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SEMESTER – I

Paper I - Inorganic & Organic Chemistry  60hrs (4h/w)

INORGANIC CHEMISTRY  30 hrs (2h /w)

UNIT –I
p-block elements –I  15h
Group-13: Synthesis and structure of diborane and higher boranes (B₄H₁₀ and B₅H₆),
boron-nitrogen compounds (B₃N₃H₆ and BN)
Group - 14: Preparation and applications of silanes and silicones.

UNIT-II
1. p-block elements -II 8h
Group-16: Classifications of oxides based on (i) Chemical behavior and (ii) Oxygen
content.
Group-17: Inter halogen compounds and pseudo halogens.
2. Organometallic Chemistry 7h
Definition- classification of Organometallic compounds- nomenclature, preparation,
properties and applications of alkyls of Li and Mg.

ORGANIC CHEMISTRY  30hrs (2h /w)

UNIT-III
Structural theory in Organic Chemistry 10 h
Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical
reagents including neutral molecules like H₂O, NH₃& AlCl₃).
Bond polarization: Factors influencing the polarization of covalent bonds, electro
negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b)
Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric
effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper
conjugation and its application to stability of carbonium ions, Free radicals and alkenes,
carbanions, carbenes and nitrenes.
Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical.
Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples.
UNIT-IV

1. Acyclic Hydrocarbons  

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetra halides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity-electrophilic addition of X₂, HX, H₂O (Tautomerism), Oxidation with KMnO₄, OsO₄, reduction and Polymerization reaction of acetylene.

2. Alicyclic hydrocarbons (Cycloalkanes)  

UNIT-V

Benzene and its reactivity  
Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene. Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)
Reactions - General mechanism of electrophilic substitution, mechanism of nitration, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of 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)

List of Reference Books
1. Inorganic Chemistry by J.E.Huheey
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. A textbook of qualitative inorganic analysis by A.I. Vogel
4. Organic Chemistry by Morrison and Boyd
5. A Text Book of Organic chemistry by I L Finar Vol I
6. Concise Inorganic Chemistry by J.D.Lee
**Guidelines to the Paper Setter:** The syllabus I Semester consists of Inorganic & Organic chemistry. The I Semester question paper consists of 2 sections.

**In Section- A:** Consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from Inorganic & organic part.

**In Section- B:** Consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 3 questions from Inorganic & 5 questions from organic part.

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

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**B. Sc Chemistry, Paper-I, Semester-I**

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(Inorganic & Organic Chemistry)

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc, DEGREE FIRST YEAR EXAMINATIONS
Paper –I, SEMESTER- I
(INORGANIC & ORGANIC CHEMISTRY)

Time: 3 hours  Maximum Marks: 60 Marks

PART- A
Answer ALL the questions  5x8 = 40 Marks

1. (a) Explain the Preparation, Structure and Properties of Silicones.

(OR)
(b) Define the electron deficient molecules and draw the structure of Diborane.

2. (a) Explain the different types of interhalogen compounds.

(OR)
(b) Define and classify the organometallic compounds, and write their synthetic applications.

3. (a) Describe different types of Organic Reactions with one example.

(OR)
(b) Write notes on the following.

1) Mesomeric effect  - 2) Hyper conjugation - 3) Inductive effect -

4. (a) Explain the preparation and properties of alkenes.

(OR)
(b) Explain Baeyer’s bond angle strain theory.

5. (a) Describe the structure and properties of Benzene.
(OR)

(b) Explain electrophillic substitution mechanism in Benzene in respect of nitration and Friedel craft’s acylation?

PART-B

Answer any FIVE of the following questions 5x4 = 20 Marks

6. Explain the Preparation and reactions of Hydroxylamine.

7. Classify the Oxides based on the oxygen content with one example.

8. Write any two synthesis applications of Organo Lithium Compounds.

9. Explain the Bond fission in organic Reactions.

10. Expalin the Markonikov’s rule with Example.

11. Explain the acidity of the Acetylinic hydrogen with example.

12. Expalin Friedel Crafts Alkylation reaction with Mechanism.

13. Define aromaticity and apply the Huckel’s rule to benzene and naphthalene.
LABORATORY COURSE-I

Practical-I Simple Salt Analysis  30 hrs (2 h / w)

(At the end of Semester-I)

Qualitative inorganic analysis

Analysis of simple salt containing one anion and cation from the following

Anions: Carbonate, sulphate, chloride, bromide, acetate, nitrate, borate, phosphate.

Cations: Lead, copper, iron, aluminum, zinc, manganese, nickel, calcium, strontium, barium, potassium and ammonium.
Paper II (Physical & General Chemistry) 60 hrs. (4h/w)

PHYSICAL CHEMISTRY 30 hrs (2h / w)

UNIT-I
Solid state

UNIT-II
1. Gaseous state

2. Liquid state
Structural differences between solids, liquids and gases. 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.

UNIT-III
Solutions
GENERAL CHEMISTRY

UNIT-IV
1. Surface chemistry

2. Chemical Bonding
   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).

UNIT-V
Stereochemistry of carbon compounds
   Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.
   Optical isomerism: Optical activity- wave nature of light, plane polarized light, optical rotation and specific rotation.
   Chiral molecules- definition and criteria (Symmetry elements) - Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples Glyceraldehydes, Lactic acid, Alanine, Tartaric acid, 2, 3-dibromopentane.
   D, L and R, S configuration methods and E, Z- configuration with examples.

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. Stereochemistry of Organic compounds by E L Eliel
6. Advanced Organic Chemistry by F A Carey and R J Sundberg
7. Stereochemistry by P.S.Kalsi
8. Stereochemistry of Organic compounds by D. Nasipuri
9. Advanced physical chemistry by Bahl and Tuli
10. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
**Guidelines to the Paper Setter:** The syllabus II Semester consists of Physical & General Chemistry. The II Semester question paper consists of 2 sections.

**In Section- A:** consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from Physical & General Chemistry part.

**In Section- B:** consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 4 questions from Physical & 4 questions from General Chemistry part.

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

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**B. Sc Chemistry, Paper-I, Semester-II**  
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(Physical & General Chemistry)

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc. DEGREE FIRST YEAR EXAMINATIONS
Paper –I, SEMESTER– II
(PHYSICAL & GENERAL CHEMISTRY)
(w.e.f 2019-20 revised on October-2018)

Time: 3 hours Maximum Marks: 60Marks

PART- A

Answer ALL the questions 5 x 8 = 40 Marks

1. (a) Define semi conductors? Write a detailed note on n-type and p-type semi conductors.

Or

Derive the Bragg equation of crystals.

2. Derive the Vanderwall’s equation of state for real gases? How does it explain the behavior of real gases?

Or

Derive the relationship between Vanderwaals constants and Critical Constants.

3. Explain Nernst distribution law and its applications.

Or

What is critical solution temperature? Explain the phenol-water system in terms of C.S.T.?

4. (a) Explain the paramagnetic behavior of oxygen with the help of molecular orbital energy-diagram.

Or

(b) Write any two methods of preparations of colloids?
(b) Explain Kinetic and Optical properties of colloids?

5. Explain the CIP Rules to assign the R, S configuration with examples.

Or

Explain enantiomerism and diastereomerism with suitable examples.

PART- B

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

6. Write a short note on schottky and frenkel defects in crystals?

7. What are liquid crystals? Write about their classification?

8. Write a short note on Joule Thamson Effect?


10. What are protective colloids? Explain and give their uses?

11. Discuss the structure of with the help of valance bond theory.

12. Write a short note on molecular representation in organic molecules.

UNIT –I
1. Chemistry of d-block elements: 9h
Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states

2. Theories of bonding in metals: 6h
Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

UNIT – II
3. Metal carbonyls: 7h
EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni.

4. Chemistry of f-block elements: 8h
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.

ORGANIC CHEMISTRY 30 h (2h/w)

UNIT – III
1. Halogen compounds 5 h
Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aryl alkyl, allyl, vinyl, benzyl halides.
Nucleophilic aliphatic substitution reaction – classification into $\text{SN}_1$ and $\text{SN}_2$ – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane.

2. **Hydroxy compounds**

Nomenclature and classification of hydroxy compounds.

Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols.

Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene.

Physical properties – Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water.

Identification of alcohols by oxidation with $\text{KMnO}_4$, Ceric ammonium nitrate, Luca’s reagent and phenols by reaction with $\text{FeCl}_3$.

Chemical properties:

a) Dehydration of alcohols.

b) Oxidation of alcohols by $\text{CrO}_3$, $\text{KMnO}_4$.

c) Special reaction of phenols: Bromination, Kolbe-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, azocoupling, Pinacol-Pinacolone rearrangement.

UNIT-IV

**Carbonyl compounds**

Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties: Reactivity of carbonyl group in aldehydes and ketones.

Nucleophilic addition reaction with a) $\text{NaHSO}_3$, b) HCN, c) $\text{RMgX}$, d) $\text{NH}_2\text{OH}$, e) $\text{PhNHNH}_2$, f) 2,4 DNPH, g) Alcohols-formation of hemiacetal and acetal. Base catalysed reactions: a) Aldol, b) Cannizzaro’s reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction. Oxidation of aldehydes-Baeyer-Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with $\text{LiAlH}_4$ and $\text{NaBH}_4$. Analysis of aldehydes and ketones with a) 2,4-DNPH test, b) Tollen’s test, c) Fehling test, d) Schiff’s test e) Haloform test (with equation)

UNIT-V

1. **Carboxylic acids and derivatives**


c) Kolbe reaction. **Physical properties**: Hydrogen bonding, dimeric association, acidity-strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids. **Chemical properties:**
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.

2. Active methylene compounds  

**Acetoacetic ester:** keto-enol tautomerism, preparation by Claisen condensation, Acid hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids.  

b) Dicarboxylic acids. c) Reaction with urea  

**Malonic ester:** 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.

**List of Reference Books**  
1. Selected topics in inorganic chemistry by W.D. Malik, G. D. Tuli, R.D. Madan  
2. Inorganic Chemistry J E Huheey, E A Keiter and R L Keiter  
3. A Text Book of Organic Chemistry by Bahl and Arun bahl  
4. A Text Book of Organic chemistry by I L Finar Vol I  
5. Organic chemistry by Bruice  
6. Organic chemistry by Clayden  
7. Advanced Inorganic chemistry by Gurudeep Raj  
8. Basic Inorganic Chemistry by Cotton and Wilkinson  
9. Concise Inorganic Chemistry by J.D. Lee

**LABORATORY COURSE -III**  

30 hrs. (2 h / w)

**Practical Paper-III Titrimetric analysis and Organic Functional Group Reactions**  
(At the end of Semester-III)

**Titrimetric analysis:**  
1. Determination of Fe (II) using KMnO₄ with oxalic acid as primary standard.  
2. Determination of Cu(II) using Na₂S₂O₃ with K₂Cr₂O₇ as primary standard.

**Organic Functional Group Reactions**  
3. Reactions of the following functional groups present in organic compounds (at least four) Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids and Amides
**Guidelines to the Paper Setter:** The syllabus III Semester consists of Inorganic & Organic chemistry. The III Semester question paper consists of 2 sections.

**In Section- A:** consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from Inorganic & organic part

**In Section- B:** consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 3 questions from Inorganic & 5 questions from organic part.

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

### II B.Sc, Chemistry, III Semester

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(Inorganic & Organic chemistry)

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc, DEGREE SECOND YEAR EXAMINATIONS
Paper –III, SEMESTER– III
(INORGANIC & ORGANIC CHEMISTRY)
(w.e.f 2019-20 revised on October-2018)

Time: 3 hours
Maximum Marks: 60Marks

PART- A

Answer all FIVE questions. Each question caries 8 marks. 5 X 8 = 40 Marks

1. What are transition elements? What are transition elements? Describe their variable oxidation states, Magnetic
   పƔశ్తలకు సమషంలు సమష ఆలు, ఆసంప్న దృశ్యం
   మొట్టము మినుగన పాలనలు పలుకు చేసాలను మాధ్యమం.

   OR
   Explain Band theory of metals?
   మాధ్యమం చేసుకుంటుంది.

2. What are metal carbonyls? Explain the classification of metal carbonyls?
   పంగ లేసంప్రతి వసంప్రతి వసంప్రతి వసంప్రతి వసంప్రతి వసంప్రతి
   అంశం వసంప్రతి వసంప్రతి వసంప్రతి వసంప్రతి

   OR
   What is lanthanide contraction? Explain the consequences of lanthanide Contraction?
   లంటే వైపు సఫ్టు సఫ్టు సఫ్టు సఫ్టు సఫ్టు
   సఫ్టు సఫ్టు సఫ్టు సఫ్టు

3. Explain SN¹ and SN² reaction mechanism with the help of energy profile diagram.
   SN¹ పఖాపాదం SN2 పఖాపాదం, పఖాపాదం సంఖ్య సంఖ్య సంఖ్య సంఖ్య సంఖ్య సంఖ్య
   సంఖ్య సంఖ్య సంఖ్య

   OR
   Write a brief note on the following. పఖాపాదం పఖాపాదం పఖాపాదం పఖాపాదం పఖాపాదం పఖాపాదం
   a) Acidic nature of phenols b) Riemer-Tiemann reaction c) Kolbe's reaction
   a) భేషుకుడం భేషుకుడం భేషుకుడం భేషుకుడం భేషుకుడం భేషుకుడం
   b) ముంగుడం ముంగుడం ముంగుడం ముంగుడం ముంగుడం ముంగుడం
   c) ముంగుడం ముంగుడం ముంగుడం ముంగుడం ముంగుడం ముంగుడం

4. Write any three methods of preparation of aldehydes.
   పాఠ పాఠ పాఠ పాఠ పాఠ
   పాఠ పాఠ పాఠ పాఠ పాఠ

   OR
   Explain the following reactions. పాఠ పాఠ పాఠ
   a) Aldol reaction b) Cannizzaro's reaction c) Perkin reaction

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5. Write any three methods of preparation of carboxylic acids.

OR

How do you prepare Aceto acetic ester and write any two synthetic applications of it.

SECTION – B

Answer any FIVE questions. Each question caries 4 marks 5 X 4 = 20 Marks


7. Write a short note on conductors and semi conductors.

8. Discuss structure of Nickel carbonyl and Iron carbonyl.


10. Write any two methods of Identification of alcohols.

11. Write any two reduction reactions of aldehydes.

12. Explain Huns-Diecke and HVZ reactions

13. Write any two applications of Malonic ester.
Dr. V. S. Krishna Govt. Degree & PG College (A)
(NAAC Reaccredited A Grade Institution & District Identified College)
CENTRE FOR RESEARCH STUDIES
Visakhapatnam- 530 013, Andhra Pradesh, INDIA

Semester- IV, Chemistry Syllabus
(w.e.f 2019-20 revised on October-2018)

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

SPECTROSCOPY  30 hrs (2h / w)

UNIT-I
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\textsubscript{2}Cr\textsubscript{2}O\textsubscript{7} 2. Manganese in Manganous sulphate

Electronic spectroscopy:  8h

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 (\textit{\textsuperscript{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
of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van’t Hoff factor.

UNIT-IV

Electrochemistry-I


UNIT-V

1. Electrochemistry-II

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

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
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

Guidelines to the Paper Setter: The syllabus IV Semester consists of Spectroscopy & Physical chemistry. The IV Semester question paper consists of 2 sections.
In Section - A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from Spectroscopy & Physical chemistry part.

In Section - B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 4 questions from SPECTROSCOPY & 4 questions from PHYSICAL CHEMISTRY part.

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

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc, DEGREE SECOND YEAR EXAMINATIONS

Paper –IV, SEMESTER– IV
(SPECTROSCOPY & PHYSICAL CHEMISTRY)
(w.e.f 2019-20 revised on October-2018)

Time: 3 hours

Maximum Marks: 60Marks

PART- A

Answer all FIVE questions. Each question caries 8 marks

5 x 8 = 40 Marks

1. Explain single and double beam spectrophotometers.

OR

Explain different types of electronic transitions in molecules with examples.

2. Explain different modes of vibrations in poly atomic molecules.

OR

Explain the following.

a) Equivalent, nonequivalent protons b) Chemical shift c) Spin-Spin coupling

3. Explain the following.

a) Colligative properties with examples. b) Raoult's law and relation with molecular weight of solute.

OR

Define Osmotic pressure. Explain experimental method for determination of osmotic pressure.

4. Explain Debye Huckel theory.

OR

Explain Conductometric titrations.

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5. Explain the following.

- SHE
- Calomel electrode

OR

State and explain Gibbs phase rule and explain the following.

- Phase
- Degrees of freedom
- Number of components

SECTION – B

Answer any FIVE questions. Each question carries 4 marks 5 X 4 = 20 Marks

6. What are Beer-Lambert's law and its limitations?

7. Define Chromophore and Auxochrome and give one example each?

8. Write the characteristic frequencies of absorption of alcohols and aldehydes with example.

9. Write the NMR Spectroscopy of Toluene and Ethyl acetate.

10. Write the abnormal colligative properties with examples.

11. Define specific conductance and Equivalent conductance.

12. Write short note on potentiometric titrations.

13. Write the phase diagram of Pb-Ag system.
LABORATORY COURSE-IV  
30 hrs (2 h / W)

Practical Paper - IV Physical Chemistry and IR Spectral Analysis  
(At the end of semester IV)

Physical Chemistry  
25M

a. Critical Solution Temperature- Phenol-Water system  
b. Effect of NaCl on critical solution temperature (Phenol-Water system)  
c. Determination of concentration of HCl conductometrically using standard NaOH solution.  
d. Determination of concentration of acetic acid conductometrically using standard NaOH Solution.

IR Spectral Analysis  
25 M

e. IR Spectral Analysis of the following functional groups with examples

   a) Hydroxyl groups  
   b) Carbonyl groups  
   c) Amino groups  
   d) Aromatic groups
SEMESTER-V
Paper - V (INORGANIC, PHYSICAL & ORGANIC CHEMISTRY)
45 hrs (3 h / w)

INORGANIC CHEMISTRY

UNIT – I
Coordination Chemistry: 8h
IUPAC nomenclature-bonding theories - Review of Werner's theory and Sedgwick’s concept of coordination-Valence bond theory - geometries of coordination numbers 4- tetrahedral and square planar and 6-octahedral and its limitations, crystal field theory-splitting of d-orbital’s in octahedral, tetrahedral and square-planar complexes - low spin and high spin complexes - factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

UNIT-II
1. Spectral and magnetic properties of metal complexes: 4h
Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility-Gouy method.
2. Stability of metal complexes: 3h
Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

ORGANIC CHEMISTRY

UNIT- III
Nitro hydrocarbons: 3h
Nomenclature and classification-nitro hydrocarbons, structure-Tautomerism of nitroalkanes leading to acid and keto form, Preparation of Nitroalkanes, reactivity-halogenations, reaction with HONO (Nitrous acid), Neff reaction and Mannich reaction leading to Michael addition and reduction.

UNIT- IV
Nitrogen compounds: 12h
Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods - 1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism).
Reduction of Amides and Schmidt reaction. Physical properties and basic character - Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline-comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophillic substitution of Aromatic amines -Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

PHYSICAL CHEMISTRY

UNIT- V
Thermodynamics 15h

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
10. Advanced physical chemistry by Gurudeep Raj
**Guidelines to the Paper Setter:** The syllabus V Semester consists of Inorganic, Organic & Physical Chemistry. The V Semester question paper consists of 2 sections.

**In Section- A:** consists of FIVE internal choice essay questions are to be set, each question carries 08 marks from Inorganic, Organic & Physical Chemistry part.

**In Section- B:** consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 3 questions from Inorganic, 3 questions in Organic & 2 questions from Physical part.

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

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<td>Nitro hydro carbons</td>
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<td>Thermodynamics</td>
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MODEL PAPER
Dr. V.S. Krishna Govt. Degree College (A), VISAKHAPATNAM-13
III B.Sc., V SEMESTER, END EXAMINATIONS, 2019-20
Chemistry, Paper-V
(Inorganic, Organic and Physical Chemistry-III)
(w. e. f. 2019-20)

Time: 3 hours
Max. Marks: 60 Marks

PART- A
Answer all FIVE questions. Each question caries 8 marks. 5 x 8 = 40 Marks

1. Write the important postulates of Valence Bond Theory and on the basis of VBT. How will you explain that \([\text{Ni(CO)}_4]\) is Tetrahedral while \([\text{Ni(CN)}_4]^2-\) Square planar. (Or)

Explain crystal Field Theory. Discuss the splitting of d-orbitals in Octahedral and Tetrahedral complexes by taking any one example.

2. How will you determine the composition of a complex by Job’s method and mole ration method? And write their limitations. (Or)

Explain the absorption spectrum of \([\text{Ti(H}_2\text{O)}_6]^{3+}\) with suitable diagram?

3. (a). Explain Tautomerism in nitroalkanes with one example. (b). Write any two methods of preparation of nitro alkanes. (Or)

Write any two properties of nitroalkanes.

4. How do you prepare primary amines by Hoffmann Bromamide reaction method and give it’s mechanism. (Or)

Write the reaction of \(1^0, 2^0, 3^0\) amines with \(\text{HNO}_2\).
4.  (a) How do you separate the mixture of primary, secondary and tertiary amines by Hinsberg’s method.
(b) Write the reactions
   (i) Gabriel synthesis (ii) Carbylamines reaction
(a). $1^0$, $2^0$, $3^0$ amines can be treated similarly in preparing primary amines?
(b) Primary amines can be treated similarly in preparing secondary amines?
(i) Primary amines (ii) Secondary amines?

(Or)
(a). Derive Kirchhoff’s law?
(b). Derive Gibbs Helmholtz equation?
(a). $\Delta h_{\text{reaction}}$ is the change in reaction?
(b) Reaction $\Delta h_{\text{reaction}}$ is the change in reaction?

5. Deduce the following relations
(a). $PV^r = \text{constant}$ for an adiabatic expansion of an ideal gas.
(b). $C_p - C_v = R$
(a) What is the relation between the product $PV^r = \text{constant}$?
(b). $C_p - C_v = R$ is the relation?

(Or)
(a) Derive Carnot’s cycle?
(b). Explain the significance of entropy.
(a) Which is the second law of entropy?
(b) Explain the significance of entropy?

SECTION – B
Answer any FIVE questions. Each question caries 4 marks 5 x 4 = 20 Marks

6. Write the postulates of Werner’s theory.

7. What is effective atomic number and calculate the EAN of $\text{[Pt(NH}_3\text{)}_2\text{Cl}_2]$?

8. What is chelating effect? Give examples?

9. Explain Gouy method?
10. Which is more basic among N, N–Dimethyl aniline and Aniline.

11. Explain the basic characters of amines with the suitable examples?

12. Write any one definitions of second law of thermodynamics.

UNIT-I
1. Reactivity of metal complexes: 4h
Labile and inert complexes, ligand substitution reactions - $S\text{N}^1$ and $S\text{N}^2$, substitution reactions of square planar complexes - Trans effect and applications of Trans effect.

2. Bioinorganic chemistry: 4h
Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl. Metalloporphyrins – Structure and functions of hemoglobin, Myoglobin and Chlorophyll.

PHYSICAL CHEMISTRY
UNIT-II
1. Chemical kinetics 8h
Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

2. Photochemistry 5h

ORGANIC CHEMISTRY
UNIT-III
Heterocyclic Compounds 7h
Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1, 4, - dicarboxylic compounds, Paul-Knorr synthesis.
Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenations, 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

Monosaccharides: (+) Glucose (aldo hexose) - Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylolation, 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

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
6. Instrumentation and Techniques by Chatwal and Anand
7. Essentials of Nano chemistry by pradeep
8. A Textbook of Physical Chemistry by Puri and Sharma
9. Advanced physical chemistry by Gurudeep Raj

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

Organic Qualitative Analysis: 50M
Analysis of an organic compound through systematic qualitative procedure for functional

group identification including the determination of melting point and boiling point with

suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic Primary Amines,

Amides and Simple sugars.

LABORATORY COURSE – VI

Practical Paper – VI Physical Chemistry

(at the end of semester V) 30 hrs (2 h/W)

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

2. Determination of molecular status and partition coefficient of benzoic acid in Benzene and

water.

3. Determination of Surface tension of liquid


5. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.
Guidelines to the Paper Setter: The syllabus V Semester consists of Inorganic, Organic & Physical Chemistry. The V Semester question paper consists of 2 sections.

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In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 3 questions from Inorganic, 3 questions in Organic & 2 questions from Physical part.

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MODEL PAPER
Dr. V.S. Krishna Govt. Degree College (A), Visakhapatnam-13
III B.Sc., V SEMESTER - END EXAMINATIONS 2019 - 20
Paper-VI, CHEMISTRY
(Inorganic, Organic and Physical Chemistry-VI)
(w. e. f. 2019 – 20)

Time: 3 hours Max. Marks: 60

**PART- A**
Answer all FIVE questions. Each question carries 8 marks. 5 X 8 = 40 Marks

1. Explain SN\(_1\) & SN\(_2\) reactions in metal complex compounds?

2. Discuss the Trans effect and write the theories of trans effect and its applications?

3. Explain the structure and functions of hemoglobin, chlorophyll?

4. Define first order reaction? Derive the rate equation for first order reaction?

5. Write any three methods of determination of order of reaction?

**PART- B**

6. What are fluorescence and phosphorescence? Explain with Joblonski diagram?
Explain the aromatic character of furan, pyrrole, and thiophene and write the preparation methods for the above compounds?

5. Explain the structural elucidation of glucose?

(Or)

Explain the following?

(i) Aldopentose to aldohexose
(ii) Aldohexose to aldopentose

SECTION – B

Answer any FIVE questions. Each question caries 4 marks5 X 4 = 20 Marks

6. What are labile and inert complexes? Give examples?

7. Define order and molecularity with examples?

8. State stark-Einstein law and Grothoths draper law?

9. Write chichibbin reaction with their mechanism?

10. The electrophonic substitution reaction occurs in five membered hetero cyclic compounds at position-2. Explain reason?

11. What is mutarotation? Write note in glucose mutarotation?

12. Define Zwitterions and Isoelectric point? Give its uses?
13. What are peptide bonds? What are essential amino acids? Give examples?
DEPARTMENT OF CHEMISTRY

III B.Sc. Chemistry Cluster Electives Syllabus under CBCS
Syllabus, Blue Print & Model Question Papers

WITH EFFECT FROM 2019-20

Dr. V. S. Krishna Govt. Degree & PG College (A)
(NAAC Reaccredited A Grade Institution & District Identified College)
CENTRE FOR RESEARCH STUDIES
Visakhapatnam- 530 013, Andhra Pradesh, INDIA

Board Of Studies October- 2018
### Dr. V. S. Krishna Govt. Degree & P.G. College (A), Visakhapatnam
#### III B.Sc. Semester-VI, Chemistry Cluster Electives Syllabus under CBCS
[Revised in October 2018]

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UNIT-I
Quantitative analysis: 10h
a) Importance in various fields of science, steps involved in chemical analysis. Principles of volumetric analysis. Theories of acid-base, redox, complexometric, iodometric and precipitation titrations - choice of indicators for these titrations.

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

UNIT-II
Treatment of analytical data: 7h
Types of errors, significant figures and its importance, accuracy - methods of expressing accuracy, error analysis and minimization of errors, precision - methods of expressing precision, standard deviation and confidence limit.

UNIT-III
SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS: 8h
SOLVENT EXTRACTION: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism., Application - Determination of Iron (III)
ION EXCHANGE : Introduction, action of ion exchange resins, separation of inorganic mixtures, applications, Solvent extraction: Principle and process,

UNIT – IV
Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, \( R_f \) values, factors effecting \( R_f \) values.

Paper Chromatography: Principles, \( R_f \) values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.
UNIT - V  
HPLC: Basic principles and applications.

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

LABORATORY COURSE – VI
Practical Paper – VII-(A) (at the end of semester VI)  30hrs (2 h / W)

1. Identification of amino acids by paper chromatography.
2. Determination of Zn using EDTA
3. Determination of Mg using EDTA

50M
**Guidelines to the Paper Setter:** The syllabus VI Semester consists of *Analytical methods in chemistry*. The VI Semester question paper consists of 2 sections.

**In Section- A:** Consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from *Analytical methods in chemistry*.

**In Section- B:** Consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 8 questions from *Analytical methods in chemistry*.

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

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**B. Sc Chemistry, Paper-VII (A), Semester- VI**

(ANALYTICAL METHODS IN CHEMISTRY)

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc, DEGREE FINAL YEAR EXAMINATIONS
(w.e.f 2019-20 revised on October-2018)

Paper – VII (A), SEMESTER- VI
Elective: Analytical Methods in Chemistry

Time: 3 hours  Max Marks: 60M

SECTION A

Answer all questions  5 x 8 = 40M

1. Explain about theories acid base titrations.
   Or
   Explain about gravimetric analysis.
2. Explain about Errors.
   Or
   Explain methods of expressing of precision and accuracy.
3. Explain the principle and techniques of solvent extraction.
   Or
   Explain the ion exchange resins.
4. Explain the principle and classification of chromatography methods.
   Or
   Explain about paper chromatography.
5. Explain about Thin layer chromatography.
   Or
   Explain about column chromatography.

SECTION B

Answer any five questions  5 x 4 = 20M

6. Explain about complexometric titrations.
7. Explain about digestion and ignition.
8. Explain about significant figures and its importance.
9. Explain determination of Fe (III) by using solvent extraction.
10. Explain the R_f value and factors effecting R_f value.
11. Explain about two dimensional chromatography and applications.
12. Explain principle and applications of HPLC.
13. Explain applications of column chromatography.
SEMESTER-VI
ELECTIVE PAPER - VII (B): ENVIRONMENTAL CHEMISTRY
45 hrs (3 h / w)

UNIT-I
Introduction
Concept of Environmental chemistry - Scope and importance of environment in now a
days – Nomenclature of environmental chemistry – Segments of environment - Natural
resources – Renewable Resources – Solar and biomass energy and Nonrenewable
resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and
Hydrological cycle.

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

UNIT-III
Water pollution
Unique physical and chemical properties of water – water quality and criteria for finding
of water quality – Dissolved oxygen – BOD, COD, Suspended solids, total dissolved
solids, alkalinity – Hardness of water – Methods to convert temporary hard water into
soft water – Methods to convert permanent hard water into soft water – eutrophication

UNIT-IV
Chemical Toxicology
Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic
effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and
cadmium.

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

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

List of Reference books
1. Fundamentals of ecology by M. C. Dash
3. Environmental Chemistry by Shamir K. Banerji

LABORATORY COURSE – VI

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

1. Determination of carbonate and bicarbonate in water samples (acidity and alkalinity)
2. Determination of hardness of water using EDTA
   a) Permanent hardness
   b) Temporary hardness
3. Determination of Acidity
4. Determination of Alkalinity
5. Determination of chlorides in water samples
**Guidelines to the Paper Setter:** The syllabus VI Semester consists of Environmental chemistry. The VI Semester question paper consists of 2 sections.

**In Section- A:** Consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from Environmental chemistry.

**In Section- B:** Consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 8 questions from Environmental chemistry.

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

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**B. Sc Chemistry, Paper-VII (B), Semester-VI**  
(Environmental chemistry)

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc, DEGREE FINAL YEAR EXAMINATIONS
(w.e.f 2019-20 revised on October-2018)

Paper –VII (B), SEMESTER- VI
Elective: Environmental Chemistry,

SECTION A

Answer all questions \[5 \times 8 = 40M\]

1. Explain about importance and nomenclature of environmental chemistry.
   Or
   Explain about atmospheric oxygen and Hydrological cycle.
2. Explain about air pollution.
   Or
   Explain the following
   (a) Acid rain  (b) Green house effect
3. Explain physical and chemical properties of water.
   Or
   Explain about the methods to convert permanent hard water into soft water.
4. Explain about toxicity effects of lead and mercury.
   Or
   Explain about toxicity effects of cyanide and pesticides.
5. Explain about bio chemical cycle of nitrogen and phosphorus.
   Or
   Explain about Biodiversity

SECTION B

Answer any five questions \[5 \times 4 = 20M\]

6. Explain about renewable and non renewable resources.
7. Explain about segments of environment.
8. Explain about formation and depletion of ozone.
9. Explain about controlling methods of air pollution.
11. Explain the toxicity effect of arsenic and cadmium.
12. Explain about functions and types of Eco system.
13. Write short notes on food chin and food web.
SEMESTER-VI
ELECTIVE PAPER – VII-(C) GREEN CHEMISTRY
45 hrs (3 h / w)

UNIT-I
Green Chemistry: Introduction- Definition of green Chemistry, need 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 examples of sonochemical reactions (Heck, Hundsdiecker and Wittig reactions).

UNIT-II
Selection of solvent: i) Aqueous phase reactions ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis
Super critical CO₂: Preparation, properties and applications, (decaffeination, dry cleaning)

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

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

UNIT V
Examples of green synthesis / reactions and some real world cases: 1. Green synthesis of the following compounds: adipic acid, catechol, disodium imino di acetate (alternative Strecker’s synthesis) 2. Microwave assisted reaction in water – Hoffmann elimination – methyl benzoate to benzoic acid–oxidation of toluene and alcohols – microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction. 3. Ultrasound assisted reactions–sonochemical Simmons –Smith reaction(ultrasonic alternative to iodine)
Reference books:
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
5. Green Chemistry: Introductory Text, M. Lancaster

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

1. Determination of specific reaction rate of hydrolysis for methyl acetate catalysed by hydrogen ion at room temperature.
2. Determination of molecular status and partition coefficient of benzoic acid in Benzene and water.
3. Surface tension and viscosity of liquids.
4. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.
**Guidelines to the Paper Setter:** The syllabus VI Semester consists of Green chemistry. The VI Semester question paper consists of 2 sections.

**In Section-A:** Consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 question from each unit from Green chemistry.

**In Section-B:** Consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner has to choose 8 questions from Green chemistry.

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

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**B. Sc Chemistry, Paper-VII(C), Semester-VI**  
(Green chemistry)

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MODEL PAPER

Dr. V. S Krishna Govt. Degree College, Visakhapatnam (A)
B. Sc, DEGREE FINAL YEAR EXAMINATIONS
(w.e.f 2019-20 revised on October-2018)

Paper-VII (C), SEMESTER-VI
Elective: Green Chemistry

SECTION A

Answer all questions 5 x 8 = 40M

1. Define green chemistry? Explain basic principles of green chemistry.
   Or
   Explain the following organic reactions by sonication method.
   Heck reaction (b) Hundsdiecker reaction (c) Wittig reaction
2. Explain aqueous phase reactions and reactions in ionic solids.
   Or
   Explain about preparation and properties of super critical co2.
3. Explain about apparatus and examples of MAOS.
   Or
   Explain the following reactions by using MAOS.
   (a)Aldol condensation (b) Diels Ålder reactions (c) Strecker’s synthesis
4. Explain about Heterogeneous catalysis
   Or
   Explain about phase transfer catalysis.
5. Explain the green synthesis of following compounds.
   (a) Adipic acid (b) catechol (c) Disodium imino di acetate
   Or
   Explain the microwave assisted reactions in in organic solvents.

SECTION B

Answer any five questions 5 x 4 = 20M

6. Explain about atom economy with examples.
7. Explain about Green synthesis.
8. Explain about solid support synthesis.
9. Explain about advantages and disadvantages of MAOS.
10. Explain about Cannizzaro’s reaction by using MAOS.
11. Explain about Bio catalysis.
12. Explain the microwave assisted reaction in water.
13. Explain the Ultra sound assisted reactions.
UNIT-I
Introduction of polymers:

UNIT-II
Techniques of Polymerization: Bulk polymerization, solution polymerization, suspension and Emulsion polymerization.
Molecular weights of polymers: Number average and weight average molecular weights Determination of molecular weight of polymers by Viscometry, Osmometry and light scattering methods.

UNIT-III
Kinetics of Free radical polymerization, Glass Transition temperature (Tg) and Determination of Tg:
Free volume theory, WLF equation, factors affecting glass transition temperature (Tg).

UNIT-IV
Polymer additives:
Introduction to plastic additives-fillers, Plasticizers and Softeners, Lubricants and Flow Promoters, Anti aging additives, Flame Retardants, Colorants, Blowing agents, Cross linking agents, Photo stabilizers, Nucleating agents.

UNIT-V
Polymers and their applications:
Preparation and industrial applications of Polyethylene, Polyvinyl chloride, Teflon, Polyacrylonitrile, Terelene, Nylon6.6 silicones.

Reference Books:

Guidelines to the Paper Setter: The syllabus VI Semester consists of POLYMER CHEMISTRY. The VI Semester question paper consists of 2 sections.
In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from POLYMER CHEMISTRY.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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CLUSTER ELECTIVES: Cluster Elective I
Analytical and physical

SEMESTER VI
PAPER VIII A1: POLYMER CHEMISTRY

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SECTION A

Answer all questions: 5X8=40M

1. Define a polymer? Explain the classification of polymers?
   Or
   Explain free radical and ionic polymerization mechanism of polymers with suitable examples?
2. Explain any one method to determine the molecular weight polymers?
   Or
   Explain different techniques of polymerization?
3. Define Glass transition temperature? Explain the method to determine Glass transition temperature?
   Or
   Explain the kinetics of free radical polymerization?
4. Explain about fillers plasticizers?
   Or
   Explain about anti aging additives and flame retardants?
5. Explain the preparation and industrial application of poly ethylene and poly vinyl chloride?
   Or
   Explain the preparation and industrial application of Teflon and polyacrylonitrile?

SECTION B

Answer any five questions: 5X4=20M

6. Explain about Zeigler Natta polymerization.
7. Explain about plastics and Elastomers?
8. Explain Number average and Weight average molecular weight of polymers.
9. Explain about bulk polymerization?
10. Explain the factors affecting glass transition temperature?
11. Explain about lubricants?
12. Explain about cross linking agents?
13. Explain preparation and industrial application of Terelene?
SEMESTER-VI
PAPER – VIII-A-2: INSTRUMENTAL METHODS OF ANALYSIS
45 hrs (3 h / w)

UNIT – I
Introduction to spectroscopic methods of analysis: 4 h
Recap of the spectroscopic methods covered in detail in the core chemistry syllabus:
Treatment of analytical data, including error analysis. Classification of analytical
methods and the types of instrumental methods. Consideration of electromagnetic
radiation.

UNIT – II
Molecular spectroscopy: 8h
Infrared spectroscopy:
Interactions with molecules: absorption and scattering. Means of excitation (light
sources), separation of spectrum (wavelength dispersion, time resolution), detection of
the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures,
resolution), advantages of Fourier Transform (FTIR). Samples and results expected.
Applications: Issues of quality assurance and quality control, Special problems for
portable instrumentation and rapid detection.

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

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

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

56
UNIT – V

Elemental analysis: 10h
Mass spectrometry (electrical discharges).
Excitation and getting sample into gas phase (flames, electrical discharges, plasmas),
Wavelength separation and resolution (dependence on technique), Detection of radiation
(simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic
species, matrix effects, other interferences).

NMR spectroscopy: Principle, Instrumentation, Factors affecting chemical shift,
Spin coupling, Applications. 4h

Electroanalytical Methods: Potentiometry & Voltammetry 4h

Radiochemical Methods 4h

X-ray analysis and electron spectroscopy (surface analysis)

Reference books:
1. Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis,
   Cengage Learning India Ed.
2. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. Instrumental Methods of
   Analysis, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California,
   USA, 1988.
7. W.J. Moore: Physical Chemistry
Guidelines to the Paper Setter: The syllabus VI Semester consists of INSTRUMENTAL METHODS OF ANALYSIS. The VI Semester question paper consists of 2 sections.

In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from INSTRUMENTAL METHODS OF ANALYSIS.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered.

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

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SEMESTER VI,
PAPER VIII A2
Instrumental methods of analysis

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Semester VI, Paper VIII- A2 (Instrumental methods of analysis)

SECTION A

1. Explain the classification of analytical methods?
   Or
   Explain the classification of instrumental methods?
2. Explain the advantages of Fourier transform infrared spectroscopy?
   Or
   Explain the principle and different modes of vibration in infrared spectroscopy?
3. Explain about single and double beam spectrophotometers?
   Or
   Explain about fluorescence and photoacoustic?
4. Explain gas chromatography?
   Or
   Explain the principle of mass spectroscopy?
5. Explain the principle if NMR spectroscopy?
   Or
   Explain about atomic emission and atomic fluorescence?

SECTION B

Answer any five questions 5 x 4 = 20M

6. Explain about error analysis?
7. Explain the issues of quality assurance and quality control in FTIR?
8. Explain about photomultipliers?
9. Explain about excitation sources in UV spectroscopy?
10. Explain about Electrophoresis?
11. Write short notes on Electric quadrupole?
12. Explain about chemical shift?
13. Explain about Radio chemical methods?
SEMESTER-VI
PAPER – VIII-A-3: ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIO-CHEMICAL ANALYSIS
45 hrs (3 h / w)

UNIT - I
Analysis of the following drugs and pharmaceuticals preparations:
(Knowledge of molecular formula, structure and analysis)
Analysis of anlgesics and antipyretics like aspirin
Analysis of antimalerials like chloroquine.
Analysis of drugs in the treatment of infections and infestations: penicillin.
Analysis of tuberculous drug- isoniazid.

UNIT - II
Analysis of the following drugs and pharmaceuticals preparations:
(Knowledge of molecular formula, structure and analysis)
Analysis of antihistamine drugs and sedatives like: allegra, zyrtec(citirizine), diazepam,

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

UNIT - IV
Analysis of Milk and milk products: Acidity, total solids, fat, total nitrogen, proteins, lactose, phosphate activity, casein, choride. Analysis of food materials-Preservatives: Sodium carbonate, sodium benzoate, Coloring matters,- Brilliant blue FCF.
Flavoring agents - Vanilla , diacetyl, isoamyl acetate, limonene, ethylpropionate , allyl hexanoate and Adulterants in rice and wheat, wheat flour, sago, coconut oil, coffee powder, tea powder, milk.

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

REFERENCE BOOKS :
1.F.J.Welcher-Standard methods of analysis,
2.A.I.Vogel-A text book of quantitative Inorganic analysis-ELBS,
3.F.D.Snell & F.M.Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,
4.J.J.Elving and I.M.Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,
6. Quantitative analysis of drugs in pharmaceutical formulations by P.D. Sethi, CBS Publishers and Distributors, New Delhi
7. G. Ingram - Methods of organic elemental micro analysis - Chapman and Hall.,
8. H. Winciam and Bobbles (Henry J) - Instrumental methods of analysis of food additives.,
9. H. Edward - The Chemical analysis of foods; practical treatise on the examination of food stuffs and the detection of adulterants,
10. The quantitative analysis of drugs - D.C. Garratt - Chapman & Hall.,
LABORATORY COURSE – VIII
Practical Paper – VIII-A-1: (at the end of semester VI) 30 hrs (2 h / W)

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

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

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Acetylation of 1° amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Electrophilic aromatic substitution reaction: Nitration of phenol
5. Radical coupling reaction: Preparation of 1, 1-bis -2-naphthol
6. Green oxidation reaction: Synthesis of adipic acid
7. Green procedure for Diels Alder reaction between furan and maleic anhydride

List of Reference Books
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
5. Green Chemistry: Introductory Text, M.Lancaster
Guidelines to the Paper Setter: The syllabus VI Semester consists of ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIO CHEMICAL ANALYSIS. The VI Semester question paper consists of 2 sections.

In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIO CHEMICAL ANALYSIS.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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SEMESTER-VI, PAPER VIII - A3
ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIO CHEMICAL ANALYSIS

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</table>
SEMESTER-VI, PAPER VIII- A3
Analysis of drugs, foods, dairy products & bio chemical analysis

SECTION A

Answer all questions 5 x 8 = 40M

1. Explain the analysis of analgesics and antipyretics of Aspirin?
   Or
   Explain the analysis of chloroquine?

2. Explain the analysis of Allegra?
   Or
   Explain the analysis of Diazepam?

3. Explain the analysis of Phenobarbital?
   Or
   Explain the analysis of Atenolol?

4. Explain analysis the milk (Acidity, casein, fat, proteins)
   Or
   Explain the preservatives of sodium carbonate and sodium benzoate?

5. Explain clinical analysis of Blood?
   Or
   Explain the trace elements in the body

SECTION B

Answer any five questions: 5 x 4 = 20M

6. Explain the analysis of Penicillin?
7. Explain the analysis of Ionized?
8. Explain about analysis of Citirizine?
9. Explain about the analysis of Lipitor?
10. Explain the analysis of prevacid?
11. Write about flooring agents?
12. Write about food adulterants?
13. Explain about RBC and WBC?
UNIT –I 12h
Review of energy sources (renewable and non-renewable)-classification of fuels and their calorific value. Coal: Uses of Coal (fuel and non fuel) in various industries , its composition , carbonization of coal-coal gas , producer gas and water gas- composition and uses-fractionation of coal tar-uses of coal tar based chemicals , requisites of a good metallurgical coke, coal gasification (Hydro gasification and catalytic gasification ) coal liquefaction and solvent refining.

UNIT-II 6h
Petroleum and petrol chemical industry:
Composition of crude petroleum, refining and different types of petroleum products and their applications.

UNIT-III 10h
Fractional distillation (principle and process) , cracking ( Thermal and catalytic cracking). Reforming petroleum and non petroleum fuels (LPG , CNG , LNG , biogas ) ,fuels derived from biomass , fuel from waste , synthetic fuels (gaseous and liquids) , clear fuels , petro chemicals : vinyl acetate , propylene oxide , isoprene , butadiene , toluene and its derivative xylene.

UNIT-IV 10h
Lubricants:
Classification of lubricants, lubricating oils(conducting and non conducting) , solid and semi solid lubricants , synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pore point) and their determination.

UNIT-V 7h
Batteries:
Primary and secondary batteries, battery components and their role, Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery. Fuel cells, Solar cell and polymer cell.

Reference books:
1. E.Stochi : Industrial chemistry , Vol-1,Ellis Horwood Ltd.UK

Guidelines to the Paper Setter: The syllabus VI Semester consists of Fuels and industrial inorganic materials. The VI Semester question paper consists of 2 sections.
In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from Fuels and industrial inorganic materials. 

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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CLUSTER ELECTIVE II
Fuels and industrial inorganic materials
PAPER-VIII-B1: Fuel chemistry and batteries

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CLUSTER ELECTIVE-II, Fuels and industrial inorganic materials
PAPER-VIII-B1: Fuel chemistry and Batteries

SECTION A

Answer all questions 5 x 8 = 40M

1. Explain about classification of fuels and their calorific value.
   
   Or
   
   Write brief note on coal tar.

2. Explain about composition of crude petroleum.
   
   Or
   
   Explain different types of petroleum products and their applications.

3. Explain about reforming petroleum and non petroleum fuels.
   
   Or
   
   Explain the fractional distillation and cracking.

4. Explain classification of lubricants.
   
   Or
   
   Explain about properties of lubricants.

5. Explain the primary and secondary batteries.
   
   Or
   
   Explain battery components and their role and characteristics of battery.

SECTION B

Answer any five questions 5 x 4 = 20M

6. Explain the uses of coal in various industries.

7. Explain about renewable and non renewable energy sources.

8. Explain refining of crude petroleum.

9. Write about synthetic fuels.

10. Write about petro chemicals.

11. Write about synthetic lubricants.

12. Explain the working of Li battery.

13. Explain the working of fuel cells.
SEMESTER-VI
PAPER-VIII-B-2: INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE
45 hrs (3 h / w)

UNIT - I
Recapitulation of s- and p-Block Elements 8h
Periodicity in s- and p-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electronegativity (Pauling, Mulliken, and Alfred - Rochow scales). Allotropy in C, S, and P. Oxidation states with reference to elements in unusual and rare oxidation states like carbides and nitrides), inert pair effect, diagonal relationship and anomalous behaviour of first member of each group.

UNIT – II
Silicate Industries 15h
Glass: Glassy state and its properties, classification (silicate and non-silicate glasses). Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.
Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes carbon nanotubes and carbon fibre.
Cements: Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

UNIT – III
Fertilizers: 8h
Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.

UNIT – IV
Surface Coatings: 8h

UNIT – V
Alloys: 6h
Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.

Chemical explosives:
Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.
Reference Books:
E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut
Guidelines to the Paper Setter: The syllabus VI Semester consists of Inorganic materials of industrial importance. The VI Semester question paper consists of 2 sections.

In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from Inorganic materials of industrial importance.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered.
The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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Paper- VIII B-2:
Inorganic materials of industrial importance

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Answer all questions

1. Explain electronegativity of s and p block elements by using Pauling and Mulliken scales.
   - Explain the allotropy of C, S and P.
2. Explain the composition and properties of the following
   (a) Soda lime glass        (b) borosilicate glass
   (b) Photo sensitive glass  (d) colored glass
   - Explain the classification, manufacture and setting process of cement.
3. Explain the manufacture of the following fertilizers.
   (a) Urea (b) ammonium nitrate (c) calcium ammonium nitrate
   - Explain the manufacture of the following fertilizers
   (a) Ammonium phosphate (b) poly phosphate (c) super phosphate
4. Explain about special paints.
   - Explain the paints and pigments.
5. Explain the classification and properties of different types of steels.

Answer any five questions

6. Explain atomic size and ionization enthalpy of s and p block elements.
7. Explain about diagonal relationship of elements.
8. Write short notes on Ceramics.
10. Write about mixed fertilizers.
11. Explain classification of surface coatings.
12. Explain the surface treatment of steels.
13. Explain preparation and explosive Properties of RDX.
SEMESTER-VI
PAPER – VIII-B-3: ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS
45 hrs (3 h / w)

UNIT-I
Analysis of soaps: moisture and volatile matter, combined alkali, total fatty matter, free alkali, total fatty acid, sodium silicate and chlorides.
Analysis of paints: Vehicle and pigments, Barium Sulphate, total lead, lead chromate, iron pigments, zinc chromate

UNIT-II
Analysis of oils: saponification value, iodine value, acid value, ester value, bromine value, acetyl value.
Analysis of industrial solvents like benzene, acetone, methanol and acetic acid,
Determination of methoxyl and N-methyl groups.

UNIT-III
Analysis of fertilizers: urea, NPK fertilizer, super phosphate,
Analysis of DDT, BHC, endrin, endosulfone, malathion, parathion,
Analysis of starch, sugars, cellulose and paper,

UNIT-IV
Gas analysis: carbon dioxide, carbon monoxide, oxygen, hydrogen, saturated hydro carbon, unsaturated hydrocarbons, nitrogen, octane number, cetane number
Analysis of Fuel gases like: water gas, producer gas, kerosene (oil) gas.
Ultimate analysis: carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur,

UNIT - V
Analysis of Complex materials:
Analysis of cement - loss on ignition, insoluble residu, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydrid.
Analysis of glasses - Determination of silica, sulphuur, barium, arsinic, antimony, total R₂O₃, calcium, magnesium, total alkaliies, aluminium, chloride, fluoride

SUGGESTED BOOKS:
1. F.J. Welcher-Standard methods of analysis,
2. A.I. Vogel-A text book of quantitative Inorganic analysis-ELBS,
3. H.H. Willard and H. Deal- Advanced quantitative analysis- Van Nostrand Co,
4. F.D. Snell & F.M. Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,
5. J.J. Elving and I.M. Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,
6. G.Z. Weig - Analytical methods for pesticides, plant growth regulators and food additives - Vols I to VII.
LABORATORY COURSE – VIII
Practical Paper – VIII-B-1: (at the end of semester VI) 30 hrs (2 h / W)

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

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

30 hrs (2 h / W)

8. 2.Acetylation of 1° amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
5. Electrophilic aromatic substitution reaction: Nitration of phenol
6. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
9. Green oxidation reaction: Synthesis of adipic acid
10. Green procedure for Diels Alder reaction between furan and maleic anhydride

List of Reference Books
4. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly

Guidelines to the Paper Setter: The syllabus VI Semester consists of Analysis of applied industrial products. The VI Semester question paper consists of 2 sections.
In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from Analysis of applied industrial products.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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PAPER-VIII B-3

Analysis of applied industrial products

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PAPER-VIII B-3: Analysis of applied industrial products

Answer all questions: 5 x 8 = 40M

1. Explain the analysis of soap.
   Or
   Explain the analysis of paints.
2. Explain the analysis of oils.
   Or
   Explain the analysis of following industrial solvents.
   (a) Benzene  (b) Acetone  (c) methanol
3. Explain the analysis of following fertilizers.
   (a) Urea  (b) NPK fertilizer
   Or
   Explain the analysis of following fertilizers (a) DDT (b) Malathion
4. Explain the following gas analysis.
   (a) Octane number  (b) saturated and unsaturated hydrocarbons
   Or
   Explain the analysis of fuel gases.
5. Explain the following factors in analysis of cement.
   (a) Lime  (b) loss on ignition (c) ferric oxide (d) magnesia
   Or
   Explain the following factors in analysis of glasses.
   (a) Sulphur  (b) Barium  (c) Arsenic  (d) Antimony

Answer any five questions: 5 x 4 = 20M

6. Explain about vehicle and pigments.
7. Explain about determination of N–methyl and methoxyl groups.
8. Explain about the analysis of sugars.
9. Explain about the analysis of papers.
10. Write short note on Cetane number?
11. Explain the analysis nitrogen and oxygen.
12. Explain about determination of Silica.
13. Explain about sesqui oxides.
UNIT-I 10h
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

UNIT – II 5h
Spin decoupling, Spin tickling, Deuterium exchange, Chemical shift reagents and nuclear overhauser effect. Applications in Medical diagnostics, Reaction kinetics and mechanically induced dynamic nuclear polarization. FT NMR and its Advantages.

UNIT-III 10h
UV & VISIBLE SPECTROSCOPY
Types of transitions, Chromophores, Conjugated dienes, trienes and polyenes, unsaturated carbonyl compounds-Woodward – Fieser rules.

UNIT-IV 5h
Electronic spectra of polyatomic molecules. Chemical analysis by Electronic Spectroscopy – Beer-Lambert’s Law. Deviation from Beer’s law. Quantitative determination of metal ions (Mn²⁺, Fe²⁺, NO₂⁻, Pb²⁺). Simultaneous determination of Chromium and Manganese in a mixture.
Electron Spin Resonance Spectroscopy

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

Applications: Detection of free radicals; ESR spectra of (a) Methyl radical (CH₃), (b) Benzene anion (C₆H₆⁻) (c) Isoquinine (d) [Cu(H₂O)₆]²⁺ (e) [Fe(CN)₅NO]⁻³ (f)

REFERENCE BOOKS:

Guidelines to the Paper Setter: The syllabus VI Semester consists of Organic spectroscopic techniques. The VI Semester question paper consists of 2 sections.

In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from Organic spectroscopic techniques.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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CLUSTER ELECTIVE-III, ORGANIC
PAPER -VIII C 1: Organic spectroscopic techniques

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MODEL PAPER

Dr. V. S. Krishna Govt. Degree & PG College (A)
(NAAC Reaccredited A Grade Institution & District Identified College)
Visakhapatnam- 530 013, Andhra Pradesh, INDIA
(w.e.f 2019-20 revised on October-2018)

Cluster Elective-III, ORGANIC
Paper -VIII C 1: Organic spectroscopic techniques

SECTION A

Answer all questions: 5 x 8 = 40M

1. Explain the principle of NMR spectroscopy.
   Or
   Explain the spin –spin interactions of AX, AX₂ and AB types.
2. Explain about FT-NMR and its advantages.
   Or
   Explain about applications in medical diagnostics, reaction kinetics and mechanically induced dynamic nuclear polarization.
3. Explain about different types of electronic transitions.
   Or
   Explain about Woodward-Fisher rules with suitable examples.
   Explain determination of Mn²⁺ by using Beer’s law.
   Or
   Explain about electronic spectra of poly atomic molecules.
5. Explain the basic principle and theory of Electronic spin resonance spectroscopy.
   Or
   Explain the following compounds using ESR spectroscopy.
   (a) Isoquinine  (b) [Cu(H₂O)₆]²⁺

SECTION B

Answer any five questions: 5 x 4 = 20M

6. Explain about chemical shift.
7. Explain factors influencing coupling constants.
8. Explain about nuclear over Hauser effect.
9. Explain about spin decoupling and spin tickling.
10. Explain about Frank Condon principle.
11. Explain simultaneous determination of chromium and manganese in a mixture.
12. Explain about Kramer degeneracy.
13. Explain hyperfine splitting and coupling constants in ESR spectroscopy.
Cluster Elective –III

ORGANIC

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

UNIT – I

ORGANIC PHOTOCHEMISTRY


Photochemical reactions: (a) Photoreduction, mechanism, influence of temperature, solvent, nature of hydrogen donors, structure of substrates on the course of photo reduction.

UNIT – II

ORGNAIC PHOTOCHEMISTRY


UNIT – III

PROTECTING GROUPS AND ORGANIC REACTIONS

Principles of (1) Protection of alcohols – ether formation including silyl ethers-ester formation, (2) Protection of carboxylic acids – ester formation, benzyl and t–butyl esters, (3) Protection of carbonyl groups-acetal, ketal, 1,2-glycols and 1,2-dithioglycols formation.

UNIT-IV


UNIT – V: NEW SYNTHETIC REACTIONS

Baylis–Hillman reaction, RCM olefm metathesis, Grubb catalyst, Heck reaction, Suziki coupling, Stille coupling and Sonogishira coupling, Click reaction.
Recommended Books

3. Importance of antibonding orbitals by Jaffe and Orchin.
10. Name Reactions by Jie Jack Li
11. Reagents in Organic synthesis by B.P. Mundy and others.
12. Tandem Organic Reactions by Tse–Lok Ho.
**Guidelines to the Paper Setter:** The syllabus VI Semester consists of ADVANCED ORGANIC REACTIONS. The VI Semester question paper consists of 2 sections.

**In Section- A:** consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from ADVANCED ORGANIC REACTIONS.

**In Section- B:** consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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**PAPER-VIII C2: ADVANCED ORGANIC REACTIONS**

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PAPER-VIII C2: ADVANCED ORGANIC REACTIONS

SECTION A

1. Explain about Joblonski diagram.
   Or
   Explain about photo reduction.

2. Explain about Norrish type I reactions.
   Or
   Explain about Norrish type II reactions.

3. Explain about protection of alcohols with suitable examples.
   Or
   Explain about protection of carbonyl compounds with suitable examples.

4. Explain the phase transfer catalysis.
   Or
   Explain Mannich reaction with mechanism.

5. Explain about Bayils-Hillman reaction.
   Or
   Explain the following reactions.
   (a) Suziki coupling   (b) Stille coupling

SECTION B

Answer any five questions 5 x 4 = 20M

6. Explain about reactions of singlet.

7. Explain structure of substrates on the course of photo reduction.

8. Explain the Barton reaction.

9. Explain about protection of carboxylic acids.

10. Explain about Witting reaction.

11. Explain Stork examine reaction.

12. Explain about click reaction.

13. Explain about RCM olefin metathesis.
Cluster Elective-III, ORGANIC

PAPER -VIII-C-3: PHARMACEUTICAL AND MEDICINAL CHEMISTRY 45hrs (3h / w)

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

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

UNIT-III

UNIT-IV
Pharmacodynamic Drugs: 1. Antiasthma Drugs (Solbutamol) 3. Antianginals (Glycerol Trinitrate) 4. Diuretics (Frusemide)

UNIT-V
HIV-AIDS:

List of Reference Books:
1. Medicinal Chemistry by Dr. B.V. Ramana
2. Synthetic Drugs by O.D. Tyagi & M. Yadav
3. Medicinal Chemistry by Ashutoshkar
4. Medicinal Chemistry by P. Parimoo
5. Pharmacology & Pharmacotherapeutics R.S. Satoshkar & S.D. Bhandenkar
6. Medicinal Chemistry by Kadametal P-I & P-II
7. European Pharmacopoeia
Guidelines to the Paper Setter: The syllabus VI Semester consists of PHARMACEUTICAL AND MEDICINAL CHEMISTRY. The VI Semester question paper consists of 2 sections.

In Section- A: consists of FIVE internal choice essay questions are to be set, each question carries 8 marks. The examiner has to choose 2 questions from each unit from PHARMACEUTICAL AND MEDICINAL CHEMISTRY.

In Section- B: consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered. The examiner is requested to set question in such a way that the entire syllabus is reflected in the question paper set by him.

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PAPER- VIII C 3: PHARMACEUTICAL AND MEDICINAL CHEMISTRY

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(w.e.f 2019-20 revised on October-2018)

PAPER- VIII C 3: Pharmaceutical and medicinal chemistry

SECTION A

Answer all questions  5 x 8 = 40M

1. Explain the following
   (a) Pharmacy (b) pharmacology (c) pharmacophore
   Or
   Explain the following
   (a) Pharmacodynamics (b) pharmacokinetics

2. Explain the classification of drugs.
   Or
   Explain administration of drugs.

3. Explain the synthesis and therapeutic activity of chloroquine.
   Or
   Explain the synthesis and therapeutic activity of antibiotics.

4. Explain the synthesis and therapeutic activity of salbutamol.
   Or
   Explain the synthesis and therapeutic activity of Glycerol trinitrate.

5. Explain the various drugs available in the treatment of HIV- AIDS.
   Or
   Define HIV- AIDS? Explain the factors that cause HIV- AIDS.

SECTION B

Answer any five questions  5 x 4 = 20M


7. Explain the nomenclature of drugs.

8. Explain the synthesis and therapeutic activity of Levodopa.

9. Explain the synthesis and therapeutic activity of paracetamal.

10. Explain the synthesis and therapeutic activity of Diuretics.

11. Write the structure and therapeutic activity of sulphamethaoxazole

12. Write short notes on CD₄ and CD₈ cells.

DEPARTMENT OF CHEMISTRY

Inter Disciplinary Add On Course
CLINICAL LAB TECHNOLOGY

Model Curriculum- Inter Disciplinary Add on Course
Syllabus & Model Question Papers

WITH EFFECT FROM 2018-19

Dr. V. S. Krishna Govt. Degree & PG College (A)
(NAAC Reaccredited A Grade Institution & District Identified College)
CENTRE FOR RESEARCH STUDIES

87
MODULE- I (Clinical Lab Technology) 18 hrs

1. Solutions: 2 hrs
Definition, different concentration methods

2. Carbohydrates and Lipids 4 hrs
(a) Carbohydrates: Definition, biological importance, classification, qualitative tests
(b) Lipids: Definition, biological importance, classification and clinical importance.

3. Amino acids Proteins 4 hrs
Definition, biological importance, classification, qualitative tests.

4. Vitamins and Minerals 4 hrs
(a) Vitamins: Classification, source, deficiency diseases
(b) Minerals: source, importance, deficiency diseases and clinical tests

5. Blood composition 4 hrs
Blood composition functions tests

6. Practical 12hrs
(a) Blood tests, group identification, hemoglobin, other tests
(b) Blood sugar test
(c) Lipid profile test
(d) Liver function test
(e) Kidney function test

(f) Serum calcium, Sodium, Potassium test
Guidelines to the Paper Setter:

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

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

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

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

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

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Inter Disciplinary Add on Course
Clinical Lab Technology
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Time: 3 Hours 

Model Paper 

Max. Mark: 75

SECTION – A

Answer any FIVE questions. Each question carries 2 Marks  (5 X 2 = 10 Marks)

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

SECTION – B

Write any FIVE questions. Each question carries 5 Marks.  (5 X 5 = 25 Marks)

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

SECTION – C

Answer any FOUR questions. Each question carries 10 Marks. (4 X 10 = 40 Marks)

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