

# DEPARTMENT OF CHEMISTRY

## B.Sc. Chemistry Syllabus under CBCS Semester Wise Syllabus & 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 & PG College (A)

(NAAC Reaccredited A Grade Institution & District Identified College)

CENTRE FOR RESEARCH STUDIES

Visakhapatnam- 530 013, Andhra Pradesh, INDIA



## Resolutions/Minutes of the 5<sup>th</sup> Board of studies 2019-20

**Subject: Chemistry**

**Department: Chemistry**

In pursuance of conferment of Autonomous status to Dr.V.S.Krishna Govt. Degree College(A), Visakhapatnam by the UGC vide letter No.F22-1/2011(AC) dated 20.07.2011 from Dr. Manju Singh, Joint Secretary, UGC, New Delhi and Proceedings No. C-II (CDC) /Dr. V S K. Govt. College/BOS/2018 dt. 27-07-2017 of The Vice-Chancellor, Andhra University, Visakhapatnam, the 5<sup>th</sup> Board of Studies in Chemistry Subject is conducted on 12.10.2018 at 10:00 AM with the following members. The Changes will be implemented from 2019-20 academic year onwards.

MEMBER	NAME & DESIGNATION	SIGNATURE
Head of the Department (Chairman)	<b>Dr. K. Bharath Kumar Naik</b> Lecturer in Chemistry	
Faculty Members	<b>Sri. KARSS Prasad</b>	
	<b>Smt. J Laxmi Mangamma</b>	
	<b>Sri. A. Ramesh</b>	
	<b>Smt. R. Sailaja</b>	
Subject Expert (University Nominee)	<b>Dr. B. Venkateswara Rao</b> Professor, Andhra University, Visakhapatnam	
Subject Experts (from outside the parent university)	<b>Dr. V. Sambasiva Rao</b> Lecturer in Chemistry Govt. Degree College, TUNI-East Godavari(Dist)	
	<b>Dr. S. Ramakrishna</b> Lecturer in Chemistry Govt. Degree College (Men), SRIKAKULAM	
Representative Member From Industry / Corporate / Allied Area relating to Placement	<b>Dr. N. Rambabu</b> Senior Manager-QC HPCL-Visakhapatnam	
Member from Alumni	<b>Dr. Ch. V. M. K. Hari</b> HOD, Dept. of Computer Science	
Coordinator, Academic Council	<b>Dr. D. Sravan Kumar</b> Reader in Physics HOD, Dept. of Physics	
Chairperson, Academic Council	<b>Dr. V. Chandra Sekhar</b> Principal	

**Dr. V. S. Krishna Govt. Degree & P.G. College (A), Visakhapatnam**  
**B.Sc. Chemistry Syllabus Under CBCS**  
[w.e.f. 2019-20 (Revised in October 2018)]

Year	Semester	Paper	Title	Marks	Credits	
I	I	I	Inorganic and Organic Chemistry	100	03	
			Practical – I	50	02	
	II	II	Physical and General Chemistry	100	03	
			Practical – II	50	02	
II	III	III	Inorganic and organic Chemistry	100	03	
			Practical – III	50	02	
	IV	IV	Spectroscopy and Physical Chemistry	100	03	
			Practical – IV	50	02	
III	V	V	Inorganic ,Organic and Physical Chemistry	100	03	
			Practical – V	50	02	
		VI	Inorganic ,Organic and Physical Chemistry	100	03	
			Practical – VI	50	02	
	* Any one Paper from VII A, B and C	VII (A)*	Elective	100	03	
			Practical - VII A	50	02	
		<del>VII (B)*</del>	Elective	100	03	
			Practical - VII B	50	02	
		VII (C)* ✓	Elective	100	03	
			Practical - VII C	50	02	
		** Any one cluster from VIII, A, B and C	VIII (A)**	<b>Cluster Electives - I :</b>	100	03
				VIII-A-1	100	03
	VIII-A-2			100	03	
	VIII-A-3			50	02	
				50	02	
				50	02	
VIII (B)**	<b>Cluster Electives - II ::</b>	100	03			
	VIII-B-1	100	03			
	VIII- B-2	100	03			
	VIII-B-3	50	02			
		50	02			
		50	02			
VI	VIII (C)**	<b>Cluster Electives - III ::</b>	100	03		
		VIII-C-1	100	03		
		VIII-C-2	100	03		
		VIII-C-3	50	02		
			50	02		
			50	02		

VII → [e] ✓  
VIII → [c] ✓

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CENTRE FOR RESEARCH STUDIES

Visakhapatnam- 530 013, Andhra Pradesh, INDIA

Semester- I, Chemistry Syllabus

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

**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 ( $B_4H_{10}$  and  $B_5H_9$ ), boron-nitrogen compounds ( $B_3N_3H_6$  and BN)

Group - 14: Preparation and applications of silanes and silicones.

Group - 15: Preparation and reactions of hydrazine, hydroxylamine.

**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  $H_2O$ ,  $NH_3$  &  $AlCl_3$ ).

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

6 h

Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H<sub>2</sub>O, HOX, H<sub>2</sub>SO<sub>4</sub> with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Dienes - Types of dienes, reactions of conjugated dienes - 1, 2 and 1, 4 addition of HBr to 1, 3 - butadiene and Diels - Alder reaction.

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 X<sub>2</sub>, HX, H<sub>2</sub>O (Tautomerism), Oxidation with KMnO<sub>4</sub>, OsO<sub>4</sub>, reduction and Polymerization reaction of acetylene.

### 2. Alicyclic hydrocarbons (Cycloalkanes)

4 h

Nomenclature, Preparation by Freund's method, Wislicenus method. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.

## UNIT-V

### Benzene and its reactivity

10h

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 NO<sub>2</sub> 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.

**B. Sc Chemistry, Paper-I, Semester-I  
BLUE PRINT  
(Inorganic & Organic Chemistry)**

Sl. No	UNITS	Name of the chapter	8 Marks	4 Marks
<b>INORGANIC CHEMISTRY</b>				
1	UNIT-I	p-block elements –I	1	1
2	UNIT-II	p-block elements -II	2	1
		Organometallic Chemistry	1	1
<b>ORGANIC CHEMISTRY</b>				
3	UNIT-III	Structural theory in Organic Chemistry	2	1
4	UNIT-IV	Acyclic Hydrocarbons	1	1
		Alicyclic hydrocarbons (Cycloalkanes)	1	1
5	UNIT-V	Benzene and its reactivity	2	2



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: 60Marks

PART- A

Answer ALL the questions

5x8 = 40 Marks

1. (a) Explain the Preparation, Structure and Properties of Silicones.  
సిలికోన్లు తయారీ, నిర్మాణం మరియు ధర్మాలు ను వివరించండి.  
(OR)  
(b) Define the electron deficient molecules and draw the structure of Diborane.  
ఎలక్ట్రాన్ కొరత అణువులు అనగానేమి? డైబోరేన్ నిర్మాణాన్ని వ్రాయండి?
2. (a) Explain the different types of interhalogen compounds.  
అంతర హాలోజన్ సమ్మేళనాలు రకాలును వివరించండి.  
(OR)  
(b) Define and classify the organometallic compounds, and write their synthetic applications.  
కర్బన లోహ సమ్మేళనాలు అనగా నిర్వచించి, వాటి వర్గీకరణను వివరించి సంశ్లేషణ అనువర్తనాలను తెల్పండి
3. (a) Describe different types of Organic Reactions with one example.  
వివద కర్బన రసాయన చర్యలును ను ఉదాహరణతో వివరించండి.  
(OR)  
(b) Write notes on the following. ఈ క్రింది వాటిని వివరించండి.  
1) Mesomeric effect -మీసోమెరిక్ ప్రభావం 2) Hyper conjugation - అతిసంయుక్త ప్రభావం 3) Inductive effect - ప్రేరేపక ప్రభావం
4. (a) Explain the preparation and properties of alkenes.  
ఆల్కిన్ల తయారీ మరియు ధర్మాలును వివరించండి.  
(OR)  
(b) Explain Baeyer's bond angle strain theory.  
బేయర్ ప్రయాస కోణ సిద్ధాంతం ను వివరించండి.
5. (a) Describe the structure and properties of Benzene.

టెంజీన్ నిర్మాణాన్ని మరియు ధర్మాలు వివరించండి.

(OR)

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

టెంజీన్ లో జరిగే ఎలక్ట్రోఫిలిక్ ప్రతిక్షేపన చర్య విధానంలను నైట్రేషన్ మరియు ఫ్రీడెల్ క్రాఫ్ట్ యస్ట్రేషన్ లకు వివరించండి.

### PART- B

Answer any FIVE of the following questions

5x4 = 20 Marks

6. Explain the Preparation and reactions of Hydroxylamine.  
హైడ్రజీల్ అమీన్ తయారీ, చర్యలును వివరించండి.
7. Classify the Oxides based on the oxygen content with one example.  
ఆక్సిజన్ పరిమాణం ఆధారంగా ఆక్సైడ్లను ఒక ఉదాహరణతో వర్గీకరించండి.
8. Write any two synthesis applications of Organo Lithium Compounds.  
ఆర్గానో లిథియం సమ్మేళనాలు యొక్క రెండు సంశ్లేష్ట అనువర్తనములు వ్రాయండి.
9. Explain the Bond fission in organic Reactions.  
కర్పన రసాయన శాస్త్రము లో బంధ విచ్ఛిన్నం వివరించండి.
10. Explain the Markonikov's rule with Example.  
మార్కోవ్నికోవ్ నియమం ను ఉదాహరణతో వివరించండి
11. Explain the acidity of the Acetylinic hydrogen with example.  
ఎసిటిలిన్ హైడ్రోజన్ యొక్క అమ్లత్వ ధర్మాన్ని ఉదాహరణతో వివరించండి.
12. Explain Friedel Crafts Alkylation reaction with Mechanism.  
ఫ్రీడెల్ క్రాఫ్ట్ అల్కైలేషన్ చర్యను చర్య క్రమ విధానంతో వివరించండి.
13. Define aromaticity and apply the Huckel's rule to benzene and naphthalene.  
ఎరోమాటిసిటీ ని నిర్వచించి మరియు హుకెల్ నియమాన్ని టెంజీన్ మరియు నాఫ్టాలిన్ కు వర్తింపజేయండి.



## 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.

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CENTRE FOR RESEARCH STUDIES

**Visakhapatnam- 530 013, Andhra Pradesh, INDIA**

**Semester- II, Chemistry Syllabus**

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

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**Paper II (Physical & General Chemistry)**

**60 hrs. (4h/w)**

**PHYSICAL CHEMISTRY**

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

**UNIT-I**

**Solid state**

**10h**

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

**UNIT-II**

**1. Gaseous state**

**6 h**

Compression factors, deviation of real gases from ideal behavior. Vander Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The vander Waal's equation and the critical state. Law of corresponding states. Relationship between critical constants and vander Waal's constants. Joule Thomson effect.

**2. Liquid state**

**4 h**

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**

**10h**

Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure- temperature curves. Azeotropes-HCl-H<sub>2</sub>O, ethanol-water systems and fractional distillation. Partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

## UNIT-IV

**1. Surface chemistry****8 h**

Definition of colloids. Solids in liquids (sols), preparation, purification, properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid.

Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

Adsorption: Physical adsorption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applications of adsorption

**2. Chemical Bonding****7h**

Valence bond theory, hybridization, VB theory as applied to  $\text{ClF}_3$ ,  $\text{Ni}(\text{CO})_4$ , Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules ( $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{CO}$  and  $\text{NO}$ ).

## UNIT-V

**Stereochemistry of carbon compounds****15 h**

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.

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

Sl. No	Units	Name of the chapter	8 Marks	4 Marks
<b>PHYSICAL CHEMISTRY</b>				
1	UNIT-I	Solid state	2	1
2	UNIT-II	Gaseous state	2	1
		Liquid state	-	1
3	UNIT-III	Solutions	2	1
<b>GENERAL CHEMISTRY</b>				
4	UNIT-IV	Surface chemistry	1	1
		Chemical Bonding	1	1
5	UNIT-V	Stereochemistry of carbon compounds	2	2

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.

అర్ధ వాహకాలు ను నిర్వచించండి? n-రకం మరియు p-రకం అర్ధ వాహకాలు గురించి వివరించండి.

Or

Derive the Brags equation of crystals.

స్పటికాలు యొక్క బ్రాగ్ సమీకరణంను రాబట్టండి.

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

నిజ వాయువులకు వాండర్వాల్స్ సమీకరణంరాబట్ట నుం. ఇది నిజ వాయువుల యొక్క స్వభావాన్ని ఏ విధముగా వివరించినను.

Or

Derive the relationship between Vanderwaals constants and Critical Constants.

వాండర్వాల్స్ స్థిరాంకాలు మరియు సందిగ్ధ స్థిరాంకాలు మధ్య సంబాధాన్ని రాబట్టండి.

3. Explain Nernst distribution law and its applications.

నెర్న్ స్ట్ వితరణ నియమము ను మరియు వాటి అనువర్తనములను వివరించండి.

Or

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

సందిగ్ధ ద్రావణ ఉష్ణోగ్రత అనగా నేమి? ఫినోల్- నీరు యొక్క C.S.T ని వివరించండి.

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

అణు ఆర్బిటాల్ శక్తి పటం ఆధారంగా ఆక్సిజన్ పారా అయిస్కాంత ధర్మాన్ని వివరించండి.

Or

(a) Write any two methods of preparations of colloids?

కొల్లాయిడులు యొక్క ఏవైనా రెండు తయారీలను వ్రాయండి.

(b) Explain Kinetic and Optical properties of colloids?  
కొల్లాయదులు యొక్క గతిక మరియు కాంతి దర్శాలును వివరించండి.

5. Explain the CIP Rules to assign the R, S configuration with examples.  
R, S విన్యాసాన్ని నిర్ణయించే CIP నియమాలు ను వివరించండి.

Or

Explain enantiomerism and diastereomerism with suitable examples.  
ఎనన్షియోమెరిజం మరియు డయాస్టేరియోమెరిజంలను ఉదాహరణలతో వివరించండి.

### 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?  
స్పటికాలలో షాట్కీ మరియు ఫ్రెనికల్ లోపాలు ను వివరించండి.
7. What are liquid crystals? Write about their classification?  
ద్రవ స్పటికాలు అనగా నేమి. వాటి యొక్క వర్గీకరణను వ్రాయండి.
8. Write a short note on Joule Thomson Effect?  
జౌల్ థామ్సన్ ప్రభావం గురించి వ్రాయండి.
9. State and explain Raoult's Law.  
రౌల్ట్ నియమం ను నిర్వచించి, వివరించండి.
10. What are protective colloids? Explain and give their uses?  
రక్షక కొల్లాయదులు అనగానేమి? వాటి ఉపయోగాలు ని వివరించండి.
11. Discuss the structure of with the help of valance bond theory.  
 $Ni(CO)_4$  నిర్మాణాన్ని వెలన్సి బంధ సిద్ధాంత ఆధారముగా వివరించండి.
12. Write a short note on molecular representation in organic molecules.  
కర్బన అణువులలో అణువుల ప్రాతినిధ్యం పై చిన్న వ్యాసం రాయండి.
13. Explain E, Z configuration with Examples.  
E, Z విన్యాసాన్ని ఉదాహరణలతో వివరించండి.

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

Paper III (INORGANIC & ORGANIC CHEMISTRY) 60 hrs (4 h / w)

INORGANIC CHEMISTRY 30 hrs (2h / w)

## 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  $SN^1$  and  $SN^2$  – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane.

## 2. Hydroxy compounds

5 h

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  $KMnO_4$ , Ceric ammonium nitrate, Luca's reagent and phenols by reaction with  $FeCl_3$ .

Chemical properties:

a) Dehydration of alcohols.

b) Oxidation of alcohols by  $CrO_3$ ,  $KMnO_4$ .

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

## UNIT-IV

### Carbonyl compounds

10 h

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)  $NaHSO_3$ , b)  $HCN$ , c)  $RMgX$ , d)  $NH_2OH$ , e)  $PhNHNH_2$ , 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  $LiAlH_4$  and  $NaBH_4$ . 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

6 h

Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) Hydrolysis of nitriles, amides b) Hydrolysis of esters by acids and bases with mechanism c) Carbonation of Grignard reagents. Special methods of preparation of aromatic acids by a) Oxidation of side chain. b) Hydrolysis by benzotrichlorides. 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

4 h

**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)  $\alpha,\beta$ -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:

25M

1. Determination of Fe (II) using  $\text{KMnO}_4$  with oxalic acid as primary standard.
2. 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.

#### Organic Functional Group Reactions

25M

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.

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<b>II B.Sc, Chemistry, III Semester BLUE PRINT (Inorganic &amp; Organic chemistry)</b>				
<b>Sl. No</b>	<b>Units</b>	<b>Name of the chapter</b>	<b>8 Marks</b>	<b>4 Marks</b>
<b>INORGANIC CHEMISTRY</b>				
1	UNIT-I	Chemistry of d-block elements	1	1
		Theories of bonding in metals	1	1
2	UNIT-II	Metal carbonyls	1	-
		Chemistry of f-block elements	1	1
<b>ORGANIC CHEMISTRY</b>				
3	UNIT-III	Halogen compounds	1	1
		Hydroxyl compounds	1	1
4	UNIT-IV	Carbonyl compounds	2	1
5	UNIT-V	Carboxylic acids and derivatives	1	1
		Active methylene compounds	1	1

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 carries 8 marks. 5 X 8 = 40 Marks  
అన్ని ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు

1. What are transition elements? What are transition elements? Describe their variable oxidation states, Magnetic  
పరివర్తన మూలకాల అనగా నేమి ? d-బ్లాక్ మూలకాల ఆక్సీకరణ స్థితులు, అయస్కాంత ధర్మాలు మరియు సంశ్లేష్ట సమ్మేళనాలను ఏర్పరిచే ప్రవృత్తులను వివరించుము.

OR

Explain Band theory of metals?  
బంధసిద్ధాంతమును వివరించుము.

2. What are metal carbonyls? Explain the classification of metal carbonyls?  
మెటల్ కార్బోనైల్స్ అనగా నేమి? మెటల్ కార్బోనైల్ ల వర్గీకరణను వివరించుము.

OR

What is lanthanide contraction? Explain the consequences of lanthanide Contraction?

లాంథ్ నైడు సంకోచం అనగానేమి ? ? లాంథ్ నైడుల సంకోచానికి గల కారణాలను వ్రాయండి..

3. Explain SN<sup>1</sup> and SN<sup>2</sup> reaction mechanism with the help of energy profile diagram.

SN<sup>1</sup> మరియు SN<sup>2</sup> చర్యలును, చర్యావిధానంను శక్తి పట సహాయంతో వివరించుము.

OR

Write a brief note on the following. క్రింది వాటిని వివరించుము.

a) Acidic nature of phenols b) Riemer-Tiemann reaction c) Kolbe's reaction

a) ఫీనోల్ ల ఆమ్ల స్వభావం b) రైమర్-టీమన్ చర్య c) కోల్బ్ చర్య

4. Write any three methods of preparation of aldehydes.

ఏవైన మూడు ఆల్డిహైడ్ ల తయారీ విధానాలను వివరించుము.

OR

Explain the following reactions. . క్రింది చర్యలను వివరించుము

a) Aldol reaction b) Cannizzaro's reaction c) Perkin reaction

a) ఆల్డోల్ చర్య b) కానిజారో చర్య c) పెర్కిన్ చర్య

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

ఏవైన మూడు కార్బాక్సిలిక్ ఆమ్లాల తయారీ విధానాలను వివరించుము .

OR

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

ఏసిటోఏసిటిక్ ఎస్టర్ తయారీని తెలిపి, ఏవైన రెండు సంశ్లేషణ అనువర్తనములను

వివరించండి .

### SECTION – B

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

ఏవైనా ఐదు ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు నాలుగు మార్కులు

6. Explain catalytic properties of d-block elements.

d- బ్లాక్ మూలకాల ఉత్ప్రేరక ధర్మాలను వ్రాయండి

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

వాహకాలు ,అర్ధవాహకాలు గూర్చి వ్రాయండి.

8. Discuss structure of Nickel carbonyl and Iron carbonyl.

నికెల్ కార్బోనైల్ మరియు ఐరన్ కార్బోనైల్ నిర్మాణాలను వ్రాయండి

9. Explain nucleophilic substitution in 2-bromo butane.

2-బ్రోమో బ్యూటేన్ లో న్యుక్లియోఫిలిక్ ప్రతిక్షేపణను వివరించండి.

10. Write any two methods of Identification of alcohols.

ఏవైనా రెండు ఆల్కహాల్ ల గుర్తించుట కు పరీక్షలు వ్రాయండి.

11. Write any two reduction reactions of aldehydes.

ఏవైనా రెండు ఆల్డిహైడ్ ల ను గుర్తించుట కు పరీక్షలు వ్రాయండి.

12. Explain Huns-Dieckmann and HVZ reactions

హన్స్ డెకర్ మరియు HVZ చర్యలను వ్రాయండి.

13. Write any two applications of Malonic ester.

ఏవైనా రెండు మెలనిక్ ఎస్టర్ అనువర్తనాలను వ్రాయండి.

# 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)

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

SPECTROSCOPY 30 hrs (2h / w)

UNIT-I 6h

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

Electronic spectroscopy: 8h

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals ( $\sigma$ ,  $\pi$ , n). Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore and auxochrome.

UNIT-II

Infra red spectroscopy 8h

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

Proton magnetic resonance spectroscopy ( $^1H$ -NMR) 8h

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

PHYSICAL CHEMISTRY 30 hrs (2h / w)

UNIT-III

Dilute solutions 10h

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis,



osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor.

#### **UNIT-IV**

##### **Electrochemistry-I**

**10h**

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

#### **UNIT-V**

##### **1. Electrochemistry-II**

**4h**

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

##### **2. Phase rule**

**6h**

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

#### **List of Reference Books**

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



**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.

SEMESTER- IV				
II B.Sc, Chemistry Paper IV				
BLUE PRINT				
( Spectroscopy & Physical chemistry)				
Sl. No	Units	Name of the chapter	8 Marks	4 Marks
<b>SPECTROSCOPY</b>				
1	UNIT-I	General features of Spectroscopy	1	1
		Electronic spectroscopy	1	1
2	UNIT-II	Infra red spectroscopy	1	1
		Proton magnetic resonance spectroscopy	1	1
<b>PHYSICAL CHEMISTRY</b>				
3	UNIT-III	Dilute solutions	2	1
4	UNIT-IV	Electrochemistry-I	2	1
5	UNIT-V	Electrochemistry-II	1	1
		Phase rule	1	1

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 carries 8 marks 5 x 8 = 40 Marks

అన్ని ప్రశ్నలకు సమాధానాలు వ్రాయండి..ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు.

1. Explain single and double beam spectrophotometers.

ఏక పుంజ మరియు ద్వి పుంజ వర్ణ పట కాంతి మాపకాలను గూర్చి వ్రాయండి.

OR

Explain different types of electronic transitions in molecules with examples.

వివిధ రకాల అణువులో జరిగే ఎలక్ట్రాన్ పరివర్తనాలను ఉదాహరణలతో వివరించండి.

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

బహు పరమాణుక అణువులలో కంపన విధానాలను రెండు ఉదాహరణల తో వివరించుము.

OR

Explain the following.

క్రింది వాటిని వివరించుము.

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

a) సమతుల్య, అసమతుల్య ప్రోటానులు b) రసాయన విస్తాపనం c) స్పిన్ - స్పిన్ విభజన

3. Explain the following.

క్రింది వాటిని వివరించుము.

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

a) కణాధార ధర్మాలు ఉదాహరణలు. b) రౌల్ట్ నియమం మరియు ద్రావిత అణుభారానికి గల

సంబంధం ను ఉత్పాదించండి.

OR

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

ద్రవాభిసరణ పీడనం అనగా నేమి ? ద్రవాభిసరణ పీడనం ను నిర్ణయించే పద్ధతిని వివరించండి .

4. Explain Debye Huckel theory.

డిబై హుకెల్ సిద్ధాంతం ను వివరించండి

OR

Explain Conductometric titrations. వాహకత అంశ మాపనాలను వివరించండి .

5. Explain the following.

క్రింది వాటిని వివరించుము.

a) SHE హైడ్రోజన్ ఎలక్ట్రోడ్ b) Calomel electrode. కాల మల్ ఎలక్ట్రోడ్

OR

State and explain Gibbs phase rule and explain the following.

గిబ్స్ ప్రావస్థ నియమం అనగా నేమి అందలి పదాలను వివరించండి .

a) Phase b) Degrees of freedom c) Number of components.

a) ప్రావస్థ b) స్వాతంత్ర పరిమితులు c) ఘటకాలు సంఖ్య

### SECTION – B

Answer any FIVE questions. Each question carries 4 marks

5 X 4 = 20 Marks

ఏవైనా ఐదు ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు నాలుగు మార్కులు

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

బీర్- లాంబర్ట్ నియమం అనగానేమి ? వాటి పరిమితులు వ్రాయండి.

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

క్రోమోఫోర్ లు మరియు ఆక్సోక్రోములు అనగానేమి ? ఒక్కొక్క ఉదాహరణ తో వివరించండి.

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

ఆల్కహాల్ మరియు ఆల్డిహైడ్ ల అభిలాక్షణిక పౌనఃపున్యం ను ఉదాహరణ తో వివరించండి.

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

టోలెన్ మరియు ఇథైల్ ఎసిటేట్ NMR వర్ణ పటము ను వ్రాయండి.

10. Write the abnormal colligative properties with examples.

అసాధారణ కణాధార ధర్మాలను ఉదాహరణ ల తో వివరించండి.

11. Define specific conductance and Equivalent conductance.

విశిష్ట వాహకత మరియు తుల్యాంకవాహకత ను వివరించండి.

12. Write short note on potentiometric titrations.

పొటెన్షియోమెట్రిక్ అంశమాపనాల పై లఘు వ్యాఖ్య వ్రాయండి.

13. Write the phase diagram of Pb-Ag system.

Pb-Ag ప్రావస్థ చిత్రం తో వివరించండి.

**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**

1. Critical Solution Temperature- Phenol-Water system
2. Effect of NaCl on critical solution temperature (Phenol-Water system)
3. Determination of concentration of HCl conductometrically using standard NaOH solution.
4. Determination of concentration of acetic acid conductometrically using standard NaOH Solution.

**IR Spectral Analysis**

**25 M**

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

# 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- V, Chemistry Syllabus

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

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## 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-Gouymethod.

##### 2. Stability of metal complexes:

3h

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

### ORGANIC CHEMISTRY

#### UNIT- III

##### Nitro hydrocarbons:

3h

Nomenclature and classification-nitro hydrocarbons, structure-Tautomerism of nitroalkanes leading to 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

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

#### 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

**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.

BLUE PRINT				
III B.Sc, Chemistry, V Semester				
(Inorganic, Organic & Physical chemistry)				
Sl. No	Units	Name of the chapter	8 Marks	4 Marks
<b>INORGANIC CHEMISTRY</b>				
1	<del>Unit I</del> Unit I	Coordination compounds	3	2
	<del>Unit II</del> Unit II	Spectral and magnetic properties of metal complexes	1	1
<b>ORGANIC CHEMISTRY</b>				
2	<del>Unit III</del> Unit III	Nitro hydro carbons	3	2
	<del>Unit IV</del> Unit IV	Heterocyclic compounds	1	1
<b>PHYSICAL CHEMISTRY</b>				
3	<del>UNIT-V</del> UNIT-V	Thermodynamics	2	2

Sl No	Units	chapter	8M	4M
1	I	Coord <sup>n</sup> chem	3	2
	II	Spectra magnetic properties stability of m. complexes	1	1
2	III	Nitrohydrocarbons	3	2
	IV	Nitrogen compounds	1	1
3	V	Thermodynamics	2	2



## 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: 60Marks

### PART- A

Answer all FIVE questions. Each question carries 8 marks. 5 x 8 = 40 Marks  
అన్ని ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు

1. Write the important postulates of Valence Bond Theory and on the basis of VBT. How will you explain that  $[\text{Ni}(\text{CO})_4]$  is Tetrahedral while  $[\text{Ni}(\text{CN})_4]^{2-}$  Square planar.  
వేలన్స్ బండ్ సిద్ధాంతం యొక్క ముఖ్య ప్రతిపాదనలు వ్రాయండి. వేలన్స్ బండ్ సిద్ధాంతంను అనుసరించి  $[\text{Ni}(\text{CO})_4]$  టెట్రాహెడ్రల్ మరియు  $[\text{Ni}(\text{CN})_4]^{2-}$  లో సమతల చదర సంశ్లేష్ట సమ్మేళనాలును వివరించండి.

(Or)

Explain crystal Field Theory. Discuss the splitting of d-orbitals in Octahedral and Tetrahedral complexes by taking any one example  
స్పటిక క్షేత్ర సిద్ధాంతంను వివరించండి. ఏదైనా ఒక ఉదాహరణతో అష్టముఖీయ మరియు సమతల చదర సంశ్లేష్ట సమ్మేళనాలలో-d ఆర్బిటాల్ ల విభజనను వివరించండి. ?

2. How will you determine the composition of a complex by job's method and mole ration method? And write their limitations.  
సంశ్లేష్ట సమ్మేళనాల యొక్క సంఘటనాలను జాబ్స్ మరియు మోల్ నిష్పత్తి పద్ధతి లలో ఎట్లు నిర్ణయిస్తారు?

(Or)

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

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

నైట్రో అల్కేన్స్ లో టాటోమెరిజం ను ఒక ఉదాహరణ తో వివరించండి.

ఏవైనా రెండు నైట్రో అల్కేన్స్ తయారీ ధర్మాలు వ్రాయండి.

ఏవైనా రెండు నైట్రో అల్కేన్స్ రసాయన ధర్మాలు వ్రాయండి.

(Or)

- (a). How do you prepare primary amines by Hoffmann Bromamide reaction method and give it's mechanism.
- (b). Write the reaction of  $1^0$ ,  $2^0$ ,  $3^0$  amines with  $\text{HNO}_2$ .
- (a). ప్రైమరీ ఎమైన్లను హాఫ్ మన్ బ్రోమైడు చర్య పద్ధతి ద్వారా ఎట్లు తయారీ చేస్తారు . మరియు చర్య విధానం నమునా వ్రాయండి
- (b).  $\text{HNO}_2$  తో  $1^0$ ,  $2^0$ ,  $3^0$  ఎమైన్లు చర్యలను వ్రాయండి.
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).  $1^0$ ,  $2^0$ ,  $3^0$  ఎమైన్స్ ను హిన్స్ బెర్గ్ పద్ధతి ద్వారా ఏ విధముగా వేరుచేయుదురు?
- (b) క్రింది చర్యలను గురించి వివరించండి.
- (i) గాబ్రియల్ సంశ్లేషణ (ii). కార్బైల్ అమీన్ చర్య.
- (Or)
- (a). Derive Kirchhoff's law?
- (b). Derive Gibbs Helmholtz equation?
- (a). కిర్కాఫ్స్ సమీకరణాన్ని ఉత్పాదించండి?
- (b) గిబ్స్ హెల్మ్హోల్ట్జ్ సమీకరణాన్ని ఉత్పాదించండి?
5. Deduce the following relations
- (a).  $PV^\gamma = \text{constant}$  for an adiabatic expansion of an ideal gas.
- (b). Derive  $C_p - C_v = R$
- (a) ఆదర్శ వాయువులకు స్థిరస్థాన ప్రక్రియలలో  $PV^\gamma = \text{స్థిరం}$  అని నిరూపించుము?
- (b).  $C_p - C_v = R$  ఉత్పాదించండి?
- (Or)
- (a) Derive Carnot's cycle?
- (b). Explain the significance of entropy.
- (a) కార్నోట్ చక్రం ను ఉత్పాదించండి ?
- (b) ఎంట్రోపీ యొక్క ప్రాముఖ్యత ను వివరించండి

#### SECTION - B

Answer any FIVE questions. Each question carries 4 marks  $5 \times 4 = 20$  Marks  
ఏవైనా ఐదు ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు నాలుగు మార్కులు

6. Write the postulates of Werner's theory.  
వెర్నర్ సిద్ధాంతం యొక్క ప్రతిపాదనలు వ్రాయండి
7. What is effective atomic number and calculate the EAN of  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ .  
ప్రాభావిక పరమాణు సంఖ్య అనగానేమి?  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$  యొక్క ప్రాభావిక పరమాణు సంఖ్య లెక్కింపుము
8. What is chelating effect? Give examples?

కీలేటింగ్ ప్రభావం అనగానేమి ? ఒక ఉదాహరణ తో వివరించండి?

9. Explain Gouy method?  
గాయి పద్ధతిని వివరించండి?
10. Which is more basic among N, N -Dimethyl aniline and Aniline.  
N, N -డై మిథైల్ ఎనిలీన్ మరియు ఎనిలీన్ ఏది ఎక్కువ క్షార స్వభావంను ప్రదర్శించెను?
11. Explain the basic characters of amines with the suitable examples ?  
ఎమిన్స్ యొక్క క్షార స్వభావంను సరైన ఉదాహరణ లతో వివరించండి?
12. Write any one definitions of second law of thermodynamics.  
ఏదైనా ఒక ఉష్ణగతికశాస్త్ర రెండవ నియమం యొక్క నిర్వచనంను వ్రాయండి?
13. Write a short note on Joule - Thomson effect.  
జౌల్-థామ్సన్ ప్రభావం ను గురించి లఘువాఖ్య వ్రాయండి?

# 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- V, Chemistry Syllabus

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

## Paper - VI (INORGANIC, ORGANIC & PHYSICAL CHEMISTRY)

45 hrs (3 h / w)

### INORGANIC CHEMISTRY

#### UNIT-I

##### 1. Reactivity of metal complexes: 4h

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

##### 2. Bioinorganic chemistry: 4h

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

### PHYSICAL CHEMISTRY

#### UNIT-II

##### 1. Chemical kinetics 8h

Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time 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

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

### ORGANIC CHEMISTRY

#### UNIT- III

##### Heterocyclic Compounds 7h

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

Properties: Acidic character of pyrrole - electrophilic 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

8h

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

(-) Fructose (keto hexose) - Evidence of 2 - keto hexose 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 Keto hexose

[(+)] Glucose to (-) Fructose] and Keto hexose to Aldohexose (Fructose to Glucose)

#### UNIT- V

##### Amino acids and proteins

7h

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

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

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

##### List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G. Mare loudan, Purdue Univ
4. Advanced Physical Chemistry by Atkins

5. Text book of physical chemistry by S Glasstone
7. Instrumentation and Techniques by Chatwal and Anand
8. Essentials of Nano chemistry by pradeep
9. A Textbook of Physical Chemistry by Puri and Sharma
10. Advanced physical chemistry by Gurudeep Raj

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

**Organic Qualitative Analysis: 50M**

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

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic Primary Amines, Amides and Simple sugars.

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

1. Determination of rate constant for acid catalyzed ester hydrolysis.
2. Determination of molecular status and partition coefficient of benzoic acid in Benzene and water.
3. Determination of Surface tension of liquid
4. Determination of Viscosity of liquid.
5. Adsorption of acetic acid on animal charcoal, verification of 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.

**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.

BLUE PRINT				
III B.Sc, Chemistry, V Semester, Paper-VI (Inorganic, Organic & Physical chemistry)				
Sl. No	Units	Name of the chapter	8 Marks	4 Marks
<b>INORGANIC CHEMISTRY</b>				
1	UNIT-I	Reactivity of Metal Complex	2	1
		Bio Inorganic Chemistry	1	0
<b>ORGANIC CHEMISTRY</b>				
2	<del>Unit-III</del>	Heterocyclic compounds	1	2
	UNIT-IV	Carbohydrates	2	1
	<del>Unit-V</del>	Amino Acids & Proteins	1	2
<b>PHYSICAL CHEMISTRY</b>				
3	UNIT-II	Chemical Kinetics	2	1
		Photo Chemistry	1	1

Unit - I	Reactivity of M-complex	8M 2	4M 1
Unit - II	Chemical Kinetics	2	1
	photo chemistry	1	1
Unit - III	Heterocyclic Compounds	1	2
Unit - IV	Carbohydrates	2	1
Unit - V	Amino Acids & Proteins	1	2



**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.

<b>BLUE PRINT</b>				
<b>III B.Sc, Chemistry, V Semester</b>				
<b>(Inorganic, Organic &amp; Physical chemistry)</b>				
Sl. No	Units	Name of the chapter	8 Marks	4 Marks
<b>INORGANIC CHEMISTRY</b>				
1	UNIT-I	Reactivity of Metal Complex	2	1
		Bio Inorganic Chemistry	1	0
<b>ORGANIC CHEMISTRY</b>				
2	UNIT-II	Heterocyclic compounds	1	2
		Carbohydrates	2	1
		Amino Acids & Proteins	1	2
<b>PHYSICAL CHEMISTRY</b>				
3	UNIT-III	Chemical Kinetics	2	1
		Photo Chemistry	1	1

## 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: 60Marks

### PART- A

Answer all FIVE questions. Each question carries 8 marks. 5 X 8 = 40 Marks  
అన్ని ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు

1. Explain SN1 & SN<sup>2</sup> reactions in metal complex compounds?  
లోహ సంక్లిష్ట సమ్మేళనాలలో గల SN<sup>1</sup> & SN<sup>2</sup> చర్యలను వివరించండి?

(Or)

Discuss the trans effect and write the theories of trans effect and its applications?

ట్రాన్స్ ప్రభావం ను వివరించి, దాని యొక్క సిద్ధాంతాలను మరియు అనువర్తనాలను వ్రాయండి?

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

హిమోగ్లోబిన్ మరియు క్లోరోఫిల్ నిర్మాణాలను వివరించి వాటి యొక్క విధులను తెల్పండి?

(Or)

Write the classification of amino acids and write any two methods of preparations amino acids?

ఎమినో ఆమ్ల వర్గీకరణ వ్రాసి మరియు వాటి యొక్క రెండు తయారీ పద్ధతులును వ్రాయండి?

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

ప్రథమ క్రమాంక చర్య అనాగనేమి? దాని యొక్క రేటు సమీకరణమను ఉత్పాదించండి?

(Or)

Write any three methods of determination of order of reaction?

చర్య క్రమాంకము నిర్ధారించు ఏవైనా మూడు పద్ధతులను గురించి వ్రాయండి?

4. What are fluorescence and phosphorescence? Explain with Joblonski diagram?

ఫోరోసెన్స్ మరియు ఫాస్ఫారిసెన్స్ అనగానేమి? జబ్బాన్ని పటం ద్వారా వివరించండి?

(Or)

Explain the aromatic character of furan, pyrrole, and thiophene and write the preparation methods for the above compounds?

ఫ్యూరాన్, పిర్లోల్, మరియు థయోఫిన్ ల యొక్క ఆరోమాటిక్ స్వభావం గురించి వ్రాసి మరియు వాటి యొక్క తయారీ ధర్మలును వ్రాయండి?

5. Explain the structural elucidation of glucose?

గ్లూకోజు యొక్క నిర్మాణం సోదాహరణం గా వివరించండి ?

(Or)

Explain the following క్రింది వాటిని గురించి వివరించండి?

(i) Aldopentose to aldohexose (i) అల్టోపెంట్ ఓక్ నుండి అల్టోహెక్సోక్

(ii) Aldohexose to aldopentose (ii) అల్టోహెక్సోక్ నుండి అల్టోపెంట్ ఓక్

### SECTION – B

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

ఏవైనా ఐదు ప్రశ్నలకు సమాధానాలు రాయండి. ప్రతి ప్రశ్నకు నాలుగు మార్కులు

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

ఆస్థిరత్వ మరియు జడత్వ సంశ్లేష్ట సమ్మేళనాలు అనగానేమి ? ఉదాహరణ తో వివరించండి?

7. Define order and molecularity with examples ?

క్రమాంకం మరియు అణుత అనగానేమి ? ఉదాహరణ తో వివరించండి?

8. State stark-einstins law and grothoths drapher law ?

స్టార్క్ ఐన్స్టీన్ మరియు గ్రోత్ థ్ డ్రాఫర్ నియమాలను గురించిన వ్రాయండి?

9. Write chichibbin reaction with their mechanism ?

చిచిబిన్ చర్యను చర్యా విధానం తో వివరించండి?

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

ఎలక్ట్రోఫిలిక్ ప్రతిక్షేపన చర్యలు 5 వలయలు కలిగిన విజాతీయ వలయ సమ్మేళనాలలో 2-వ స్థానం లో మాత్రమే జరుగును. ఎందుకు ?

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

క్షీణభ్రమణత అనగానేమి ? గ్లూకోజులో క్షీణభ్రమణతను గురించి వ్రాయండి ?

12. Define Zwitterion and isoelectric point? Give its uses?

జ్వెట్టర్ ఆయన్ మరియు ఐసోఎలక్ట్రిక్ స్థానం లను నిర్వచించండి. వాటియొక్క ఉపయోగాలను వ్రాయండి?

13. What are peptide bonds? What are essential amino acids? Give examples?

పెప్టిడ్ బంధాలు అనాగనేమి? ఆవశ్యక ఎమినో ఆమ్లాలు అనాగనేమి? వాటియొక్క ఉపయోగాలను వ్రాయండి?

# 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**

Year	Semester	Paper	Title	Marks	Credits
	* Any one Paper from VII A, B and C	VII (A)*	Elective	100	03
			Practical - VII A	50	02
		VII (B)*	Elective	100	03
			Practical - VII B	50	02
		VII (C)*	Elective	100	03
			Practical - VII C	50	02
	** Any one cluster from VIII, A, B and C	VIII (A)**	<b>Cluster Electives - I :</b>	100	03
			VIII-A-1	100	03
			VIII-A-2	100	03
			VIII-A-3	50	02
				50	02
				50	02
		VIII (B)**	<b>Cluster Electives - II ::</b>	100	03
			VIII-B-1	100	03
			VIII- B-2	100	03
VIII-B-3			50	02	
			50	02	
			50	02	
VI	VIII (C)**	<b>Cluster Electives - III ::</b>	100	03	
		VIII-C-1	100	03	
		VIII-C-2	100	03	
		VIII-C-3	50	02	
			50	02	
			50	02	

[w.e.f. 2019-20 (Revised in October 2018)]

# 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- VI (Elective) Chemistry Syllabus

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

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

45 hrs (3h / w)

##### UNIT-I

###### Quantitative analysis:

10h

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

b) Principles of gravimetric analysis: precipitation, coagulation, peptization, 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

10h

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

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



**UNIT -V****10h**

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

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

HPLC : Basic principles and applications.

**List of Reference Books**

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

**LABORATORY COURSE – VI****Practical Paper – VII-(A) (at the end of semester VI) 30hrs (2 h / W)****50M**

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

**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)**

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	1
3	UNIT III	1	1
4	UNIT IV	1	2
5	UNIT V	1	2

## 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)

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**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**

9h

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**

9h

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

**UNIT-III**

**Water pollution**

9h

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

**UNIT-IV**

**Chemical Toxicology**

9h

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

**UNIT-V**

9h

**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
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
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)

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	2
3	UNIT III	1	1
4	UNIT IV	1	1
5	UNIT V	1	2

## 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)

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

### SECTION A

Answer all questions

5 x 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 x 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.
10. Explain about industrial waste water treatment.
11. Explain the toxicity effect of arsenic and cadmium.
12. Explain about functions and types of Eco system.
13. Write short notes on food chain and food web.



**SEMESTER-VI**  
**ELECTIVE PAPER – VII-(C) GREEN CHEMISTRY**  
**45 hrs (3 h / w)**

**UNIT-I**

**10h**

**Green Chemistry:** Introduction- Definition of green Chemistry, need of green chemistry, basic principles of green chemistry. Green synthesis- 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**

**10h**

**Selection of solvent:**i) Aqueous phase reactions ii) Reactions in ionic liquids, Heckreaction, Suzuki reactions, epoxidation. iii) Solid supported synthesis  
**Super critical CO<sub>2</sub>:** Preparation, properties and applications, (decaffeination, dry cleaning)

**UNIT-III**

**10h**

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

**UNIT-IV**

**5h**

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

**UNIT V**

**10h**

Examples of green synthesis / reactions and some real world cases: 1. Green synthesis of the following compounds: adipic acid, catechol, disodium imino di acetate (alternative Strecker's synthesis) 2. Microwave assisted reaction in water – Hoffmann elimination – methyl benzoate to benzoic acid–oxidation of toluene and alcohols – microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction. 3. Ultrasound assisted reactions–sonochemical Simmons –Smith reaction(ultrasonic alternative to iodine)

**Reference books:**

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

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

1. Determination of specific reaction rate of hydrolysis for methyl acetate catalysed by hydrogen ion at room temperature.
2. Determination of molecular status and partition coefficient of 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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## BLUE PRINT

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

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	1
3	UNIT III	1	2
4	UNIT IV	1	1
5	UNIT V	1	2

## 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)

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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 CO<sub>2</sub>.
3. Explain about apparatus and examples of MAOS.  
Or  
Explain the following reactions by using MAOS.  
(a) Aldol condensation (b) Diels Alder 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 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.

## CLUSTER ELECTIVES: Cluster Elective -I

Analytical and Physical  
SEMESTER-VI

PAPER – VIII-A1: POLYMER CHEMISTRY

45 hrs (3 h / w)

### UNIT-I

12h

Introduction of polymers:

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

### UNIT-II

10h

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

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

### UNIT-III

6h

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

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

### UNIT-IV

9h

Polymer additives:

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

### UNIT-V

8h

Polymers and their applications:

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

### Reference Books:

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

**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**

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	2
3	UNIT III	1	1
4	UNIT IV	1	2
5	UNIT V	1	1

## 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 ELECTIVES: Cluster Elective I, Analytical and physical  
SEMESTER VI  
PAPER VIII A1: POLYMER CHEMISTRY**

### 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

10h

*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

## UNIT – V

<b>Elemental analysis:</b>	<b>10h</b>
<b>Mass spectrometry (electrical discharges).</b>	
Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique), Detection of radiation (simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic species, matrix effects, other interferences).	
<b>NMR spectroscopy: Principle, Instrumentation, Factors affecting chemical shift, Spin coupling, Applications.</b>	<b>4h</b>
<b>Electroanalytical Methods: Potentiometry &amp; Voltammetry</b>	<b>4h</b>
<b>Radiochemical Methods</b>	<b>4h</b>
<b>X-ray analysis and electron spectroscopy (surface analysis)</b>	

### Reference books:

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

**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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### BLUE PRINT

#### SEMESTER VI, PAPER VIII A2

#### Instrumental methods of analysis

Sl. No.	UNIT	8 Marks	4 Marks
1	UNIT I	1	1
2	UNIT II	1	1
3	UNIT III	1	2
4	UNIT IV	1	2
5	UNIT V	1	2

## MODEL PAPER

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

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

#### SECTION A

Answer all questions

5 x 8 = 40M

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 of 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 analgesics and antipyretics like aspirin

Analysis of antimalarials like chloroquine .

Analysis of drugs in the treatment of infections and infestations: penicillin.

Anti tuberculous drug- isoniazid.

#### UNIT - II

Analysis of the following drugs and pharmaceuticals preparations:

(Knowledge of molecular formula, structure and analysis)

Analysis of antihistamine drugs and sedatives like: allegra, zyrtec(citirizine), 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 prevention of production 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, chloride. 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.,

5. Analytical Agricultural Chemistry by S.L.Chopra & J.S.Kanwar -- Kalyani Publishers

6. Quantitative analysis of drugs in pharmaceutical formulations by P.D.Sethi, CBS Publishers and Distributors, New Delhi
7. G.Ingram- Methods of organic elemental micro analysis- Chapman and Hall.,
8. H.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.,
11. A text book of pharmaceutical analysis by K.A.Connors-Wiley-International.,
12. Comprehensive medicinal chemistry-Ed Corwin Hansch Vol 5,Pergamon Press.,

### 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  $\beta$ -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<sup>o</sup> amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Electrophilic aromatic substitution reaction: Nitration of phenol
5. Radical coupling reaction: Preparation of 1, 1-bis -2-naphthol
6. Green oxidation reaction: Synthesis of adipic acid
7. Green procedure for Diels Alder reaction between furan and maleic anhydride

#### List of Reference Books

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



**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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## BLUE PRINT

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

Sl. No.	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	1
3	UNIT III	1	2
4	UNIT IV	1	2
5	UNIT V	1	1

## MODEL PAPER

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### 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?

## VII-A-3 Practical:- Project Work

### Cluster Elective –II

#### Fuels and Industrial Inorganic Materials

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

45 hrs (3 h / w)

#### UNIT –I

12h

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

#### UNIT-II

6h

Petroleum and petrol chemical industry:

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

#### UNIT-III

10h

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

#### UNIT-IV

10h

Lubricants:

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

#### UNIT-V

7h

**Batteries:**

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

#### Reference books:

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

**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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### **BLUE PRINT**

#### **CLUSTER ELECTIVE II**

#### **Fuels and industrial inorganic materials**

#### **PAPER-VIII-B1: Fuel chemistry and batteries**

<b>Sl. No</b>	<b>UNIT</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT I	1	2
2	UNIT II	1	2
3	UNIT III	1	1
4	UNIT IV	1	2
5	UNIT V	1	1

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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

15h

##### Silicate Industries

**Glass:** Glassy state and its properties, classification (silicate and non-silicate glasses).

Manufacture and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

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

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

#### UNIT - III

8h

##### Fertilizers:

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

#### UNIT - IV

8h

##### Surface Coatings:

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

#### UNIT - V

6h

##### Alloys:

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

**Chemical explosives:**

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

**Reference Books:**

E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.

R. M. Felder, R. W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.

W. D. Kingery, H. K. Bowen, D. R. Uhlmann: *Introduction to Ceramics*, Wiley Publishers, New Delhi.

J. A. Kent: *Riegel's Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.

P. C. Jain & M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.

R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry*, Vikas Publications, New Delhi.

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**

<b>Sl. No</b>	<b>UNIT</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT I	1	2
2	UNIT II	1	2
3	UNIT III	1	1
4	UNIT IV	1	1
5	UNIT V	1	2



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**PAPER- VIII B2, Inorganic materials of industrial importance**

**SECTION A**

**Answer all questions**

**5 x 8 = 40M**

1. Explain electronegativity of s and p block elements by using Pauling and Mulliken scales.

Or

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

Or

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

Or

Explain the manufacture of the following fertilizers

(a) Ammonium phosphate (b) poly phosphate (c) super phosphate

4. Explain about special paints.

Or

Explain the paints and pigments.

5. Explain the classification and properties of alloys.

Or

Explain the composition and properties of different types of steels.

**SECTION B**

**Answer any five questions**

**5 x 4 = 20M**

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.  
9. Explain about classification of Glass.  
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 hydrocarbon, 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 residue, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydride.

**Analysis of glasses -** Determination of silica, sulphur, barium, arsenic, antimony, total  $R_2O_3$ , calcium, magnesium, total alkalies, 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,
7. Analytical Agricultural Chemistry by S.L. Chopra & J.S. Kanwar -- Kalyani Publishers
8. Manual of soil, plant, water and fertilizer analysis, R.M. Upadhyay and N.L. Sharma, Kalyani Publishers

## 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  $\beta$ -naphthol

## I. LABORATORY COURSE – VIII

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

**30 hrs (2 h / W)**

7. 1.Green procedure for organic qualitative analysis: Detection of N, S and halogens
8. 2.Acetylation of 1<sup>o</sup> 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

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

**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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### BLUE PRINT

PAPER-VIII B-3

#### Analysis of applied industrial products

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	1
2	UNIT II	1	1
3	UNIT III	1	2
4	UNIT IV	1	2
5	UNIT V	1	2

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

**SECTION A**

**Answer all questions:**

**5 x 8 =**

**40M**

1. Explain the analysis of soap.

Or

Explain the analysis 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

**SECTION B**

**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.

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

### Cluster Elective - III ORGANIC

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

#### UNIT-I

10h

#### NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

Nuclear spin, Principles of NMR-Classical and Quantum Mechanical methods, Magnetic moment and Spin angular momentum. Larmour Frequency. Instrumentation. Relaxation-spin-spin & spin lattice relaxation. Shielding constants, Chemical shifts, Shielding and Deshielding mechanism-Factors influencing Chemical shift. Spin-Spin interactions-AX, AX<sub>2</sub> and AB types. Vicinal, Geminal and Long range coupling- Factors influencing coupling constants.

#### UNIT – II

5h

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

#### UNIT-III

10h

#### UV & VISIBLE SPECTROSCOPY

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

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

#### UNIT-IV

5h

Electronic spectra of polyatomic molecules. Chemical analysis by Electronic Spectroscopy – Beer-Lambert's Law. Deviation from Beer's law. Quantitative

determination of metal ions ( $\text{Mn}^{+2}$ ,  $\text{Fe}^{+2}$ ,  $\text{NO}_2^-$ ,  $\text{Pb}^{+2}$ ). Simultaneous determination of Chromium and Manganese in a mixture.

#### UNIT-V

15h

#### Electron Spin Resonance Spectroscopy

Basic Principles, Theory of ESR, Comparison of NMR & ESR. 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 ( $\text{CH}_3^\cdot$ ), (b) Benzene anion ( $\text{C}_6\text{H}_6^-$ ) (c) Isoquinine (d)  $[\text{Cu}(\text{H}_2\text{O})_6]^{+2}$  (e)  $[\text{Fe}(\text{CN})_5\text{NO}]^{-3}$  (f)

#### REFERENCE BOOKS:

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

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

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	2
3	UNIT III	1	1
4	UNIT IV	1	1
5	UNIT V	1	2



## MODEL PAPER

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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, AX<sub>2</sub> 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.
4. Explain Beer- Lambert's law and its deviations.  
Explain determination of Mn<sup>+2</sup> 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(H<sub>2</sub>O)<sub>6</sub>]<sup>+2</sup>

### 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

Organic photochemistry : Molecular orbitals, carbonyl chromophore–triplet states, Jablonski diagram, inter–system crossing. Energy transfer. Energies properties and reaction of singlet and triplet states of and transitions.

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

##### UNIT – II

##### ORGANIC PHOTOCHEMISTRY

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

##### UNIT – III

##### PROTECTING GROUPS AND ORGANIC REACTIONS

Principles of (1) Protection of alcohols – ether formation including silyl ethers-ester formation, (2) Protection of 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

Synthetic reactions: Mannich reaction – Mannich bases – Robinson annulations. Stork-enamine reaction. Phase transfer catalysis-mechanisms and use of benzyl trialkyl ammonium halides. Wittig reaction.

##### UNIT –V: NEW SYNTHETIC REACTIONS

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

### **Recommended Books**

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

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

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	2
2	UNIT II	1	1
3	UNIT III	1	1
4	UNIT IV	1	2
5	UNIT V	1	2

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

**SECTION A**

**Answer all questions:**

**5 x 8 = 40M**

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 Baylis-Hillman reaction.  
Or  
Explain the following reactions.  
(a) Suzuki 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 Wittig 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

8h

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

### UNIT-II

#### Drugs:

8h

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

#### Synthesis and therapeutic activity of the compounds:

12h

##### a. Chemotherapeutic Drugs

1. Sulphadugs (Sulphamethoxazole) 2. Antibiotics -  $\beta$ -Lactam Antibiotics, Macrolide Antibiotics, 3. Anti malarial Drugs (chloroquine)

##### b. Psycho therapeutic Drugs:

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

### UNIT-IV

#### Pharmacodynamic Drugs:

8h

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

### UNIT-V

#### HIV-AIDS:

9h

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

#### List of Reference Books:

1. Medicinal Chemistry by Dr. B.V. Ramana
2. Synthetic Drugs by O.D. Tyagi & M. Yadav
3. Medicinal Chemistry by Ashutoshkar
4. Medicinal Chemistry by P. Parimoo
5. Pharmacology & Pharmacotherapeutics R.S 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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#### BLUE PRINT

#### PAPER- VIII C 3: PHARMACEUTICAL AND MEDICINAL CHEMISTRY

Sl. No	UNIT	8 Marks	4 Marks
1	UNIT I	1	1
2	UNIT II	1	1
3	UNIT III	1	3
4	UNIT IV	1	1
5	UNIT V	1	2

## MODEL PAPER

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#### 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

6. Explain about metabolites and anti metabolites.
7. Explain the nomenclature of drugs.
8. Explain the synthesis and therapeutic activity of Levodopa.
9. Explain the synthesis and therapeutic activity of paracetamol.
10. Explain the synthesis and therapeutic activity of Diuretics.
11. Write the structure and therapeutic activity of sulphamethoxazole
12. Write short notes on CD<sub>4</sub> and CD<sub>8</sub> cells.
13. Explain the Retro virus.



# 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**

Visakhapatnam- 530 013, Andhra Pradesh, INDIA

**Board Of Studies October- 2018**



# 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



## Resolutions/Minutes of the 5<sup>th</sup> Board of studies 2019-20

Subject: **Chemistry - ADD ON COURSE**

Department: **Chemistry**

In pursuance of conferment of Autonomous status to Dr.V.S.Krishna Govt. Degree College(A), Visakhapatnam by the UGC vide letter No.F22-1/2011(AC) dated 20.07.2011 from Dr. Manju Singh, Joint Secretary, UGC, New Delhi and Proceedings No. C-II (CDC) /Dr. V S K. Govt. College/BOS/2018 dt. 27-07-2017 of The Vice-Chancellor, Andhra University, Visakhapatnam, the 5<sup>th</sup> Board of Studies in Chemistry Subject is conducted on 12.10.2018 at 10:00 AM with the following members. The Changes will be implemented from 2019-20 academic year onwards.

MEMBER	NAME & DESIGNATION	SIGNATURE
Head of the Department (Chairman)	<b>Dr. K. Bharath Kumar Naik</b> Lecturer in Chemistry	
Faculty Members	<b>Sri. KARSS Prasad</b>	
	<b>Smt. J Laxmi Mangamma</b>	
	<b>Sri. A. Ramesh</b>	
	<b>Smt. R. Sailaja</b>	
Subject Expert (University Nominee)	<b>Dr. B. Venkateswara Rao</b> Professor, Andhra University, Visakhapatnam	
Subject Experts (from outside the parent university)	<b>Dr. V. Sambasiva Rao</b> Lecturer in Chemistry Govt. Degree College, TUNI-East Godavari(Dist)	
	<b>Dr. S. Ramakrishna</b> Lecturer in Chemistry Govt. Degree College (Men), SRIKAKULAM	
Representative Member From Industry / Corporate / Allied Area relating to Placement	<b>Dr. N. Rambabu</b> Senior Manager-QC HPCL-Visakhapatnam	
Member from Alumni	<b>Dr. Ch. V. M. K. Hari</b> HOD, Dept. of Computer Science	
Coordinator, Academic Council	<b>Dr. D. Sravan Kumar</b> Reader in Physics HOD, Dept. of Physics	
Chairperson, Academic Council	<b>Dr. V. Chandra Sekhar</b> Principal	

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

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Visakhapatnam- 530 013, Andhra Pradesh, INDIA

Dept of Chemistry Inter Disciplinary Add On Course

Clinical Lab Technology-Syllabus

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

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<b>MODULE- I (Clinical Lab Technology)</b>	<b>18 hrs</b>
<b>1. Solutions:</b>	<b>2 hrs</b>
Definition, different concentration methods	
<b>2. Carbohydrates and Lipids</b>	<b>4 hrs</b>
(a) Carbohydrates: Definition, biological importance, classification, qualitative tests	
(b) Lipids: Definition, biological importance, classification and clinical importance.	
<b>3. Amino acids Proteins</b>	<b>4 hrs</b>
Definition, biological importance, classification, qualitative tests.	
<b>4. Vitamins and Minerals</b>	<b>4 hrs</b>
(a) Vitamins: Classification, source, deficiency diseases	
(b) Minerals: source, importance, deficiency diseases and clinical tests	
<b>5. Blood composition</b>	<b>4 hrs</b>
Blood composition functions tests	
<b>6. Practical</b>	<b>12hrs</b>
(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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### **BLUE PRINT** **Inter Disciplinary Add on Course** **Clinical Lab Technology**

Sl. No	Name of the chapter	2 Marks	5 Marks	10 Marks
<b>Module-I (Clinical Lab Technology)</b>				
1.	Solutions	1	1	--
2.	Carbohydrates and Lipids	2	2	2
3.	Amino acids Proteins	1	1	1
4.	Vitamins and Minerals	1	--	2
5.	Blood composition	1	2	1
6.	Practical	--	2	--

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

(NAAC Reaccredited A Grade Institution & District Identified College)

Visakhapatnam- 530 013, Andhra Pradesh, INDIA

Dept of Chemistry Inter Disciplinary Add On Course

Clinical Lab Technology-Syllabus

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

*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?

# DEPARTMENT OF CHEMISTRY

Industrial Chemistry Syllabus

Of

**B.Sc (Mathematics, Chemistry & Industrial Chemistry)  
Restructured Course under CBCS**

**Semester Wise Syllabus & 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 on October-2018**



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

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CENTRE FOR RESEARCH STUDIES

Visakhapatnam- 530 013, Andhra Pradesh, INDIA



## Resolutions/Minutes of the 5<sup>th</sup> Board of studies 2019-20

Subject: **Industrial Chemistry**

Department: **Chemistry**

In pursuance of conferment of Autonomous status to Dr.V.S.Krishna Govt. Degree College(A), Visakhapatnam by the UGC vide letter No.F22-1/2011(AC) dated 20.07.2011 from Dr. Manju Singh, Joint Secretary, UGC, New Delhi and Proceedings No. C-II (CDC) /Dr. V S K. Govt. College/BOS/2018 dt. 27-07-2017 of The Vice-Chancellor, Andhra University, Visakhapatnam, the 5<sup>th</sup> Board of Studies in Industrial Chemistry Subject is conducted on 12.10.2018 at 10:00 AM with the following members. The Changes will be implemented from 2019-20 academic year onwards.

MEMBER	NAME & DESIGNATION	SIGNATURE
Head of the Department (Chairman)	<b>Dr. K. Bharath Kumar Naik</b> Lecturer in Chemistry	
Faculty Members	<b>Sri. KARSS Prasad</b>	
	<b>Smt. J Laxmi Mangamma</b>	
	<b>Sri. A. Ramesh</b>	
	<b>Smt. R. Sailaja</b>	
Subject Expert (University Nominee)	<b>Dr. B. Venkateswara Rao</b> Professor, Andhra University, Visakhapatnam	
Subject Experts (from outside the parent university)	<b>Dr. V. Sambasiva Rao</b> Lecturer in Chemistry Govt. Degree College, TUNI-East Godavari(Dist)	
	<b>Dr. S. Ramakrishna</b> Lecturer in Chemistry Govt. Degree College (Men), SRIKAKULAM	
Representative Member From Industry / Corporate / Allied Area relating to placement	<b>Dr. N. Rambabu</b> Senior Manager-QC HPCL-Visakhapatnam	
Member from Alumni	<b>Dr. Ch. V. M. K. Hari</b> HOD, Dept. of Computer Science	
Coordinator, Academic Council	<b>Dr. D. Sravan Kumar</b> Reader in Physics HOD, Dept. of Physics	
Chairperson, Academic Council	<b>Dr. V. Chandra Sekhar</b> Principal	



B.Sc Industrial Chemistry under CBCS with effect from Academic Year 2019-20

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
I	I	I	Material & Energy balances and Utilities in Chemical Industry	100	03
			Practical-I	50	02
	II	II	Inorganic Materials	100	03
			Practical-II	50	02
II	III	III	Cosmetics, Fermentation, Paints & Pigments, Sugar and Industrial Pollution	100	03
			Practical-III	50	02
	IV	IV	Dyes, Leather, Paper, Corrosion and Industrial waste management	100	03
			Practical-IV	50	02
III	V	V	Drugs & Pharmaceuticals, Polymers and Food additives	100	03
			Practical-V	50	02
		VI	Industrial chemical analysis and Instrumental methods of analysis	100	03
			Practical-VI	50	02
	★ Any one paper from VII (A) and VII (B)	VII (A) ★	Oils, Fats, Fuel Chemistry, Lubricants and Adhesives	100	03
			Practical- VII (A)	50	02
		VII (B) ★	To be Introduced	100	03
			Practical- VII (B)	50	02
	★★ Any one Cluster from VIII (A) and VIII (B)	VIII (A)★★	Cluster Electives-I		
			VIII-A-1	100	03
			Chemical Process Economics, Entrepreneurship and IPR	100	03
			VIII-A-2: To be Introduced	100	03
VIII-A-3: To be Introduced			50	02	
Project Work			50	02	
VI	VIII (B)★★	Cluster Electives-I			
		VIII-B-1: To be Introduced	100	03	
		VIII-B-2: To be Introduced	100	03	
		VIII-B-3: To be Introduced	100	03	
			50	02	
			50	02	



**B.Sc Industrial Chemistry under CBCS with effect from Academic Year 2019-20**



Semester	Paper	Subject	Hrs	Credits	IA	ES	Total
<b>FIRST YEAR</b>							
SEMESTER I	I	Material & Energy balances and Utilities in Chemical Industry	4	3	25	75	100
		Practical-I	2	2	0	50	50
SEMESTER II	II	Inorganic Materials	4	3	25	75	100
		Practical-II	2	2	0	50	50
<b>SECOND YEAR</b>							
SEMESTER III	III	Cosmetics, Fermentation, Paints & Pigments, Sugar and Industrial Pollution	4	3	25	75	100
		Practical-III	2	2	0	50	50
SEMESTER IV	IV	Dyes, Leather, Paper, Corrosion and Industrial waste management	4	3	25	75	100
		Practical-IV	2	2	0	50	50
<b>THIRD YEAR</b>							
SEMESTER V	V	Drugs & Pharmaceuticals, Polymers and Food additives	3	3	25	75	100
		Practical-V	2	2	0	50	50
	VI	Industrial chemical analysis and Instrumental methods of analysis	3	3	25	75	100
		Practical-VI	2	2	0	50	50
SEMESTER VI	VII (A)	Elective-Oils, Fats, Fuel Chemistry, Lubricants and Adhesives	3	3	25	75	100
		Practical Paper-VII A	2	2	0	50	50
	VII (B)	★ Elective	3	3	25	75	100
		Practical Paper-VII B	2	2	0	50	50
	VIII (A)	Cluster elective-VIII-A-1 Chemical Process Economics, Entrepreneurship and IPR	3	3	25	75	100
		Practical Paper-VIII -A-1 -Project work	2	2	0	50	50
		★ Cluster elective-VIII-A-2	3	3	25	75	100
		Practical Paper-VIII -A-2 -Practical	2	2	0	50	50
		★ Cluster elective-VIII-A-3	3	3	25	75	100
		Practical Paper-VIII -A-3-Practical	2	2	0	50	50
VIII (B)	Cluster elective-VIII-B-1 Chemical Process Economics, Entrepreneurship and IPR	3	3	25	75	100	
	Practical Paper-VIII -B-1 -Project work	2	2	0	50	50	
	★ Cluster elective-VIII-B-2	3	3	25	75	100	
	Practical Paper-VIII -B-2 -Practical	2	2	0	50	50	
	★ Cluster elective-VIII-B-3	3	3	25	75	100	
	Practical Paper-VIII -B-3-Practical	2	2	0	50	50	

To be introduced

IA → Internal Assessment → 40M { IMID - 20 (16+4)  
 ES → End SEM → 60M { IMID - 20 (16+4)  
 Practicals → 100M

## **Industrial Chemistry syllabus of B.Sc (Mathematics, Chemistry and Industrial Chemistry) restructured course under CBCS pattern**

Industrial Chemistry curriculum of B.Sc (Mathematics, Chemistry and Industrial Chemistry) restructured course under CBCS pattern was designed with an aim to increase the job potential of the undergraduate students. The curriculum was developed in consultation with industry experts. The curriculum is interdisciplinary in nature. Modules in economics, auditing, IPR, factory acts etc., are part of the curriculum.

### **The Objectives of the course are**

1. To equip the students for job opportunities in industries of both private and public sectors involved in manufacturing and processing.
2. To give the students a comprehensive view on different types of industrial products and knowledge about chemical principles involved in the manufacturing and analysis of industrial materials both organic and inorganic in nature
3. To nurture entrepreneurship in the students

### **The learning outcomes of the course are (at the end of the course the students can)**

1. Have knowledge about manufacturing procedures of different organic and inorganic industrial materials
2. Gain knowledge about several analytical methods used in the characterization and quality analysis of industrial materials
3. Able to understand the basics of resource management and financial management
4. Able to know about the important provisions of Factory Act, sales of goods Act and Partnership Act
5. Able to know the process of licensing and registration a small scale industry
6. Able to know the Techno-economic feasibility of the projects

**Total number of papers = 24**

**Mathematics= 07 papers**

**Chemistry= 07 papers and**

**Industrial Chemistry = 10 papers (including 03 cluster elective papers)**

**Total number of credits of the proposed restructured course = 158 (same as that of B.Sc conventional course)**

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CENTRE FOR RESEARCH STUDIES

Visakhapatnam- 530 013, Andhra Pradesh, INDIA

**Semester- I, Industrial Chemistry Syllabus**

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

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## **Paper-I**

### **Material & Energy balances and Utilities in Chemical Industry**

**60hrs (4 hours/week)**

#### **Unit-1**

**12 hours**

**Material and Energy Balance:** Dimensions and units: Basic Chemical Calculations - Atomic weight, molecular weight, equivalent weight, Mole, composition of - (i) Liquid mixtures and (ii) gaseous mixtures, ideal gas law, vapour pressure, Humidity and Saturation.

#### **Unit-II**

**14 hours**

**Material Balance without Chemical Reactions:** Flow diagram for material balance, simple material balance with or without recycle or by-pass for chemical engineering operations such as distillation, absorption, crystallization, evaporation, extraction, etc.

**Material Balance involving chemical reactions:** concept of limiting reactant, conversion, yield, selectivity, and liquid phase reaction, gas phase reaction with or without recycle or bypass.

#### **Unit-III**

**10 hours**

**Energy Balance:** Heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, Enthalpy changes.

#### **Unit-IV**

**12 hours**

#### **Utilities in Chemical Industry**

- a) **Boilers:** Types of boilers and their functioning
- b) **Water:** Specifications of industrial use, various water treatments.
- c) **Steam:** Generation and use.
- d) **Air:** Specification of industrial use, processing of air

**Unit-V****12 hours****Fluid flow:** Fans, blowers, compressors, vacuum pump, ejector**Pumps:** Reciprocating pumps, Gear pumps, centrifugal pumps.**Laboratory Course –I****50 Marks****Practical Paper- I (at the end of semester I) 30 hours (2 hours / week)**

1. Quantitative analysis of calcium in lime stone by complexometric titration.
2. Hardness of water by EDTA titration.
3. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder

**Reference Books**

1. B.I. Bhatt and S.M. Vora: *Stoichiometry*, Tata McGraw-Hill publishing Company Ltd, New Delhi.
2. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK
3. R. M. Felder, R. W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
4. J. A. Kent: *Riegel's Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
5. P. C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
6. R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry*, Vikas Publications, New Delhi.
7. B. K. Sharma: *Engineering Chemistry*, Goel Publishing House, Meerut
8. S. C. Bhatia: *Chemical Process Industries*, Vol. I & II, CBS Publishers, New Delhi.
9. W. L. McCabe and J. C. Smith: *Unit Operations in Chemical Engineering*, McGraw Hill Book Company, New York.
10. O. P. Vermani, A. K. Narula: *Industrial Chemistry*, Galgotia Publications Pvt. Ltd., New Delhi.

**Guidelines to the Paper Setter:** The syllabus I Semester consists of **Material and energy balance and Utilization in Chemical Industry**. 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 10 marks. The examiner has to choose 2 questions from each unit from Material and energy balance and Utilization in Chemical Industry.

**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.

<b>B. Sc Industrial Chemistry</b>				
<b>Paper-I, Semester-I</b>				
<b>BLUE PRINT</b>				
<b>(Material and energy balance and Utilization in Chemical Industry)</b>				
<b>Sl. No</b>	<b>UNITS</b>	<b>Name of the chapter</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT-I	Material and Energy Balance	2	1
2	UNIT-II	Material Balance without Chemical Reactions	1	1
		Material Balance involving chemical reactions	1	1
3	UNIT-III	Energy Balance	2	1
4	UNIT-IV	Utilities in Chemical Industry	2	2
5	UNIT-V	Fluid flow, Pumps	2	2

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

Industrial Chemistry-Model Paper

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Semester - I

Paper - I

Max marks: 60

Time: 3 hrs

## Material and energy balance and Utilization in Chemical Industry

### Section A

Answer all questions

5 x 8 = 40 Marks

1. Discuss about composition of liquid mixtures and gaseous mixtures.  
Or  
Write short notes on a) Vapor pressure b) Humidity and saturation
2. Discuss about simple material balance with or without recycle for chemical engineering operations distillation and absorption.  
Or  
Explain about concept of limiting reactant.
3. Explain about sensible heat changes in liquids.  
Or  
Explain about enthalpy changes.
4. Explain about different types of boilers their functions.  
Or  
Explain about generation of steam and its uses.
5. Explain about various types of compressors.  
Or  
Explain about centrifugal pumps.

### Section B

Answer any five questions

5 x 4 = 20 Marks

6. Molecular weight and equivalent weight.
7. Flow diagram for material balance.
8. Heat capacity of pure gases at constant pressure.
9. Specifications of industrial mater.
10. Processing of air
11. Blowers
12. Gear pumps
13. Material balance in gas phase reaction

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CENTRE FOR RESEARCH STUDIES

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

Industrial Chemistry- Syllabus

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## SEMESTER-II

### Paper-II

#### INORGANIC MATERIALS

60hrs (4 hours/week)

#### Unit-1

12 Hours

##### Silicate Industries-1

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

#### Unit-2

14

#### Hours

##### Silicate Industries-2

- 1. Ceramics:** Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, superconducting and semi conducting oxides, fullerenes carbon nanotubes and carbon fiber.
- 2. Cements:** Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

#### Unit-3

10 Hours

##### Fertilizers

Different types of fertilizers. Manufacture of the following fertilizers: Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphates; Polyphosphate, Super phosphate, Compound and mixed fertilizers Potassium Chloride, Potassium sulphate.

#### Unit-4

10 Hours

##### Alloys

Classification of alloys, Ferrous and Non-Ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon decarbonization, demanganization, desulphurization dephosphorisation) and surface treatment(argon



treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels.

#### Unit-5

14 hours

#### Surface Coatings

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

#### Laboratory Course –II 50 Marks

#### Practical Paper- II (at the end of semester II) 30 hours (2 hours/week)

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Analysis of Cement.
5. Analysis of (Cu, Ni); (Cu, Zn) in alloy or synthetic samples.

#### Reference Books

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



**Guidelines to the Paper Setter:** The syllabus II Semester consists of **Inorganic Materials**. 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 questions from each unit from **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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<b>B. Sc Industrial Chemistry Paper-II, Semester-II BLUE PRINT (Inorganic Materials)</b>				
<b>Sl. No</b>	<b>UNITS</b>	<b>Name of the chapter</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT-I	<b>Silicate industries-I</b>		
		Glass	2	1
2	UNIT-II	<b>Silicate industries-II</b>		
		Ceramics & Cements	2	2
3	UNIT-III	Fertilizers	2	1
4	UNIT-IV	Alloys	2	2
5	UNIT-V	Surface coating	2	2

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CENTRE FOR RESEARCH STUDIES

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

Industrial Chemistry-Model Paper

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## Industrial Chemistry

Semester - II

Paper - II

Max marks: 60

Time: 3 hrs

### Inorganic Materials

#### Section A

Answer all questions

5 x 8 = 40 Marks

1. Explain various types of glasses.  
Or  
Explain about manufacturing and processing of glass
2. Explain about High Technology ceramics and their applications  
Or  
Explain about Manufacture of cement
3. Explain about different types of fertilizers  
Or  
Explain about compound and mixed fertilizers with examples
4. Explain about classification of alloys  
Or  
Explain about composition and properties of different types of steels
5. Explain about classification of surface coatings  
Or  
Explain about Dyes, Water and oil paints

#### Section B

Answer any five questions

5 x 4 = 20 Marks

6. Composition and properties of lead glass
7. Fullerenes
8. Setting process of cement
9. Manufacture of urea
10. Specific properties of elements in alloys
11. Manufacture of steel
12. Metal spraying and anodizing
13. Pigments

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CENTRE FOR RESEARCH STUDIES

Visakhapatnam- 530 013, Andhra Pradesh, INDIA

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

Industrial Chemistry- Syllabus

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## SEMESTER-III (Paper-III)

Cosmetics, Fermentation, Paints & Pigments, Sugar and Industrial Pollution

60hrs (4 hours/week)

<b>Unit-1</b>	<b>12</b>
<b>Hours</b>	
<b>Cosmetics and Perfumes</b>	
A general study including preparation and uses of the following: Hair dye, hairspray, Shampoo, Sun-tan lotions, face powder, lipsticks, talcum powder, nailenamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, phenylethyl alcohol, Jasmone, Civetone, Muscone.	
<b>Unit-2</b>	<b>10 hours</b>
<b>Fermentation Industries</b>	
Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Pencillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamine B2 Vitamine B12 and Vitamine C.	
<b>Unit-3</b>	<b>14 hours</b>
<b>Paints and Pigments</b>	
<b>Paints-</b> Ingredients and their functions required properties of paint, paints constituents and their functions, manufacture of paint.	
<b>Pigments-</b> Characteristics of pigment, uses in paint, emulsion paints, special paints, paint remover, varnishes, lacquers, enamels.	
<b>Unit-4</b>	<b>10 hours</b>
<b>Sugar Chemistry</b>	
Introduction – Manufacture of cane sugar, recovery of cane sugar from molasses, preparation of Celotex and manufacture of sucrose from beat root, testing and estimation of sugar.	

**Unit-5****14 hours****Industrial pollution**

Pollutants and their statutory limits

Air Pollution- various pollutants

Water pollution- Organic and Inorganic pollutants

Noise pollution

Radiation pollution

**Laboratory Course –III****50 Marks****Practical Paper- III (at the end of semester III) 30 hours (2 hours/week)**

1. Preparation of pigment (zinc oxide).
2. Analysis of oils and fats (iodine value, saponification value, acid value)
3. Testing of turmeric powder, milk and mustard oil for adulterants.
4. Estimation of glucose in food samples.
5. Preparation of talcum powder, nail polish and face cream

**Reference Books**

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK
2. J. A. Kent: *Riegel's Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
3. P. C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
4. Water Analysis Hand Book – NEERI
5. Practicals and Calculation in Engineering Chemistry – S.S. Dara
6. A. K. De, *Environmental Chemistry*: New Age International Pvt, Ltd, New Delhi.
7. S.P. MAHAJAN: *Pollution control in process industries*, Tata McGraw-Hill publishing, company limited, New Delhi.
8. C.k. Varshney: *Water Pollution and Management*, Wiley Eastern Limited, Chennai

**Guidelines to the Paper Setter:** The syllabus II Semester consists of **Cosmetics, Fermentation, Paints & Pigments, Sugar & Industrial pollution**. 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 questions from each unit from Cosmetics, Fermentation, Paints & Pigments, Sugar & Industrial pollution

**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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<b>B.Sc Industrial Chemistry, Paper-III, Semester-III BLUE PRINT (Cosmetics, Fermentation, Paints &amp; Pigments, Sugar &amp; Industrial pollution)</b>				
<b>Sl. No</b>	<b>UNITS</b>	<b>Name of the chapter</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT-I	Cosmetics and Perfumes	2	2
2	UNIT-II	Fermentation Industries	2	1
3	UNIT-III	Paints and Pigments	2	2
4	UNIT-IV	Sugar Chemistry	2	1
5	UNIT-V	Industrial Pollution	2	2

## MODEL PAPER

**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- III, Industrial Chemistry Syllabus

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

### Semester-III Paper-III

(Cosmetics, Fermentation, Paints & Pigments, Sugar and Industrial Pollution)

Max marks 60

Time: 3 hrs

#### SECTION A

5 x 8=40 Marks

Answer any five of the following.

1.

1. Name any five following oils in cosmetics.

2. Give any two examples of aerobic fermentation.

3. Give any two examples of ethyl alcohol and Penicillin.

4. Give any two examples of dyes and their functions.

5. Give any two examples of pigments.

6. Give any two examples of Sugar.

7. Give any two examples of Sucrose from beat root.

#### SECTION-B

5x4=20 Marks

Subhodaya



8. Give any two characteristics of pigments.

9. Recovery of cane sugar from molassis

10. Noise Pollution.

11. Reduction Pollution.

12. Artificial Flavones.

13. Varnishes.

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CENTRE FOR RESEARCH STUDIES

Visakhapatnam- 530 013, Andhra Pradesh, INDIA

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

Industrial Chemistry- Syllabus

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## SEMESTER-IV

### Paper-IV

**Dyes, Leather, Paper, Corrosion and Industrial waste management**

**60hrs (4 hours/week)**

#### Unit-1

**12 hours**

##### Dyes

Introduction, Classification with special reference to textile and edible dyes and fabric brighteners. Industrial preparation and uses of methyl orange, malachite green, indigo, bismark brown, alizarin.

#### Unit-2

**08 hours**

**Leather Chemistry-** Introduction, Manufacture of Leather and Preparation of hides for tanning, vegetable, chrome and oil tanning, byproduct.

#### Unit-3

##### Paper Industry

**10 hours**

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

#### Unit-4

**15 hours**

##### Corrosion and its control

Introduction - Economic aspects of corrosion - Dry or Chemical Corrosion - Wet or electrochemical corrosion -Mechanism of Electrochemical Corrosion.

Galvanic Corrosion - Concentration Cell Corrosion - Differential aeration corrosion - Pitting Corrosion - Underground or soil corrosion.- Passivity.

Factors Influencing Corrosion - Microbiological Corrosion – GalvanicSeries - Atmospheric corrosion - Corrosion Control - Proper designing -Using pure metal - Using metal alloys - Cathodic protection.

Chemical conversion - Coating - Phosphating - Chromising - Treatment of metal surfaces hot dipping - Use of inhibitors.

**Unit-5****15 hours****Industrial Waste Management**

Waste management - primary, secondary &amp; tertiary treatment

Solid Waste Management Pyramid – Key Technologies for SWM (collection, handling, transformation, landfills, incinerators, composting)

Water treatment and purification (reverse osmosis, electro dialysis, ion exchange)

**Laboratory Course –IV****50 Marks****Practical Paper- IV (at the end of semester IV) 30 hours (2 hours/week)**

1. Preparation of Methyl Orange.
2. Synthesis of common industrial compounds involving two step reactions, e.g. 4-bromo aniline, 3-nitroaniline, sulphanilamide, 4-amino benzoic acid, 4-nitrobenzoic acid, dihalobenzenes, nitrohalobenzenes, paracetamol, oil of winter green). (ANY FIVE)

**Reference Books**

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK
2. J. A. Kent: *Riegel's Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
3. P. C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
4. Water Analysis Hand Book – NEERI
5. Practicals and Calculation in Engineering Chemistry – S.S. Dara
6. A. K. De, *Environmental Chemistry*: New Age International Pvt, Ltd, New Delhi.
7. S.P. MAHAJAN: *Pollution control in process industries*, Tata McGraw-Hill publishing company limited, New Delhi.
8. C.k. Varshney: *Water Pollution and Management*, Wiley Eastern Limited, Chennai



**Guidelines to the Paper Setter:** The syllabus II Semester consists of **Dyes, Leather, Paper, Corrosion and Industrial waste management**. 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 questions from each.

**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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<b>B.Sc Industrial Chemistry, Paper-IV, Semester - IV BLUE PRINT (Dyes, Leather, Paper, Corrosion and Industrial waste management)</b>				
<b>Sl. No</b>	<b>UNITS</b>	<b>Name of the Chapter</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT-I	Dyes	2	1
2	UNIT-II	Leather chemistry	2	2
3	UNIT-III	Paper industry –Pulp and paper	2	1
4	UNIT-IV	Corrosion and its control	2	2
5	UNIT-V	Industrial waste management	2	2

## MODEL PAPER

**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, Industrial Chemistry Syllabus**

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

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### Semester-IV Paper-IV

(Dyes, Leather, Paper, and Corrosion & Industrial waste management)

Max marks: 60

Time: 3hrs

#### SECTION -A

Answer all questions

5x8=40 marks

1. Explain the classification of Dyes  
Or  
Explain the industrial preparation and uses of a)Methyl orange b)Indigo
2. Explain the manufacture of Leather  
Or  
Explain preparation of hides for Tanning
3. Explain about manufacture of pulp  
Or  
Explain about manufacture of paper
4. Explain about Dry and Wet corrosion  
Or  
Explain about factors influencing corrosion
5. Explain about primary ,secondary and ternary treatment of waste management  
Or  
Explain about solid waste management

#### SECTION -B

Answer any five questions

5x4=20marks

6. Preparation and uses of Alizarin
7. Oil tanning
8. Soda pulp
9. Corrosion control
10. Economic aspects of corrosion
11. Water treatment and purification reverse osmosis
12. Water treatment and purification electro dialysis
13. By-products of leather industry

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

Industrial Chemistry- Syllabus

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## SEMESTER-V

### Paper-V

#### Drugs & Pharmaceuticals, Polymers and Food additives

45 hrs (3 hours/week)

#### Unit-1

10 hours

##### Drugs and Pharmaceuticals

Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti-inflammatory agents (Aspirin, paracetamol, Ibuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryl trinitrate), antiloprosy (Dapsone), HIV/AIDS related drugs (AZT- Zidovudine).

#### Unit-2

9 hours

##### Organic Polymers-1

Preparation, Properties, Classification, Structure-property relationship (Thermoplastic and Thermosetting). Industrial manufacture of the monomers and the following polymers, Polystyrene, Polyacrylonitrile, Polymethacrylate, Polymethylmethacrylate, Polyethylene,

Polybutadiene, Polyvinylidene, Polycarbonates, Polyesters, Polyurethanes, Nylon (6, 66, 610), Phenolic polyesters, Polyamides, Polysulphones, Alkyds.

#### Unit-3

9 hours

##### Organic Polymers-2

Speciality Polymers (Electro-luminescent, Biopolymers, Conducting polymers), Rubbers (synthetic and natural) and their processing, Elastomers, Cellulosics, Natural and Synthetic fibers, fiber processing, antiwrinkle and flame retardant. Comparison of

natural and synthetic polymers, relation between molecular structure and properties. Polymer Processing: Moulding, compounding, blending. Polymer designing: packaging, certification and process evaluation.

**Unit-4**

**7 hours**

**Inorganic Polymers:** Classification, preparation, properties and uses of boron containing polymers, phosphorus containing polymers, silicon containing polymers, Silicones (fluid, elastomers and resins) and Sulphur containing polymers (SN)x.

**Unit-5**

**10 hours**

**Food additives**

A general study of food flavours- Flavoring agents: Vanilla, diacetyl, isoamyl acetate, limonene, ethylpropionate, allyl hexanoate, colours: Brilliant blue FCF, fast green FCF, tartrazine, erythrosine, sunset yellow FCF and preservatives: Sodium carbonate, sodium benzoate, sorbic acid, artificial sweeteners.

**Laboratory Course –V**

**50 Marks**

**Practical Paper- V (at the end of semester V) 30 hours (2 hours/week)**

1. Extraction of natural coloring and flavoring agents from flowers and fruits (extraction of any three coloring and flavoring agents)
2. Preparation of nylon 6, 6
3. Application of TLC and paper chromatography in the separation of organic compounds

**Reference Books**

1. G.L. Patrick: *Introduction to Medicinal Chemistry*, Oxford University Press, UK.
2. Hakishan, V.K. Kapoor: *Medicinal and Pharmaceutical Chemistry*, Vallabh Prakashan, Pitampura, New Delhi.
3. William O. Foye, Thomas L., Lemke, David A. William: *Principles of Medicinal Chemistry*, B.I. Waverly Pvt Ltd. New Delhi.
4. Jayashree Ghosh: *Text Book of Pharmaceutical Chemistry*, 2nd edition, S, Chand & Company, New Delhi
5. I. K.J. Saunders: *Organic Polymer Chemistry*, Chapman & Hall, London.
6. P.J. Flory: *Principles of Polymer Chemistry*, Cornell University Press, NY.
7. G. Odian: *Principles of Polymerization*, John Wiley & Sons Inc, NY.
8. James E. Mark, Harry Allcock, Robert West, *Inorganic Polymers*, Prentice Hall Englewood.

**Guidelines to the Paper Setter:** The syllabus V Semester consists of **Drugs & Pharmaceuticals, Polymers and Food additives**. 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, **Drugs & Pharmaceuticals, Polymers and Food additives** 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 from **Drugs & Pharmaceuticals, Polymers and Food additives** 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.

## MODEL PAPER

Dr. V.S. Krishna Govt. Degree College (A), VISAKHAPATNAM-13  
III B.Sc, V SEMESTER, END EXAMINATIONS  
(w. e. f. 2019 - 20)

Semester- V Industrial Chemistry, Paper- VI,  
Drugs & Pharmaceuticals, Polymers and Food additives

### SECTION-A

Answer all questions

5 x 8 = 40 Marks

1. Explain the synthesis of the following classes.  
(a) Aspirin (b) Ibuprofen (c) Chloramphenicol  
Or  
Explain the synthesis of the following.  
(a) Sulphanethoxazol (b) Glyceryl trinitrate
2. Explain the preparation, properties and classification of organic polymers.  
Or  
Explain the industrial manufacture of following polymers.  
(a) Polyethene (b) Nylon 66 (c) Polyvinylidene
3. Explain the following organic polymers.  
(a) Rubbers (b) Elastomers  
Or  
Explain the processing and designing of polymers.
4. Explain about the boron and phosphorus containing polymers.  
Or  
Write about silicones.
5. Write about food flavoring agents.  
Or  
Write about food colors.

### SECTION-B

Answer any five questions

5 x 4 = 20 Marks

6. Explain about AZT-Zidovudine.
7. Explain the Central nervous system agents.
8. Write the preparation and properties of polystyrene and polyacrylonitrile.
9. Explain about fibers.
10. Compare nature and synthetic polymers.
11. Explain about Sulphur containing polymers (SN)<sub>x</sub>.
12. Explain about artificial sweeteners.
13. Write about food preservatives.

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**SEMESTER-V**

**Paper-VI**

**Industrial chemical analysis and Instrumental methods of analysis**

**45 hrs (3 hours/week)**

**Unit-1**

**09 hours**

**Industrial Chemical Analysis-** Sampling procedure, sampling of bulk materials, techniques of sampling Solid, liquids and gases. Collecting and processing data.

Limitation of analytical methods, accuracy, precision, Classification of errors and their minimization significant figures and computations.

**Unit-2**

**08 hours**

**Spectroscopic Methods-** Principle and its industrial application of UV-Visible spectrophotometers, IR, NMR and ESR.

**Unit-3**

**10 hours**

**Electro analytical techniques-** Potentiometry, voltametry, polarography and Colorimetry principle, instrumentation and their industrial applications.

**Unit-4**

**10 hours**

**Thermo analytical techniques-** Thermal gravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetric (DSC) – principle and their industrial applications.

**Unit-5**

**08 hours**

**Spectrophotometer-** Principle, instrumentation for absorption measurements, qualitative and quantitative applications.

**Atomic Spectroscopy-** flame photometry, Atomic absorption spectroscopy and their industrial applications.

**Laboratory Course –VI    50 Marks**

**Practical Paper- VI (at the end of semester V) 30 hours (2 hours/week)**

1. Class exercises on the interpretation of IR, Mass, UV and NMR spectra of organic compounds for structural elucidation
2. Determination of concentration of Na<sup>+</sup> and K<sup>+</sup> using Flame Photometry.
3. Determination of Fe<sup>+3</sup> by colorimetry
4. Verification of Beer Lambert's by using spectrophotometry

**Reference Books**

1. H.H. Willard, L.L. Merrit, J.A. Dean, F. A. Settle: *Instrumental Methods of Chemical Analysis*, Wadsworth Publishing Company, California.
2. G. D. Christian: *Analytical Chemistry*, John Wiley, NY.
3. S.M. Khopkar: *Basic Concepts of Analytical Chemistry*, Wiley Eastern Ltd, New Delhi.
4. D.A. Skoog, D.M. West, F.J. Holler: *Fundamentals of Analytical Chemistry*, Cengage Learning.
5. Practicals and Calculation in Engineering Chemistry – S.S. Dara
6. William Kemp, *Organic Spectroscopy*, Palgrave Publishers
7. Pavia, Lampman and Kriz *Introduction to Spectroscopy*, Cengage Learning



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Industrial Chemistry- Syllabus

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## SEMESTER-VI

### Elective

### PAPER-VIIA

**Oils, Fats, Fuel Chemistry, Lubricants and Adhesives 45 hrs (3 hours/week)**

#### **Unit-1**

**8 Hours**

#### **Oils and Fats**

Classification of oils, fat splitting, distillation of completely miscible and non-miscible oils, hydrogenation of oils, rancidity, saponification value, iodine number, acid value, Soap and Synthetic Detergent, preparation of soap and detergent, different types of soap and their composition, surfactants (LAS, ABS, LABS), detergent binders and builders.

#### **Unit-2**

**10 Hours**

#### **Fuel Chemistry-1**

Review of energy sources (renewable and non-renewable).

Renewable Natural Resources: Cellulose, Starch- preparation, Properties and industrial applications.

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-3**

**12 Hours**

#### **Fuel Chemistry-2**

**Petroleum and Petrochemical Industry:** Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking), Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels.

Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

**Unit-4**

**7 hour**

**Lubricants:** Classification of lubricants, lubricating oils (conducting and non-conducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricants (viscosity index, cloud point, pour point) and their determination.

**Unit-5**

**8 Hours**

**Adhesives-** Introduction- Classification of adhesives, adhesive action, development of adhesive strength, chemical factors influencing adhesive action, bonding processes by adhesives, advantages and limitations, examples.

**Laboratory Course –VII**

**50 Marks**

**Practical Paper- VIIA (at the end of semester VI) 30 hours (2 hours/week)**

1. Determination of Flash point and Ignition point of liquids.
2. Determination of smoke point of a fuel
3. Preparation of soap
4. Separation of essential oils by Soxhlet extractor

**Suggested Readings**

1. E. Stocchi: *Industrial Chemistry*, Vol -I, Ellis Horwood Ltd. UK.
2. P.C. Jain, M. Jain: *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi.
3. B.K. Sharma: *Industrial Chemistry*, Goel Publishing House, Meerut.
4. O. P. Vermani, A. K. Narula: *Industrial Chemistry*, Galgotia Publications Pvt. Ltd., New Delhi.
5. R. Gopalan, D. Venkappayya, S. Nagarajan: *Engineering Chemistry*, Vikas Publications, New Delhi.
6. S. C. Bhatia: *Chemical Process Industries*, Vol. I & II, CBS Publishers, New Delhi.
7. S.S. Dara, *Textbook of Engineering chemistry*, S Chand and Company Ltd, New Delhi.
8. B.K. Sharma: *Fuels and Petroleum Processing (including petrochemicals and industrial organic synthesis)* Goel Publishing House, Meerut

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

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Industrial Chemistry- Syllabus

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## SEMESTER-VI (Cluster elective) PAPER-VIII A- 1

Chemical Process Economics, Entrepreneurship and IPR 45 hrs (3 hours/week)

**Unit-1** **11 hours**  
**Chemical Process Economics**

1. Factors involved in project cost estimation, methods employed for the estimation of capital Investment. Capital formation, elements of cost accounting. Interest and investment costs, time value of money equivalence.
2. Depreciation, methods of determining depreciation. Some aspects of marketing, pricing policy, profitability criteria, economics of selecting alternatives, variation of cost with capacity, break-even point, optimum batch sizes, production scheduling etc.

**Unit-2** **8 hours**  
**Entrepreneurship-1**

1. Need, scope and characteristics of entrepreneurship, special schemes for technical entrepreneurs development (STED), exposure to demand based, resource based, service based. Import substitute and export promotion industries, criteria for principles of products selection and developments.
2. Choice of technology: plant and equipment. Techno-economic feasibility of the projects. Plant layout and process planning for the project.

**Unit-3** **8 hours**  
**Entrepreneurship-2**

1. Financial Institutions, their procedure and incentives, financial ratio and their significance. Books of accounts, financial statements and Funds flow analysis. Energy requirement and utilization.
2. Resources management: men, machine and materials. Creativity and Innovations. Problem solving approach. Strength, weakness, opportunity and threat (SWOT) techniques.

**Unit-4****08 hours****Entrepreneurship-2**

1. Quality control, quality assurance and testing of the product. Packaging and advertising. After sales service.
2. Sickness in small scale Industries and their remedial measures. Licensing and registration. Important provisions of Factory Act, sales of goods Act, partnership Act of marks – Collectivemarks, certification marks, service marks, Trade names, etc. Differences from Designs.

**Unit-5****10 hours****Introduction to Intellectual Property Rights**

Historical Perspective, Different Types of IP, Importance of protecting IP. Trade Marks: Introduction, How to obtain, Different types, PCT system. Industrial Designs: Definition, How to obtain, features, International design registration. Patents: Historical Perspective, Basic and associated right, WIPO

**Laboratory Course –VIII****50 Marks****Practical Paper- VIII A (at the end of semester VI) 30 hours (2 hours/week)****Project Work or on the Job Training in a local industry**

Every student should undergo training Programme or carry out a research project for the preparation and characterization of an industrial useful chemical/ any other investigatory project, in order to promote innovativeness, under the guidance and supervision of concerned faculty of college.

**Suggested Readings**

1. Arthur Raphael Miller, Micheal H. Davis; *Intellectual Property: Patents, Trademarks and Copyright in a Nutshell*, West Group Publishers (2000).
2. P. Ganguli, *Intellectual Property Rights: Unleashing the Knowledge Economy*, Tata McGraw-Hill (2001).
3. N.K. Acharya: *Textbook on intellectual property rights*, Asia Law House (2001).
4. Happel John, *Chemical process economics (Chemical processing and engineering)*

**Guidelines to the Paper Setter:** The syllabus V Semester consists of Industrial chemical analysis and instrumental methods of analysis. 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 Industrial chemical analysis and instrumental methods of analysis part.

**In Section- B:** consists of EIGHT short answer questions carries 4 marks out of which 5 are to be answered from Industrial chemical analysis and instrumental methods of analysis 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>BLUE PRINT</b>				
<b>B .Sc Industrial Chemistry, Paper-VI, Semester- V</b>				
<b>(Industrial chemical analysis and instrumental methods of analysis)</b>				
<b>Sl. No</b>	<b>UNITS</b>	<b>Name of the chapter</b>	<b>8 Marks</b>	<b>4 Marks</b>
1	UNIT-I	Industrial chemical analysis	1	2
2	UNIT-II	Spectroscopic methods	1	1
3	UNIT-III	Electro analytical techniques	1	1
4	UNIT-IV	Thermo analytical techniques	1	2
5	UNIT-V	Spectrophotometer and atomic spectroscopy	1	2

**MODEL PAPER**

**Dr. V.S. Krishna Govt. Degree College (A), VISAKHAPATNAM-13**  
**III B.Sc., V SEMESTER, END EXAMINATIONS, 2019- 20**  
**B. Sc Industrial Chemistry, Paper- VI, Semester- V**  
**Industrial chemical analysis and instrumental methods of analysis**  
(w. e. f. 2019 - 20)

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**SECTION-A**

**Answer all questions**

**5 x 8 = 40Marks**

1. Explain about the different techniques of sampling solid, liquids and gases.  
Or  
Explain about the classification of errors.
2. Explain the principle and industrial application of NMR.  
Or  
Explain the principle and industrial application of ESR.
3. Explain about the instrumentation and industrial applications of potentiometry.  
Or  
Explain about the instrumentation and industrial applications of paleography.
4. Write about the principle industrial applications of TGA.  
Or  
Write about the principle industrial applications of DTA.
5. Explain about principle and instrumentation of spectrophotometer.  
Or  
Explain about Atomic absorption spectroscopy

**SECTION-B**

**Answer any five questions**

**5 x 4 = 20 Marks**

6. Explain collecting and processing data of industrial chemical analysis.
7. Explain about limitation of analytical methods.
8. Explain about UV- Visible spectrophotometer.
9. Write about principle and industrial application of colorimetry.
10. Write about the principle of DSC.
11. Write about industrial applications of DSC.
12. Write about quantitative and qualitative applications.
13. Write short note on Flame photometry.



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## Department of Chemistry, External Examination List

Sl. No.	Name of the Faculty	Place of working	Contact number
01	Dr. S. Raju	Govt. Degree College Chodavaram-Visakha	9440306372
02	Smt. Ch. S. Anuradha	Govt. Degree College(W) Visakhapatnam	9885501503
03	Sri. A. Ramgopal	Govt. Degree College Paderu-Visakhapatnam	9441247706
04	Sri. A V Ramesh	SGA Govt. Degree College Yellamanchili- Visakhapatnam	8985646309
05	Dr. D. Laxman Rao	Govt. Degree College Saluru-VZM	9492451990
06	Sri. P. Kiran Kumar	SGA Govt. Degree College Yellamanchili- Visakhapatnam	9000251552
07	Smt. S. Durgabhavani	Govt. Degree College(W) Visakhapatnam	9441956233
08	Md. Pascha	Govt. Degree college Ramachandrapuram East Godavari	9440338474
09	Smt. D. Suneetha	Govt. Degree College Yeleswaram. E.G	9492260511
10	Sri. V. Sambasivarao	Govt. Degree College TUNI, East Godavari	9440473002
11	Smt. G. Tejeswani	Govt. Degree College Nidadavole. W.G	9052333529
12	Smt. D. Prasanna	Govt. Degree College V. Madugula-Visakha	8332887645
13	Sri. Mamidi Gopi	Govt. Degree College Baruva. Srikakulam	7396927964
14	Dr. S. Ramakrishna	Govt. Degree College(Men), Srikakulam	9030768474
15	Smt. K. Vidyakalpana	SGA Govt. Degree College Yellamanchili- Visakhapatnam	6301682015
16	Dr. Saikrishna	Govt. Degree College(Men), Srikakulam	9542148008
17	Sri. T. Apparao	Govt. Degree College Chodavaram-Visakha	
18	Dr. G V Rao	Mrs. AVN Degree College Visakhapatnam	9440543909


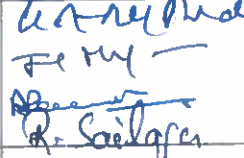



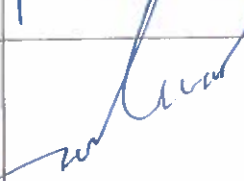


Sl. No.	Name of the Faculty	Place of working	Contact number
19	Dr. VVJ Gopalakrishna	Mrs. AVN Degree College Visakhapatnam	9848312918
20	Department of Chemistry	PR Govt. Degree College(A), Kakinada- East Godavari	0884 238 7888
21	Department of Chemistry	<b>Government Arts College(A), Rajahmundry- East Godavari-AP</b>	0883 247 5732
22	Sri. R. Ramesh Naidu	Govt. Degree College(Men), Srikakulam	9490764107
23	Sri. B. Sateesh	Govt. Degree College(Men), Srikakulam	9398794045
24	Sri. K. Nageswara Rao	Govt. Degree College(Men), Srikakulam	9642937169
25	Sri. Ch.V.Saikrishna	Govt. Degree College(Men), Srikakulam	9542148008
26	Smt. R. Neeraja	Govt. Degree College(Men), Srikakulam	9493434103
27	Sri. L. Paul	Govt. Degree College, Narsannapeta- Srikakulam	9505257639
28	Sri. A. Adinarayana	Govt. Degree College, Tekkali-Srikakulam	9441387184




### Resolutions/Minutes of the 5<sup>th</sup> Board of studies 2019-20

Subject: Chemistry

Department: Chemistry

MEMBER	NAME & DESIGNATION	SIGNATURE
Head of the Department (Chairman)	Dr. K. Bharath Kumar Naik Lecturer in Chemistry	
Faculty Members	Sri. KARSS Prasad Smt. J Laxmi Mangamma Sri. A. Ramesh Smt. R. Sailaja	
Subject Expert (University Nominee)	Dr. B. Venkateswara Rao Professor, Andhra University, Visakhapatnam	
Subject Experts (from outside the parent university)	Dr. V. Sambasiva Rao Lecturer in Chemistry Govt. Degree College, TUNI-East Godavari(Dist)	
	Dr. S. Ramakrishna Lecturer in Chemistry Govt. Degree College (Men), SRIKAKULAM	
Representative Member From Industry / Corporate / Allied Area relating to Placement	Dr. N. Rambabu Senior Manager-QC HPCL-Visakhapatnam	



Member from Alumni	<b>Dr. Ch. V. M. K. Hari</b> HOD, Dept. of Computer Science	
Coordinator, Academic Council	<b>Dr. D. Sravan Kumar</b> Reader in Physics HOD, Dept. of Physics	
Chairperson, Academic Council	<b>Dr. V. Chandra Sekhar</b> Principal	

I, **Dr. K. Bharath Kumar Naik**, Chair<sup>man</sup>person, Board of Studies in Industrial Chemistry will move the resolution for consideration and approval of the syllabus for Industrial Chemistry Restructured Course offered to the three year B.Sc. Degree Course as recommended by the Board of Studies meeting held on 10-10-2018, for the students of admitted batch of 2019-20. **Please approve**