° and 3° amines
హిన్స్ బర్గ్ విధానములో 1°, 2° మరియు 3° ఎమిన్ల మిశ్రమమును ఎట్లు వేరు చేయుదురు? వివరించండి
8. What is meant by Quantum yield? Quantum yield for the reaction $H_2 + Br_2 \rightarrow 2HBr$ is very low. Explain.
క్వాంటం ప్రాప్తి అనగానేమి? $H_2 + Br_2 \rightarrow 2HBr$ చర్యకు క్వాంటం ప్రాప్తి తక్కువ. వివరింపుము.
9. Explain Carnot cycle? Derive an expression for the efficiency of an engine working between two temperatures.

కార్నోచక్రమును వివరింపుము. రెండు ఉష్ణోగ్రతల మధ్య పనిచేసే యంత్రం సామర్థ్యాన్ని లెక్కించు సమీకరణమును ఉత్పాదించుము.

10. State and explain the first law of thermodynamics. Derive an expression for the work done in reversible isothermal expansion of an ideal gas.

ఉష్ణగతిక శాస్త్ర ప్రథమ నియమాన్ని చర్చింపుము. సమోష్ణోగ్రత ఉత్క్రమణీయ వ్యాకోచములో ఒక ఆదర్శవాయువు చేసే పనికి సమీకరణమును రాబట్టుము.

PART – B

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

5 X 5M = 25M

ఏవైనా ఐదు ప్రశ్నలకు సమాధానములు వ్రాయండి?

11. Write any two methods of preparations of mono nuclear carbonyls of 3d series
3d-శ్రేణి లోని ఏక అణుక కార్బోనైల్స్ యొక్క ఏవైనా రెండు తయారు చేయు విధానాలను వ్రాయండి?
12. What are epimers and anomers. Give examples.
ఎపిమర్లు మరియు ఏనోమర్లు అనగానేమి ? ఉదాహరణలు ఇవ్వండి?
13. Explain the classification of amino acids based on their nature?
ఎమినో ఆమ్లాల స్వభావము ఆధారముగా వాటి వర్గీకరణను వివరింపుము.
14. Explain the basicity of pyridine.
పిరిడిన్ క్షారత్వమును వివరించుము.
15. Explain the Tautomerism of Nitro alkanes.
నైట్రో ఆల్కేనులలో టాటోమెరిజంను వివరించండి?
16. Write any two preparations of primary amines?
ప్రైమరీ ఎమీనుల ఏవైనా రెండు తయారీ విధానాలను వ్రాయండి?
17. Write short notes on Einstein's law of Photo chemical equivalence
ఐన్ స్టీన్ కాంతి రసాయన తుల్యతా నియమమును గూర్చి ఒక లఘు వ్యాఖ్య వ్రాయము
18. Define heat capacities and derive $C_p - C_v = R$
ఉష్ణధారణ సామర్థ్యమును నిర్వచించండి మరియు $C_p - C_v = R$ ను ఉత్పాదించండి?

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II B.Sc. Chemistry Paper-IV (Inorganic, Organic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)

S.No		10M	5M
Inorganic & Organic Chemistry			
1	Organ metallic Compounds	1	1
2	Carbohydrates	2	1
3	Amino acids	1	1
4	Heterocyclic compounds	1	1
Organic & Physical Chemistry			
1	Nitro hydrocarbons	1	1
2	Amines	1	1
3	Photo Chemistry	1	1
4	Thermodynamics	2	1
	TOTAL	10	08

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
(Affiliated to Adikavi Nannaya University)
Accredited by NAAC with “A” Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-V (Inorganic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
SYLLABUS

(INORGANIC CHEMISTRY)

Coordination Chemistry: IUPAC nomenclature of coordination compounds, Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outer orbital complexes. Limitations of VBT, Crystal Field Theory:- Splitting of d-orbitals in Octahedral, Tetrahedral and Square-planar complexes, Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of crystal field splitting energy, Spectrochemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Jahn-Teller distortion,

Inorganic Reaction Mechanism: Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions -SN1 and SN2, Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications

Stability of metal complexes: Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

Bioinorganic Chemistry: Metal ions present in biological systems, classification of elements according to their action in biological system. biological significance of Na, K, Mg, Ca, Fe and Cl⁻. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cis-platin as an anti-cancer drug. Metalloporphyrins – Structure and functions of hemoglobin and Chlorophyll.

(PHYSICAL CHEMISTRY)

Phase rule: Concept of phase, components, degrees of freedom. Thermodynamic derivation of Gibbs phase rule. Phase diagram of one component system - water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point , freezing mixtures.

Electrochemistry: Specific conductance, equivalent conductance and molar conductance- Definition and effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications, Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel-

Onsager's equation for strong electrolytes (elementary treatment only), Application of conductivity measurements- conduct metric titrations. Electrochemical Cells- Single electrode. potential, Types of electrodes with examples: Metal- metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations. Fuel cells- Basic concepts, examples and applications

Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Enzyme catalysis- Specificity, factors affecting enzyme catalysis,

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

LABORATORY COURSE -V

Conductometric and Potentiometric Titrimetry 50 M

1. **Conductometric titration-** Determination of concentration of HCl solution using standard NaOH solution.
2. **Conductometric titration-** Determination of concentration of CH₃COOH Solution using standard NaOH solution.
3. **Conductometric titration-** Determination of concentration of CH₃COOH and HCl in a mixture using standard NaOH solution.
4. **Potentiometric titration-** Determination of Fe (II) using standard K₂Cr₂O₇ solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis.

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
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Accredited by NAAC with "A" Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-V (Inorganic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing at least **TWO questions** from each **SECTION - I & II.**

సెక్షన్ I మరియు సెక్షన్ II లలో ప్రతి దాని నుంచి కనీసం రెండు ప్రశ్నలు ఎన్నుకుంటూ మొత్తం ఐదు ప్రశ్నలకు సమాధానం వ్రాయండి

5X 10M = 50M

SECTION – I (INORGANIC & ORGANIC CHEMISTRY)

10. Write the salient features of Crystal field theory. Explain the splitting of d-orbitals in Octahedral complexes.
స్పటిక క్షేత్ర సిద్ధాంతము యొక్క ముఖ్యాంశాలు వ్రాయుము. అష్టముఖి సంశ్లిష్టాలలో d -ఆర్బిటాళ్ళ విభజనను వివరింపుము.
11. Write the salient features of Valency Bond Theory and explain the formation of $[\text{Fe}(\text{CN})_6]^{4-}$ ion.
సంయోజకత బంధ సిద్ధాంతములోని ముఖ్యాంశాలను వ్రాయండి మరియు $[\text{Fe}(\text{CN})_6]^{4-}$ అయాన్ ఏర్పడు విధానమును వివరించండి.
3. What are labile and inert complexes? Explain SN_1 and SN_2 substitution reactions in square planar complexes.
క్రియాశీల సంశ్లిష్టాలు మరియు జడ సంశ్లిష్టాలు అనగా నేమి? సమతల చతురస్ర సమ్మేళనాల లో జరుగు SN_1 మరియు SN_2 ప్రతిక్షేపణ చర్యలు వివరించండి.
4. Explain the factors that affect the stability of complexes.
సంశ్లిష్టాల స్థిరత్వమును ప్రభావితం చేయు అంశాలను గూర్చి వివరించుము.
5. Write the importance of Sodium, Potassium and Chloride ions in biological systems.
జీవ సంబంధమైన వ్యవస్థపై సోడియం, పొటాషియం మరియు క్లోరైడ్ అయాన్లకు గల ప్రాధాన్యతను వివరించండి.

SECTION – II (ORGANIC & PHYSICAL CHEMISTRY)

6. What is condensed phase rule? Explain the phase diagram of silver-lead system?
క్షయీకృత ప్రావస్తా నియమము అనగానేమి? సిల్వర్-లేడ్ వ్యవస్థ యొక్క ప్రావస్తా చిత్ర పటమును వివరించండి?
7. What is Transport number? How is transport number of an ion determined by Hittorf's method?
అభి గమన సంఖ్య అనగా నేమి ? హిట్టార్ఫ్ పద్ధతిలో ఒక అయాన్ యొక్క అభిగమన సంఖ్యను ఏ విధముగా నిర్ణయిస్తారు?
8. State and explain Kohlrausch's law? What are its applications?
కోల్ రాష్ నియమమును వ్రాసి వివరించండి? దాని యొక్క అనువర్తనములను వ్రాయండి?
9. What is EMF of a cell? How it is determined?

ఒక ఘటకము యొక్క EMF అనగానేమి? ఒక ఘటం EMF ను ఏ విధముగా నిర్ణయిస్తారు?

10. Define order and Molecularity of a reaction. Drive an expression for the rate constant of a first order reaction

చర్య క్రమాంకము మరియు అణుతలను నిర్వచించుము. ప్రథమ క్రమాంక చర్యయొక్క రేటు స్థిరాంకమును ఉత్పాదించుము

PART – B

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

5 X 5M = 25M

ఏవైనా ఐదు ప్రశ్నలకు సమాధానములు వ్రాయండి

11. Write note on Jahn-Teller distortion

జాన్ టెల్లర్ డిస్టార్షన్ పై సంగ్రహ వ్యాఖ్యను వ్రాయుము.

12. What is trans effect? Give one example. Write any two applications of trans effect.

ట్రాన్స్ ప్రభావము అనగా నేమి? ఒక ఉదాహరణ ఇవ్వండి. ట్రాన్స్ ప్రభావము యొక్క రెండు అనువర్తనాలను వ్రాయండి.

13. Explain job's method for the determination of composition of complexes.

సంశ్లేష్టముల సంఘటనమును కనిపెట్టుటకు జాబ్ విధానమును వివరింపుము

14. Explain job's method for the determination of composition of complexes.

సంశ్లేష్టముల సంఘటనమును కనిపెట్టుటకు జాబ్ విధానమును వివరింపుము

15. Explain the following terms with one example each? (1) Phase (2) Component.

క్రింది పదాలను ఒక్కొక్క ఉదాహరణతో వివరించండి? (1) ప్రావస్త (2) అనుఘటకములు

16. Explain the construction and working of calomel electrode?

కాలమోల్ ఎలక్ట్రోడ్ యొక్క నిర్మాణమును మరియు పని చేయు విధానాన్ని వివరించండి?

17. Explain the collision theory of bi molecular reaction

ద్విఅణువు చర్యల తాడన సిద్ధాంతమును గూర్చి వివరింపుము

18. Write any two methods for the determination of order of a reaction.

చర్యక్రమాంకమును కనుగొనుటకు ఏవేని రెండు పద్ధతులను వ్రాయుము

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II B.Sc. Chemistry Paper-V (Inorganic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)

S.No		10M	5M
Inorganic Chemistry			
1	Coordination Chemistry	2	1
2	Inorganic Reaction Mechanism	1	1
3	Stability of metal complexes	1	1
4	Bioinorganic Chemistry	1	1
Physical Chemistry			
1	Phase rule	1	1
2	Electrochemistry	3	1
3	Chemical Kinetics	1	2
	TOTAL	10	08

SRI Y.N.COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.

(Affiliated to Aadikavi Nannayya University)

Four year B.Sc. (Hons) Domain Subject: **CHEMISTRY**

III B.Sc–Semester –V, Paper VI: Environmental Chemistry

At the end of V-semester, w.e.f 2022-23 (2020-23 batch)

SYLLABUS

I.Learning Outcomes:

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

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

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

UNIT-I

Introduction 10h

Environment Definition – Concept of Environmental chemistry- Scope and importance of environmental chemistry in nowadays – Nomenclature of environmental chemistry – Pollution, Pollutant, Contaminant, Receptor, Sink, Pathway of a pollutant, Threshold limit value (TLV) Segments of environment– Composition and Structure of Atmosphere with temperature profile. Natural resources–Renewable Resources–Solar and biomass energy and Nonrenewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydrological cycle.

UNIT-II

Air Pollution 10h

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

UNIT-III

Chemical Toxicology 10h

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

UNIT-IV

Water pollution 10h

Unique physical and chemical properties of water – Classification of water pollutants – Dissolved oxygen – BOD, COD, Hardness of water – Methods to convert temporary hard water into soft water. Methods to convert permanent hard water into soft water. Eutrophication and its effects. Waste water treatment- Purification of waste water

UNIT-V

Ecosystem 10h

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

Biodiversity 10h

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

III. List of Reference books:

1. Fundamentals of ecology by M.C.Dash
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir k.Banerji
4. Water pollution, Lalude, MC Graw Hill
5. Environmental Chemistry, Anil Kumar De, Wiley Eastern Ltd.
6. Environmental analysis, SM Khopkar (IIT Bombay)
7. Environmental Chemistry by BK Sharma & H Kaur, Goel publishing house.
8. Fundamentals of Environmental Chemistry, Manahan, Stanley. E
9. Applications of Environmental Chemistry, Eugene R. Wiener
10. Web related references suggested by teacher.

Course6-D: Environmental Chemistry – Practical syllabus

IV. Lab work-Skills Outcomes:

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

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

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

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

VI. List of Reference books:

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

VII. Co-Curricular Activities:

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

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

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of spectrophotometry.

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.

(Affiliated to Aadikavi Nannayya University)

Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2020-23 batch)

III B.Sc. Paper- VI: Environmental Chemistry

MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing at least **TWO** questions from each **SECTION - I & II.**

5X10M = 50M

SECTION – I

1. Explain the structure of Atmosphere with temperature profile.
2. What are Renewable and Non-renewable energy resources? Explain the following.
i) Solar Energy ii) Atomic energy
3. What are the sources of Air pollution? Explain.
4. Describe the Green House Effect and write the consequences of it.
5. Explain the biochemical effects of pesticides.

SECTION – II

6. Explain the methods to convert permanent hard water into soft water.
7. Describe the methods for the purification of waste water.
8. Describe the types of ecosystem.
9. Discuss briefly about food chain.
10. Give detailed account on biodiversity.

PART – B

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

5 X 5M = 25M

11. Define the following terms.
a) Pollutant b) Contaminant c) Sink d) Threshold limit value (TLV)
12. Write the Reactions of atmospheric oxygen.
13. How Acid rain forms? What are its effects?
14. Explain the formation and depletion of Ozone layer.
15. Write the biochemical effect of Cyanide.
16. What is Eutrophication? What are its effects?
17. Write the structure of the Ecosystem.
18. What is the necessity of protecting the Biodiversity?

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Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2020-23 batch)

III B.Sc. Paper- VI: Environmental Chemistry

S.No		10M	5M
Section-I			
1	UNIT I: Introduction	2	2
2	UNIT II: Air pollution	2	2
3	UNIT III: Chemical Toxicology	1	1
Section-II			
1	UNIT IV: Water pollution	2	1
2	UNIT V: Ecosystem	2	1
3	Biodiversity	1	1
	Total questions	10	08

SRI Y.N.COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.

(Affiliated to Aadikavi Nannayya University)

Four year B.Sc. (Hons) Domain Subject: **CHEMISTRY**

III B.Sc–Semester –V, Paper VII: Green Chemistry and Nanotechnology

At the end of V-Semester w.e.f 2022-23 (2020-23 batch)

SYLLABUS

1. Learning Outcomes:

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

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

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

UNIT-I Green Chemistry: Part- I

10 hrs

Introduction-Definition of green Chemistry, Need for green chemistry, Goals of Green chemistry
Basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction

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

UNIT- II Green Chemistry: Part- II

10 hrs

A) Selection of solvent:

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

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

C) Green energy and sustainability.

UNIT-III Microwave and Ultrasound assisted green synthesis:

10 hrs

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

UNIT-IV: Green catalysis and Green synthesis

10 hrs.

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

1. Green synthesis of the following compounds: adipic acid, catechol, disodium menudo acetate(alternative Strecker's synthesis)

2. Microwave assisted reaction in water –Hoffmann elimination – methyl benzoate to benzoic acid –oxidation of toluene and alcohols–microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction.
3. Ultrasound assisted reactions–sonochemical Simmons–Smith reaction (ultrasonic alternative to iodine)

UNIT – V: Nanotechnology and Material science

10 hrs

Nanotechnology:

Basic concepts of Nano science and Nanotechnology, Synthetic techniques of nanomaterials - Bottom-up approach and Top down approaches. Classification, properties and application of Nanomaterials.

Material science:

Super conductivity-transition temperature, properties and applications of superconductors, Types of super conductors-difference between type-I and type-II super conductors, Meissner effect, magnetic levitation, Composite materials-particle reinforced composites and fibre reinforced composites.

III. Lab work - Skills Outcomes:

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

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

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

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

V. Reference books:

1. Green Chemistry Theory and Practical. P.T.Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Principles and practice of heterogeneous catalysis, Thomas J.M., Thomas M.J., John Wiley
6. Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava, Narosa Publications
7. Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press (2008).
8. Green Processes for Nanotechnology: From Inorganic to Bioinspired Nanomaterials,

Vladimir A. Basiuk, Elena V. Basiuk Springer (2015)

9. Web related references suggested by teacher.

VI. Co-Curricular Activities:

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

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

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

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

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

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of Green chemistry and Nanosynthesis.

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.

(Affiliated to Aadikavi Nannayya University)

Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2020-23 batch)

III B.Sc. Paper- VII: Green Chemistry and Nanotechnology

MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any five questions choosing at least two questions from each SECTION - I & II.

సెక్షన్-I మరియు సెక్షన్-II లలో ప్రతి దాని నుంచి కనీసం రెండు ప్రశ్నలు ఎన్నుకుంటూ మొత్తం ఐదు ప్రశ్నలకు సమాధానము వ్రాయండి

5X10 = 50M

SECTION – I

1. Write the 12 basic principles of Green Chemistry?

హరిత రసాయన శాస్త్రము యొక్క 12 ప్రాథమిక సూత్రాలను వ్రాయండి

2. Illustrate the sonication method with any two reactions

ఏవైనా రెండు చర్యలను సోనికేషన్ పద్ధతిని వర్ణించండి

3. Describe the preparation and properties of super critical carbon dioxide

సూపర్ క్రిటికల్ కార్బన్ డయాక్సైడ్ యొక్క ధర్మాలు మరియు తయారు చేయు విధానాన్ని వర్ణించండి

4. Explain the synthesis of fused anthroquinones by microwave assisted organic synthesis

మైక్రో వేవ్ ఆధారిత సేంద్రియ సంశ్లేషణ ప్రకారము fused anthroquinones యొక్క సంశ్లేషణ వివరించండి

5. Explain the following by Microwave and Ultrasound assisted green synthesis

మైక్రో వేవ్ మరియు అల్ట్రా సౌండ్ ఆధారిత హరిత సంశ్లేషణ ద్వారా ఈ క్రింది వాటిని వివరించండి

a) Aldol condensation ఆల్డోల్ సంయుగ్మము b) Cannizzaro reaction కన్నిజారో చర్య

c) Diels-Alder reaction డీల్స్ ఆల్డర్ చర్య

SECTION – II

6. How are adipic acid and catechol prepared by Green Synthesis?

హరిత సంశ్లేషణ ద్వారా ఎడిపిక్ ఆమ్లము మరియు కాటాచాల్ ను ఏ విధముగా తయారు చేయుదురు?

7. Explain the following by Microwave assisted reactions in water.

నీటిలో మైక్రో వేవ్ ఆధారిత చర్యల ద్వారా ఈ క్రింది వాటిని వివరించండి

a) Hoffmann elimination హాఫ్ మన్ నిర్మూలనా చర్య

- b) Methyl benzoate to benzoic acid మిథైల్ బెంజోయేట్ నుండి బెంజోయిక్ ఆమ్లము
- c) Oxidation of toluene and alcohol టోలెన్ మరియు ఆల్కహాల్ యొక్క ఆక్సీకరణ
8. Explain the properties and synthetic techniques of nanomaterials
నానో పదార్థాల ధర్మాలను మరియు సంశ్లేషణ సాంకేతిక పద్ధతులను వివరించండి
9. Write the properties and applications of the super conductors?
అధిసంవాహక పదార్థాల ధర్మాలు మరియు అనువర్తనాలను వ్రాయండి
10. Describe the types of super conductors in detail
అధిసంవాహక పదార్థాల రకాలను విస్తృతంగా వివరించండి

PART – B

Answer any five of the following questions.

5 X 5M = 25M

ఈ క్రింది ఏవైనా ఐదు ప్రశ్నలకు సమాధానములు వ్రాయండి

11. What is the need of green chemistry?
హరిత రసాయన శాస్త్ర ఆవశ్యకత ఏమి?
12. Discuss 100% atom economic addition reaction.
100% పరమాణు వినిమయ సంకలన చర్యను వర్ణించండి
13. Write short note on Suzuki reaction and epoxidation
సుజికి చర్య మరియు ఎపోక్సీడేషన్ లపై లఘు వ్యాఖ్య వ్రాయండి
14. Describe the green synthetic procedure for the Strecker's synthesis
హరిత సంశ్లేషణ పద్ధతి ద్వారా స్ట్రెకర్ సంశ్లేషణను వివరించండి
15. Brief about Bio catalysis
జీవ సంశ్లేషణ గూర్చి క్లుప్తము గా వ్రాయండి
16. Write the applications of Nano materials
నానో పదార్థముల అనువర్తనాలను వ్రాయండి
17. What is Meissner effect? Write its applications.
మిస్నర్ ఫలితము అనగా నేమి? దాని అనువర్తనములను వ్రాయండి
18. Explain Magnetic levitation
అయస్కాంత ఉద్ధీపనను వివరించండి

BLUE PRINT

Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2020-23 batch)

III B.Sc. Paper- VII: Green Chemistry and Nanotechnology

S.No		10M	5M
Section-I			
1	UNIT-I : Green Chemistry: Part- I	2	2
2	UNIT- II: Green Chemistry: Part- II	1	1
3	UNIT-III: Microwave and Ultrasound assisted green synthesis.	2	1
Section-II			
1	UNIT-IV: Green catalysis and Green synthesis	2	1
2	UNIT – V: Nanotechnology & Material science	3	3
	Total questions	10	08