

**Present: Dr.R.David Kumar Swamy, M.Sc, M.Phil., Ph.D**

**Rc. No: Spl./Acad.Cell-GC[A]-RJY/BOS/2018-1, Dated: 13 December 2018**

**Sub:-** Government Autonomous College, Rajamahendravaram– **Boards of Studies (BoS)** –  
Nomination of Members - Orders Issued.

**Ref:-** UGC Guidelines for Autonomous Colleges - 2018.

**ORDER:**

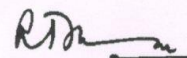
The Principal, Government Autonomous College, Rajamahendravaram is pleased to constitute **Board of studies in CHEMISTRY** for framing the syllabi in Chemistry subject for all semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name	Designation
1	Sri. C.V.Ramana Lecturer In- Charge/HoD, Department of Chemistry, GC[A], Rajamahendravaram	Chairman
2	All Faculty members in the department	Member
3	Sri P. Sreerama Murthy Lecturer in Chemistry, SKVT College, Rajamahendravaram	Subject Expert
4	Sri. V.Somasekhara Rao Lecturer in Chemistry GDC, Dumpagadapa	Subject Expert
5	Dr. K. Deepthi, ANUR	University Nominee
6	Dr.S. Ramana, Chemist, ONGC, Rajahmundry	Expert from Industry/Corporate Sector
7		Student Nominee

The above members are requested attend the BOS meetings and share their valuable views, suggestions on the following functionaries:

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stake holders and national requirement for consideration and approval of the Academic Council
- Suggest methodologies for innovate teaching and evaluation techniques
- Suggest panel of names to the Academic council for appointment of examiners
- Coordinate research, teaching, extension and other activities in the department of the college.

The term of the members will be Three years from the date of the nomination. The Chairman of the BoS (HoD/lecturer In-Charge of the department) is directed to coordinate with the Principal of the College and conduct BoS meetings as and when necessary, but at least twice a year.



PRINCIPAL .

GOVERNMENT COLLEGE [A]  
RAJAHMUNDRY

Copy to:

- The above individuals
- File

**DEPARTMENT OF CHEMISTRY,  
GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM**

**Composition of the Board of Studies Committee**

S.No.	Category	Designation	Name of the Chairperson & Members of Board of Studies	Remarks
1	Educational	Chairperson	Sri C. V. Ramana, Lecturer in charge/HoD, Department of Chemistry, Rajamahendravaram	
2	University Nominee	Member	Smt. K. Deepthi, Asst. Professor, Department of Chemistry, Adikavi Nannaya University, Rajamahendravaram	Nominated by University
3	Industrial Nominee	Member	Dr. S. Ramana, Chemist, ONGC, Rajamahendravaram	Nominated by the Principal
4	Subject Expert	Member	Sri K. Sree Rama Murthy, Lecturer in Chemistry, SKVT College, Rajamahendravaram	
5	Subject Expert	Member	Sri V. Soma Sekhara Rao, Lecturer in Chemistry Govt. Degree College, Alamuru.	
6	Faculty	Members	All Faculty ,Department of Chemistry, Rajamahendravaram	Faculty Members
7	Student	Student Nominee		Student

**Department of Chemistry,**  
**Government Autonomous College,**  
**Rajamahendravaram**

**Board of Studies Resolutions for**

**Conventional Courses of**

- **Mathematics, Physics & Chemistry (EM)**
- **Mathematics, Physics & Chemistry (TM)**
- **Botany, Zoology & Chemistry (EM)**
- **Botany, Zoology & Chemistry (TM)**
- **Geology, Mathematics & Chemistry (EM)**

**Re-Structured Courses of**

- **Micro-Biology, Zoology & Chemistry (EM)**
- **Bio-Technology, Botany & Chemistry (EM)**
- **Food Micro-Biology, Food Zoology & Food Chemistry (EM)**
- **Agricultural Bio-Technology, Agricultural Botany & Agricultural Chemistry (EM)**
- **Mathematics, Chemistry & Analytical Chemistry (EM)**
- **Botany, Chemistry & Horticulture (EM)**
- **Zoology, Chemistry & Aquaculture (EM)**

**DEPARTMENT OF CHEMISTRY, GOVERNMENT COLLEGE (A),  
RAJAMAHENDRAVARAM.  
II BOARD OF STUDIES MEETING 2018-19  
INDEX**

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12.	<b>Syllabus For II Semester &amp; Model Question for Analytical Chemistry Paper-II &amp; Blue Print</b>
13.	<b>Syllabus &amp; Scheme of Valuation for Analytical Chemistry Practical Examination Paper-II</b>
14.	<b>Recommended Text Books and Reference Books</b>

## PREFACE

With the pace that the world keeps and the speed with which technology advances, an understanding of science is inevitable in our **day-t0-day life**. To make the study of science interesting and enjoyable, the creation of a scientific temper in society is a must which could be achieved through proper education and guidance. **An effective science education can be imparted at the undergraduate level only by revamping the curriculum according to the needs and developments of the modern society from time to time.**

To achieve this goal, **Department of Chemistry of Govt. College, Rajamahendravaram** with immense privilege under autonomous status, proposed new job oriented Restructured courses for B.Sc. First Year students by introducing in the normal curriculum pattern in the regular BOS from 2017-18 as **Food MZC** and **Agricultural BBC Restructured Courses**. In these Restructured courses, the first five semesters course is as of normal B.Sc., students for Paper I, II and III and for Paper IV they study elective as Food Micro-Biology, Food Zoology and Food Chemistry for Food MZC course and Agricultural Bio-Technology, Agricultural Botany and Agricultural Chemistry for Agricultural BBC course for an effective science education to the students.

Another new Restructured course, which designed to be full-fledged restructured course was introduced from 2018-19 as **B.Sc. (MCAC)** with **MATHEMATICS, CHEMISTRY AND ANALYTICAL CHEMISTRY** as core subjects.

## AIMS

The curriculum being restructured by giving more importance to different aspects such as quality, creativity, environmental impact due to the development of technology, current development in science and operational skill of various instruments. The academic skills imparted to the students during UG programme make them competent to meet the requirements of a developing country.

**The goal of the syllabus is to make the study of chemistry stimulating, relevant and interesting.** It is prepared with a view to equip the students to understand the basic facts and concepts in chemistry to develop the interest in the study of chemistry, to appreciate the achievements in chemistry, to familiarize with the

emerging areas in chemistry, to develop skills in the proper handling of apparatus, instruments and chemicals, to familiarize with the industrial activities related to chemistry. **To have more visibility about the subject new Research Based Pedagogical methods are incorporated in teaching methods.** This programme is designed by incorporating various units in a systematic and more meaningful manner for the core as well as complementary courses.

The curriculum is designed after a thorough discussion with the academic experts from diverse fields and by considering the existing B.Sc syllabi of other universities and model curriculum proposed by **UGC** and **APSCHE & AKNU** in order to get continuity in the learning process from the new syllabi of NCERT, which meet the demands of a science aspirant. Chemistry, being a border science to biology, physics and engineering, has a key role to play in the understanding of these disciplines. Chemistry is an experimental science and demands testing theories through practical laboratory experiences for a thorough understanding of the subject.

**BROAD OBJECTIVES** To enable the students

- To understand basic facts and concepts in chemistry
- To appreciate the achievements in chemistry and to know the role of chemistry in nature and in society
- To familiarize the emerging areas of chemistry and their applications in various spheres of chemical sciences and to apprise the students of its relevance in future studies.
- To develop skills in the proper handling of instruments and chemicals
- To be exposed to the different processes used in industries and their applications
- To make the students ecofriendly by creating a sense of environmental awareness in them
- To make the students aware of the applications of chemistry in day to day life

**DEPARTMENT OF CHEMISTRY, GOVT. COLLEGE (A), R.J.Y.**

**LIST OF ACTIVITIES PROPOSED FOR THE ACADEMIC YEAR**

**2018-19**

<b>MONTH</b>	<b>ACTIVITY PROPOSED</b>
<b>JUNE - 2018</b>	Departmental staff meeting to review results and class work allotment
	Submission of proposals - National Level Seminar National Seminar on "Recent Developments in Chemical Sciences" RDCS-2018 to be conducted in June or August 2018
	Preparation of curricular plans, time-tables etc.,
	Remedial coaching classes for II & III year supplementary exams
<b>JULY - 2018</b>	Preparations for National Seminar
	Bridge classes for I year students
	Student awareness programmes on ragging & eve teasing - consequences, self-discipline, career guidance, higher education opportunities etc.,
<b>AUGUST 2018</b>	6th & 9th Aug Hiroshima & Nagasaki day / 18th August - WORLD HELIUM Day / 26th Aug -Lavoisier birth day
<b>SEPTEMBER 2018</b>	16th-Ozone day – Guest Lecture
<b>OCTOBER 2018</b>	23rd MOLE Day - Chem. Fest-2018 (Group Discussions, Quiz competitions, Poster Presentation)
<b>NOVEMBER 2018</b>	11th National Education Day - Outreach Programme to nearby school
<b>DECEMBER 2018</b>	1st World AIDS Day
	4th Chemical disaster prevention Day
	National Workshop on Separation Techniques
<b>JANUARY 2019</b>	10 days coaching for PG entrance examinations in chemistry
<b>FEBRUARY 2019</b>	National Level Seminar
	28th - NATIONAL SCIENCE DAY

## **AGENDA**

- 1. New syllabus for the Semesters II, IV, VI.**
- 2. Model Question Papers**
- 3. Blue Prints**
- 4. Additional Inputs in the Curriculum.**
- 5. Internal Assessment Component.**
- 6. Other Academic Activities of the department.**
- 7. Any other proposal with the permission of the chair.**



**DEPARTMENT OF CHEMISTRY, GOVT. COLLEGE (A), RAJAHMUNDRY.****Minutes of the II Board of Studies Meeting, December - 2018.****DATE: 27-12-2018****TIME: 3 PM**

The Board of studies meeting of Chemistry Department is convened on 27-12-2018 at 3 PM under the Chairmanship of Sri C.V. Ramana, in-charge of the department. The members present discussed various aspects such as changes to make in the syllabus & Model Question papers of 1, 3, 5 semesters both for theory and practical for implementing them during the academic year 2018-19 onwards.

**RESOLUTIONS:** It is resolved

- 1 To prescribe and implement Syllabus for B.Sc. (Chemistry) II, IV and VI Semesters and also for B.Sc. MCAC course as per CBC System for the Academic Year 2018-19.**
- 2 Implementing Pedagogical evaluation methods in the curriculum for internal assessment**
- 3 It is resolved to include a module on “Intellectual Property Rights” in the VI semester as approved in Academic Council Meeting held on 12 May 2018.**
- 4 It is resolved to include “Swayam Online Courses” and a credit will be given for those courses.**
- 5 As per the CBCS the core subject CHEMISTRY comprises of Six CORE courses in chemistry like six semesters as per previous practice.**
  - For B.Sc. first year there will be Core II in semester -II
  - For B.Sc. second year there will be Core IV in semester -IV
  - For B.Sc. third year there will be CORE VI in semester -VI
  - In B.Sc. third year CORE – VI in Semester VI, the student has choice to select any one General Elective paper from VII A/ VIIB/ VII C
  - In B.Sc. third year CORE – VI in Semester VI, the student also has choice to select any one Cluster Elective papers set from VIII A1, A2 & A3 / VIII B1, B2 & B3/ VIII C1, C2 & C3.
  - For B.Sc. first year MCAC students there will be Core II in semester –II

5. **EVALUATION:** Evaluation for each course will be done as follows:

**For First year students from 2016-17 and for Second year students from 2017-18 academic year and for Third year students from 2018-19 academic year onwards**

- a) A continuous internal assessment (CIA) ( for 40 marks) by the concerned Course teacher as well as by an end semester examination (for 60 marks) and will consolidated at the end of the course for 100 marks. The components for continuous internal assessment are:

Passing minimum for end semester exam will be 40% out of 60 marks (i.e.24 marks)

Average of two	20 Marks	1 Hours	The passing minimum CIA will be 40% (IE., 16 marks) 40 Marks
Assignments	5 Marks		
Attendance	5 Marks		
Student Seminars	5 Marks		
Viva voce / Group Discussions or any other	5 Marks		
Total	40 marks		

(b) Semester end exam at the end of each semester.

- Passing minimum for end semester exam will be 40% out of 60 marks (i.e. 24 marks)

6. To introduce new model Question paper for I year B.Sc. for Paper - II, II year B.Sc. for Paper – IV, III year B.Sc. for Paper – VII A, B & C, Paper – VIII A1,A2 &A3 ; Paper – VIII B1, B2 & B3; and Paper – VIII C1, C2 & C3.
7. The pattern of question papers of I semester end examinations of Paper -I is,

**CORE II SEMESTER -II Paper -II**

- a. MODULE-I GENERAL CHEMISTRY  
b. MODULE-II PHYSICAL CHEMISTRY

The Paper contains three sections A, B & C, and Each Section with Two Units

8. The pattern of question papers of III semester end examinations of Paper -III is as follows:

**CORE IV SEMESTER -IV PAPER - IV**

- a. MODULE-I SPECTROSCOPY  
b. MODULE-II PHYSICAL CHEMISTRY

The Paper contains three sections A, B & C, and Each Section with Two Units

9. The pattern of question papers of **VI Semester** end examinations of **Paper –VII** is as follows:

<b>CORE VI</b>	<b>SEMESTER –VI</b>	<b>PAPER – VII</b>
PAPER – VII A	ANALYTICAL METHODS IN CHEMISTRY	
PAPER – VII B	ENVIRONMENTAL CHEMISTRY	
PAPER – VII C	GREEN CHEMISTRY	

10. The pattern of question papers of **VI Semester** end examinations of **Paper –VIII** (Cluster Electives) contains three sets of papers as shown below:

<b>CORE VI</b>	<b>SEMESTER –VI</b>	<b>CLUSTER ELECTIVE - I</b>
VIII A1	POLYMER CHEMISTRY	
VIII A2	INSTRUMENTAL METHODS OF ANALYSIS	
VIII A3	ANALYSIS OF DRUGS, FOOD PRODUCTS AND BIO-CHEMICAL ANALYSIS	

The Paper contains three sections A, B &C, and Each Section with Two Units

<b>CORE VI</b>	<b>SEMESTER –VI</b>	<b>CLUSTER ELECTIVE - II</b>
VIII B1	FUEL CHEMISTRY AND BATTERIES	
VIII A2	INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE	
VIII A3	ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS	

The Paper contains three sections A, B &C, and Each Section with Two Units

<b>CORE VI</b>	<b>SEMESTER –VI</b>	<b>CLUSTER ELECTIVE - II</b>
VIII B1	ORGANIC SPECTROSCOPIC TECHNIQUES	
VIII A2	ADVANCED ORGANIC REACTIONS	
VIII A3	PHARMACEUTICAL AND MEDICINAL CHEMISTRY	

For all papers

- in section ‘A’ the candidate has to answer four essay questions from a total of **eight** questions with internal choice      Marks:  $4 \times 8 = 32$
- In section ‘B’ the candidate has to answer five short answer type questions out of Eight Questions      Marks:  $5 \times 4 = 20$
- In section ‘C’ the candidate has to answer all the four very short answer type questions.      Marks:  $4 \times 2 = 8$
- Total Marks:  $32 + 20 + 08 = 60$  Marks

- 10** As per the request from student nominees, for the benefit of students facing entrance examinations of other universities and other competitive examinations, it is resolved to include Value addition / additional inputs to the syllabus prescribed by AKNU to B.Sc. I, II & III year and to modify the syllabus as per need by utilizing academic autonomy.
- 11** For First, Second and Third Years the Internal Practical Examination, will be already conducted at the end of I, III and V semesters for 50 marks and External Practical Examination for I, II and III Years will be conducted at the end of II, IV and VI semesters for 50 marks respectively along with Project work for VIII A3/B3/C3 papers (instead of practical work) for the academic year.
- 12** For B.Sc. first year students admitted in 2017-18 onwards the practical syllabus is Qualitative Analysis, and for B.Sc. second year students spectroscopy and physical Chemistry practical and for third year practicals corresponding to VII A, B, C and VIII A1/B1/C1, VIII A2/B2/C2 and for VIIIA3/B3/C3 (project work) will be implemented.

**TABLE SHOWING ALLOCATION OF CREDITS (FOR THEORY & PRACTICAL)**

S.No.	SEMESTER	TITLE OF THE COURSE	Hrs/ Week	MAX. MARKS	MARKS IN CIA	CREDITS
<b>I B.Sc. SEMESTER - II</b>						
1.	II	<b>PAPER II: GENERAL AND PHYSICAL CHEMISTRY</b>	<b>04</b>	<b>100</b>	<b>40</b>	<b>03</b>
2.	II	PRACTICAL: QUALITATIVE ANALYSIS OF MIXTURE SALT	<b>03</b>	<b>50</b>	-	<b>02</b>
<b>II B.Sc. SEMESTER - IV</b>						
3.	IV	<b>PAPER IV: SPECTROSCOPY &amp; PHYSICAL CHEMISTRY</b>	<b>04</b>	<b>100</b>	<b>40</b>	<b>03</b>
4.	IV	PRACTICAL:	<b>03</b>	<b>50</b>	-	<b>02</b>
<b>III B.Sc. SEMESTER - VI</b>						
5.	VI	<b>VII-A: ANALYTICAL METHODS IN CHEMISTRY</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
6.	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
7.	VI	<b>VII-B: ENVIRONMENTAL CHEMISTRY</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
8.	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
9.	VI	<b>VII-C: GREEN CHEMISTRY</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
10.	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
11.	VI	<b>VIII-A1: POLYMER CHEMISTRY</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
12.		PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
13.	VI	<b>VIII-A2: INSTRUMENTAL METHODS OF ANALYSIS</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
14.	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
15.	VI	<b>VIII-A3: ANALYSIS OF DRUGS, FOOD PRODUCTS &amp; BIOCHEMICAL ANALYSIS</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
16.	VI	PROJECT WORK	<b>03</b>	<b>50</b>	-	<b>02</b>
17.	VI	<b>VIII-B1: FUEL CHEMISTRY &amp; BATTERIES</b>	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
18.	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>

**TABLE SHOWING ALLOCATION OF CREDITS (FOR THEORY & PRACTICAL) (continued)**

S.No.	SEMESTER	TITLE OF THE COURSE	Hrs/ Week	MAX. MARKS	MARKS IN CIA	CREDITS
19	VI	<b>VIII-B2:</b> INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
20	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
21	VI	<b>VIII-B3:</b> ANALYSIS OF INDUSTRIAL PRODUCTS	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
22	VI	PROJECT WORK	<b>03</b>	<b>50</b>	-	<b>02</b>
23	VI	<b>VIII-C1:</b> ORGANIC SPECTROSCOPIC TECHNIQUES	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
24	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
25	VI	<b>VIII-C2:</b> ADVANCED ORGANIC REACTIONS	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
26	VI	PRACTICAL	<b>03</b>	<b>50</b>	-	<b>02</b>
27	VI	<b>VIII-C3:</b> PHARMACEUTICAL & MEDICINAL CHEMISTRY	<b>03</b>	<b>100</b>	<b>40</b>	<b>03</b>
28	VI	PROJECT WORK	<b>03</b>	<b>50</b>	-	<b>02</b>
<b>I B.Sc. MCAC SEMESTER - II</b>						
29	II	<b>PAPER II:</b> QUANTITATIVE METHODS OF ANALYSIS	<b>04</b>	<b>100</b>	<b>40</b>	<b>03</b>
30	II	PRACTICAL - QUANTITATIVE ANALYSIS	<b>03</b>	<b>50</b>	-	<b>02</b>

**ADDITIONS AND DELETIONS FOR THE ACADEMIC YEAR 2018-19**

**Aim :**

- ❖ In order to prepare the students for attending various competitive exams and for M.Sc. Entrance tests of different Universities.
- ❖ To enrich the students in the path of application oriented learning.

**B.Sc. Chemistry Paper-II from the Academic year 2018-19**

SEMESTER I					
S.No	Topic deleted	No. of hours	Topic incorporated	No. of hours	Justification
1			Liquid state	4 h	To educate students about three states of matter
2			Interfering anions tartrate and oxalate introduced in mixture analysis	-	To enrich knowledge in Interfering radicals
3	Ni(CO) <sub>4</sub>		Structure of PCl <sub>5</sub> , SF <sub>6</sub> using V.B theory	-	About complex compound student will learn in final year so it replaced with structures of PCl <sub>5</sub> and SF <sub>6</sub>

**B.Sc. Chemistry Paper-IV from the Academic year 2018-19**

SEMESTER IV					
S.No	Topic deleted	No. of hours	Topic incorporated	No. of hours	Justification
1	Inorganic Mixture Analysis	30			Mixture Analysis is shifted to II Semester
2			Volumetric Analysis	30	To enrich knowledge in Quantitative Analysis.

**B.Sc. Chemistry Paper-VIII- A3 from the Academic year 2018-19**

SEMESTER VIII A3					
S.No	Topic deleted	No. of hours	Topic incorporated	No. of hours	Justification
1	-	-	Food Adulteration and Determination of Food Adulteration	-	To incorporate knowledge about food Adulteration which is helpful to give awareness to society.

## **JUSTIFICATION FOR THE INTRODUCTION OF VARIOUS COURSES IN OUR CURRICULUM:**

**OBJECTIVES OF THE CONVENTIONAL B.Sc CHEMISTRY COURSES:** We can hardly find any industry without the need of Chemists. Students with B.Sc. Chemistry are much sought after by the industry. This paper offers in depth knowledge in chemistry to students and surely enhances the skills and thereby improves their future job/academic prospects. Therefore it is resolved to introduce Chemistry paper in B.Sc., course. Besides classical analysis, instrumental analysis is covered in the syllabus. Quantitative and mainly qualitative analytical techniques are discussed in detail.

**OUTCOMES OF THE CONVENTIONAL B.Sc CHEMISTRY COURSES:** The students have wide range of Job Oriented opportunities as Quality Control Analyst, Quality Assurance, Research and Development, Process Managers, Project Manager, Analytical Chemists etc.

**OBJECTIVES OF THE JOB ORIENTED B.Sc FMZC, Ag. BBC COURSES:** The Food MZC course is beneficial to provide professionals courses with knowledge about the development, Preservation, processing, packaging, distribution and usage of safe, nutritive and healthy foods. Agricultural BBC course provides depth knowledge and practical skills to students regarding suitable fertilizer for the land, pest management, food preparation, entrepreneurship and food manufacturing and baking industries. Self-employment opportunities also exist in the form of dynamic delivery networks for those who want to work on their own.

**OUTCOMES OF THE JOB ORIENTED B.Sc. FMZC, Ag. BBC COURSES:** After graduating in B.Sc. FMZC & Ag. BBC courses the students have wide range of Job Oriented opportunities as Production Managers, Procuring Manager, Marketing sectors, Food Microbiologist, Food Standards Officer and Food Technologist.

### **OBJECTIVES OF THE RESTRUCTURED B.Sc. MCAC COURSE:**

Analytical Chemistry is an applied, experimental field of science and is based not only on chemistry, but also on physics, biology, information theory and many fields of technology. It is of fundamental importance not only to all branches of chemistry but also to all biological sciences, engineering sciences, health, medicine, pharmaceuticals, environment, industrial processes, quality control and implementation of legislation.

The objective of B.Sc. Analytical chemistry course is to provide students exposure to chemistry, physics, biological sciences, environmental science, computer application, instrumentation and analytical techniques. In this three year course spread over six semesters, there are 10 papers of Analytical chemistry 7 papers of chemistry and 7 Mathematics. In the last semester of this course,



there is a provision for one cluster elective papers out of two cluster elective papers.

**OUTCOMES OF THE RESTRUCTURED B.Sc. MCAC COURSE:** After graduating in Analytical Chemistry the students can pursue academics in Chemistry, bioinformatics, forensic science, biochemistry and other disciplines of interdisciplinary sciences. They can also use it as a stepping stone to pharmaceutical industry and for Research and Development in industry.

**OBJECTIVES & OUTCOMES OF THE CERTIFICATE COURSE:** This course will impart immense skills on qualitative and quantitative analysis in chemistry to both science and non-science students. The main objective of this course is to provide training to the candidates to work as technicians in chemistry labs in junior, degree and PG colleges and pharmaceutical laboratories.

**The following members attended the Board of studies meeting:**

S.No.	Name & Designation	Signature
1.	Dr. K. Deepthi, University Nominee Adi Kavi Nannaya University, Rajahmundry.	
2.	Dr. S. Ramana, Industrial Nominee Chemist, ONGC, Rajahmundry.	
3.	Sri K. Sri Rama Murthy, Local Nominee, S.K.V.T. Degree College, Rajahmundry.	
4.	Sri V. Soma Sekhara Rao, Local Nominee, Govt. Degree College, Alamuru.	
5.	Sri N.V.V.S.V. Prasad, Staff Member	
6.	Sri J. Yacob, Staff Member	
7.	Dr. B. Madhav, Staff Member	
8.	Dr. B. Mallikarjuna, Staff Member	
9.	Dr. (Smt). K. Anitha, Staff Member	
10.	Dr. K. Raveendra Babu, Staff Member	
11.	Sri V. Satyanarayana, Staff Member	
12.	Dr. M. Trinadh, Staff Member	
13.	Smt. J. Sasi Sree, Staff Member	
14.	Dr. E.S.R.S. Sharma, Staff Member	
15.	Sri B.S.V. Prasad, Staff Member	
16.	Smt. M. Usha Rani, Staff Member	
17.	Smt. N. Bhargavi, Staff Member	
18.	Smt. P. Surya Sree, Staff Member	

S.No.	Name & Designation	Signature
19.	Sri. K. Srinivasa Rao, Staff Member	
20.	Smt. B. Baby Nalini, Staff Member	
21.	Smt. P. Gayatri, Staff Member	
22.	Kum. B. Maha Lakshmi, Staff Member	
23.	Sri U. Suri Babu, Staff Member	
24.	Sri K.V.V. Ranga Rao, Staff Member	
25.	Kum. N. Deepika Priyanka, Staff Member	
26.	Smt. J. D. Sowjanya, Staff Member	
27.	Sri M. Durga Prasad, Staff Member	
28.	Sri I. Ramesh, Staff Member	
29.	III B.Sc., MPC (EM)	
30.	III B.Sc. BZC (TM)	
31.	II B.Sc., MPC (EM)	
32.	II B.Sc. BZC (TM)	
33.	I B.Sc., MPC (EM)	
34.	I B.Sc., MCAC (EM)	

Date: 27-12-2018

Chairman

Board of Studies

Department of Chemistry.

**List of Examiners and Paper Setters:**

S.No.	Name of the Lecturer/Reader	College	Paper Taught
1.	K. Sarveswara Rao	GDC Kothapeta	All Papers
2.	V.V. Prabhakara Rao	GDC, Dumpagadapa (W.G.Dt.)	All Papers
3.	V. Soma Sekhara Rao	GDC, Alamuru.	All Papers
4.	Dr. V. Sambasiva Rao	GDC, TUNI.	All Papers
5.	A. Sai Sundar	Govt. College, Jangareddigudem	All Papers
6.	Dr. T. Narasimha murthy	GDC, Mandapeta	All Papers
7.	U. Venkatacharyulu	Govt. College, Jaggampeta	All Papers
8.	Dr. G.V. Ramana	SKVTC, Rajahmundry	All Papers
9.	Ms. V. Ananta Lakshmi	ASD GDC(W), Kakinada	All Papers
10.	T.V.V. Satyanarayana	GDC, Ramachandrapuram	All Papers
11.	T. Sreevaram	GDC, Ravulapalem	All Papers
12.	D. Suneetha	GDC, Yeleswaram	All Papers
13.	V. Badrinarayana Rao	GDC.(W) Kakinada	All Papers
14.	E.V.S Subrahmanyam	GDC, Razole	All Papers
15.	M.M. Pacha	GDC, Ramachandrapuram	All Papers
16.	R. Brahmaji	GDC, Ramachandrapuram	All Papers
17.	U. Satyanarayana	GDC, Tuni	All Papers
18.	T. Vara Prasad	P.R.G. C.(A) Kakinada	All Papers
19.	D. Rama Rao	P.R.G. C.(A) Kakinada	All Papers
20.	V. Mallikrajuna Sharma	P.R.G.C, Kakinada	All Papers
21.	D. Chenna Rao	ASD GDC(W), Kakinada	All Papers
22.	T. Srinivasa Rao	GDC (M), Nidadavolu	All Papers
23.	V. Sridhar	GDC (M), Nidadavolu	All Papers

<b>S.No.</b>	<b>Name of the Lecturer/Reader</b>	<b>College</b>	<b>Paper Taught</b>
<b>24.</b>	M. Syam Babu	GDC (M), Nidadavolu	<b>All Papers</b>
<b>25.</b>	A. Venkata Rao	GDC, Ramachandrapuram	<b>All Papers</b>
<b>26.</b>	K. Vasundhara	SKR (W) C, Rajahmundry	<b>All Papers</b>
<b>27.</b>	B. Rama Krishna	SKST(W)DC, Tanuku	<b>All Papers</b>
<b>28.</b>	P. Siva Kumar	GDC, Mandapeta	<b>All Papers</b>

**Date : 27-12-2018**

**Chairman**  
**Board of Studies**  
**Department of Chemistry.**

**GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY**  
**DEPARTMENT OF CHEMISTRY**  
**SYLLABUS FOR B.Sc. FIRST YEAR SEMESTER II**  
**FROM 2018 -19 ONWARDS**  
**GENERAL & PHYSICAL CHEMISTRY**

Total hours: 60

**GENERAL CHEMISTRY**

**Unit -I: Atomic Structure, Elementary Quantum Mechanics and Chemical Bonding**

Atomic Structure, Elementary Quantum Mechanics 7 hrs

Blackbody radiation, Planck's radiation law, photoelectric effect, Compton Effect, De Broglie's hypothesis, Heisenberg's uncertainty principle. Postulates of quantum mechanics. Schrödinger wave equation derivation.

Additional input: Shapes of Orbitals.

**Chemical Bonding** 8 hrs

Valence bond theory and its application to  $\text{ClF}_3$ ,  $\text{BrF}_5$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$ ,  $\text{XeF}_2$ . Dipole moment and structure of molecules. Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules ( $\text{He}_2$ ,  $\text{B}_2$ ,  $\text{C}_2$ ,  $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{HCl}$ ,  $\text{CO}$  and  $\text{NO}$ ). Comparison of VB and MO theories.

**Additional input:** Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule.

**Unit-II: Stereochemistry of Carbon Compounds** 15 hrs

Molecular representations- a) Wedge, b) Fischer, c) Newman and d) Saw-Horse formulae.

Optical activity- 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 molecules. Glyceraldehyde, Lactic acid, Alanine, tartaric acid and 2, 3 -dibromopentane.

D,L and R, S configuration: Cahn-Ingold-Prelog rules. Racemic mixture- racemisation and resolution techniques.

Geometrical isomerism with reference to alkenes- Cis, Trans and E, Z- configuration. Additional input: Optical Activity and physiological activity of Natural Products.

**Unit- III: States of matter****1. Gaseous State****6 hrs**

Deviation of real gases from ideal behaviour, van der Waal's equation of state, P-V Isotherms of carbon dioxide. Critical phenomena. The van der Waal's equation and the critical state (Relationship between critical constants and Vander Waal's constants). The law of corresponding states and reduced equation of states. Joule-Thomson effect. Liquefaction of gases: i) Linde's method and ii) Claude's method.

**2. Liquid state****4 hrss**

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

Additional input:  $C_p/C_v$  ratio, Numerical problems

**3. Solid State Chemistry****5 hrs**

Types of Solids-symmetry in crystal systems-space lattice and unit cell- Bravais Lattices-crystal systems -law of rational indices-Miller indices-interplanar spacings in a crystal system-X-ray diffraction- Bragg's equation; Quasi crystals. Defects in crystals-point and line defects; Schottky and Frenkel defects.

Additional input: Color centre.

**Unit - IV: Solutions and Surface Chemistry****Solutions****9 hrs**

Solutions of liquids in liquids - Raoult's law- ideal solutions, non-ideal solutions. Vapour pressure - composition curves for ideal and non-ideal solutions. Vapour pressure - composition and temperature- composition curves of completely miscible binary solutions (Azeotropes-HCl-H<sub>2</sub>O, ethanol-water systems) - fractional distillation. Partially miscible liquids-phenol-water, tri methyl amine-water, nicotine-water systems. Effect of impurity on consolute temperature. Steam distillation. Nernst distribution law and its applications. Solutions of gases in liquids- Henry's law.

Additional input: Types of Solutions

**Surface Chemistry****6hrs**

Definition of colloids. Solids in liquids (sols), preparation, 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

Additional input: Factors effecting adsorption.



**GOVERNMENT COLLEGE (A), RAJAHMUNDRY.**  
**B.Sc. FIRST YEAR CHEMISTRY SEMESTER -II**  
**MODEL QUESTION PAPER BLUE PRINT FROM 2018-19 ONWARDS**

**GENERAL & PHYSICAL CHEMISTRY**

S.No.	Chapter	Essay questions (08 M) knowledge	Short answer questions (05 M) understanding	Very short answer questions (02 M) skill /application
1	Chemical Bonding	02	02	01
2	Stereochemistry of Carbon compounds	02	02	01
3	Gaseous State	02	02	01
4	Solutions	02	02	01
Total number of questions		08	08	04

**GOVERNMENT COLLEGE (A), RAJAHMUNDRY.**  
**B.Sc. FIRST YEAR CHEMISTRY SEMESTER -II**  
**MODEL QUESTION PAPER FROM 2018-19 ONWARDS**

**GENERAL & PHYSICAL CHEMISTRY**

TIME: 3hr.

MARKS: 60 M

PART -A

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

4X8 = 32 M

1. Derive Schrodinger's wave equation.

శ్రోడింగర్ తరంగ సమీకరణం ఉత్పాదించుము

(OR)

What is LCAO method? Explain the molecular orbital diagrams of molecules .

a) O<sub>2</sub> b) CO

LCAO పద్ధతి అనగానేమి ? ఈక్రింది అణువుల అణు ఆర్బిటాల్ చిత్రాలను

వివరించుము. a) O<sub>2</sub> b) CO అణువుల అణు ఆర్బిటాల్లను.

2. What are enantiomers and diastereomers? Explain optical isomerism with Glyceraldehyde and Lactic acid molecules.

ఎన్‌స్పియోమర్లు మరియు డయాస్టీరియోమర్లు అనగా నేమి? గ్లిసరాల్డిహైడ్ మరియు లాక్టిక్ ఆమ్లముల దృక్ సాదృశ్యమును వివరించుము

(OR)

What are Cahn- Ingold and Prelog (CIP) rules? Explain R, S Configuration with suitable examples.

చాన్, ఇంగోల్డ్ మరియు ప్రేలోగ్ నియమములేవి. R, S విన్యాసమును తగిన ఉదాహరణల తో వివరించుము.

3. Explain the causes for deviation of real gases and derive van der Waal's equation of state.

నిజ వాయువుల విచాలనాలకు కారణములు వివరించి వాండర్ వాల్ స్థితి సమీకరణాన్ని ఉత్పాదించండి.

(OR)

Discuss briefly the following. a) Raoult's law b) Henry's law c) Azeo tropes

d) CST

క్రింది వాటిని సంగ్రహంగా వివరించుము a) రౌల్ట్ నియమము b) హెన్రీ నియమము

b) స్థిర క్వడ్రనాంక మిశ్రమములు d) సందిగ్ధ ద్రావణ ఉష్ణోగ్రత

4. What is colloid? Write preparation, properties (kinetic, optical, electrical) of colloids.

కొల్లాయిడ్ అనగా నేమి? కొల్లాయిడ్ ల తయారీ, ధర్మాలు (గతిక, ద్రువన, విద్యుత్) వ్రాయుము

(OR)

Describe in detail different types of defects in crystals

స్పటికములలోని వివిధ రకముల లోపాలను సవివరముగా వివరించండి

### PART – B

Answer any FIVE Questions

5x4 = 20 M

5. Explain Heisenberg's uncertainty principle and Compton Effect.  
హైసెన్ బెర్గ్ అనిశ్చితత్వ నియమము మరియు కాంప్టన్ ఫలితము వివరించుము
6. Write a note about geometrical isomerism.  
జ్యామితీయ సాదృశ్యము గూర్చి లఘువ్యాఖ్య వ్రాయుము
7. What is Joule Thomson effect? Describe Claude's liquefaction process.  
జౌల్ థామ్సన్ ప్రభావం అనగానేమి? క్లాడ్ పద్ధతిలో వాయువుల ద్రవీకరణాన్ని వివరించండి.
8. Explain an expression for Langmuir adsorption isotherm.  
లాంగ్మూర్ అదిశోషణ సమోష్ణోగ్రత రేఖకు సమీకరణాన్ని వివరించండి.
9. Compare valence bond theory and molecular orbital theory.  
వేలెన్సీ బంధ సిద్ధాంతము మరియు అణు ఆర్బిటాల్ సిద్ధాంతములను పోల్చుము.
10. Write briefly about resolution?  
పుడహకరణం గురించి వ్రాయండి
11. Derive Bragg's equation.  
బ్రాగ్ సమీకరణము ఉత్పాదించుము చర్చించు.
12. Describe vapour pressure- composition curves for non-ideal solutions.  
అదర్వేతర ద్రావణాల భాష్పపీడన -సంఘటన వక్రాలను వివరించండి

### PART-C

Answer ALL Questions

4x2 = 8M

13. Write the hybridization and structure of Ni (CO)<sub>4</sub> and ClF<sub>3</sub>  
Ni (CO)<sub>4</sub> మరియు ClF<sub>3</sub> ల సంకరీకరణము మరియు నిర్మాణాలను వ్రాయుము
14. Define enantiomers and diastereomers with examples  
ఎనాన్సిమర్ మరియు డయాస్టీరియోమర్ లను నిర్వచించి, ఉదాహరణలు వ్రాయండి
15. Define critical temperature. What is T<sub>c</sub> value for CO<sub>2</sub> gas?  
సందిగ్ధ ఉష్ణోగ్రతను నిర్వచించుము. CO<sub>2</sub> వాయువుకు T<sub>c</sub> విలువ ఎంత?
16. What are Miller indices?  
మిల్లర్ ఇండిసెస్ అనగా నేమి ?

**Laboratory Course-II**  
**Practical- II Analysis of Mixture Salt**  
**(At the end of Semester-II)**

3h/w

**Qualitative Inorganic Analysis**

Analysis of mixture salt containing two anions and Cations (From two different groups) from the following

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

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

**Scheme of Valuation**

**Qualitative Analysis**

Total : 50 marks

External Evaluation : 50 marks

**Scheme For External Examination**

Marks: 50

- |                  |          |
|------------------|----------|
| 1) Record        | 10 marks |
| 2) For practical | 40 marks |

**Systematic procedure should be adopted**

**Breakup of marks:**

**A**

- |                          |   |
|--------------------------|---|
| 1. Colour And Appearance | 2 |
| 2. Solubility            | 2 |
| 3. Flame Test            | 2 |
| 4. Action Of Heat        | 2 |

**B**

- |                                  |         |
|----------------------------------|---------|
| Test For Each Anion              | - 4     |
| Two Anions-                      | 2 x 4=8 |
| Carbonate Extract Preparation    | 2       |
| Elimination of Interfering Anion | 3       |

**Breakup Of 4 Marks For Each Anion**

Dry Test With Acids	-	2
Conformation Test With Extract	-	2

**C****Identification of Cations**

Each Cation		5
Two Cations		2x5=10

**Breakup Of Marks For Cations**

## Identification of Correct Group

In Separation	-	1
Colour of the Precipitate	-	1
Group Separation	-	1

Conformation Test In The Group -2

**For Ammonium Cation**

Dry Test with Sodium Hydroxide-		2
Conformation Test with Nessler's Reagent	-	3

**D** Report 4

For Two Cations - 2

For Two Anions - 2

Viva-voce - 5

Total 50

**GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY**  
**DEPARTMENT OF CHEMISTRY**  
**SYLLABUS FOR B.Sc. SECOND YEAR SEMESTER IV**  
**FROM 2018 -19 ONWARDS**  
**SPECTROSCOPY & ORGANIC CHEMISTRY**

**Total Hours: 60**

**SPECTROSCOPY**

**(30 H)**

**UNIT-I:**

**a) Spectrophotometry**

7h

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

**a) Electronic spectroscopy**

7h

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. Concept of Chromophore and Auxochrome. Bathochromic shift, hypsochromic shift, hyper chromic shift, hypochromic shift. Effect of conjugation on  $\lambda_{max}$ .

**UNIT-II**

**a) Infrared spectroscopy**

6 h

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

**b) Proton Magnetic Resonance Spectroscopy ( $^1H$ -NMR)**

10 h

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 h)****UNIT-III****a) 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.

**b) 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.

**UNIT-IV****a) Electrochemistry-I**

10h

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

**b) 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.

**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. Backrest 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



**Government College (A), Rajahmundry.**  
**B.Sc. Second Year Chemistry Semester –IV**  
**Model Question Paper Blue Print 2018-19**  
**Spectroscopy & Physical Chemistry**

Sl. NO.	Unit	Essay Question ( 08 M ) knowledge	Short Answer Question ( 04 M ) Under standing	Very Short Answer Question ( 02 M ) Skill / Application
1.	UNIT-I	02 (1 from a + 1 from b)	02	01
2.	UNIT-II	02 (1 from a + 1 from b)	02	01
3.	UNIT-III	02 (1 from a + 1 from b)	02	01
4.	UNIT-IV	02 (1 from a + 1 from b)	02	01
<b>Total no. of Questions</b>		<b>08</b>	<b>08</b>	<b>04</b>

**Government College (A), Rajahmundry.  
B.Sc. Second Year Chemistry Semester –IV  
Model Question Paper Blue Print 2018-19  
Spectroscopy & Physical chemistry**

**Time: 3hr.**

**Marks: 60M**

**PART -A**

Answer **ALL** the Questions

**4X8 = 32 M**

1. (A) How do you estimate the amount of chromium in potassium dichromate and manganese in Manganous sulphate spectrophotometric ally.

స్వక్రోమోఫోర్ మేటర్ ను ఉపయోగించి పొటాషియం డైక్రోమేట్ నందలి క్రోమియం భారమును, మాంగనీస్ సల్ఫేట్ నందలి మాంగనీస్ భారమును లెక్కించుము.

(or)

- (B) Define chromophore and auxochrome. How does the conjugation affect the  $\lambda_{max}$ . క్రోమోఫోర్, ఆక్సో క్రోమ్ లను నిర్వచించుము.  $\lambda_{max}$  విలువను సంయుక్తం ఏ విధంగా ప్రభావితం చేస్తుంది?

2. (A) Give a short note on the factors that influence the stretching & Bending vibrations. సాగే మరియు వంగే కంపనాలను ప్రభావితం చేసే కారకాలను వివరించండి.

(or)

- (B) Write the principle NMR spectroscopy. What is chemical shift equivalence? How many different NMR signals you will see in the following molecules?

Ethanol, Ethyl Acetate and Acetophenone.

NMR వర్ణపట శాస్త్రము యొక్క సూత్రం తెలపండి. రసాయన స్థానంతరము అనగా ఏమి? ఇథనాల్, ఇథైల్ అసిటేటు మరియు అసిటోఫీనోన్ అణువుల NMR వర్ణపటము లను గీసి వివరించండి.

3. (A) Derive the relationship between elevation in the boiling point and the molecular weight of the solute.

భాష్పిభవన స్థాన ఉన్నతి మరియు ద్రావిత అణుభారము మధ్య గల సంబంధమును రాబట్టండి.

(or)

- (B) Explain water system. Why freezing mixtures produce low temperatures.

నీరు-స్రావస్థ ను వివరించండి. ఘనీభవన మిశ్రమము అల్పఉష్ణోగ్రతలను ఏ విధంగా కలిగిస్తాయో తెలపండి.

4. (A) Explain Debye-Huckel-Onsager theory of strong electrolytes and derive its equation.

బలమైన విద్యుత్ విశ్లేష్య ముల యొక్క Debye-Huckel-Onsager సిద్ధాంతమును వివరించి సమీకరణాన్ని రాబట్టండి.

(or)

(B) How E.M.F of the cell is measured? Write applications of E.M.F. measurements.

ఘటము యొక్క E.M.F ను ఎలా లెక్కగడతారు . E.M.F లెక్కింపుల యొక్క

అనువర్తనాలను వ్రాయండి

### PART- B

Answer any **FIVE** Questions

**5x4 = 20 M**

5. Write Beer-Lambert's law and its limitations.

బీర్-లాంబర్ట్ నియమాన్ని అందలి పరిమితులను తెలపండి.

6. Write about various types of electronic transitions.

వివిధ రకాలైన ఎలక్ట్రానిక్ పరివర్తనాలను గూర్చి వ్రాయండి

7. What is finger print region in IR and discuss its significance in structure elucidation.

ఫింగర్ ప్రింట్ ప్రాంతం అనగా నేమి మరియు సమ్మేళన నిర్మాణ క్రమంలో ఈ ప్రాంతం యొక్క ప్రాముఖ్యత వివరించుము.

8. What is spin-spin coupling? How do you distinguish cis and trans alkenes using NMR

spectroscopy. స్పిన్-స్పిన్ సంధానం అనగా నేమి? **NMR**

వర్ణపట శాస్త్రము ఉపయోగించి సిస్ మరియు ట్రాన్స్ ఆల్కైన్లను ఎలా వేరు చేస్తారు?

9. Define Raoult law. Write the relation between relative lowering of vapor pressure and molecular weight of the solute.

రౌల్ట్ నియమాన్ని నిర్వచించండి. భాష్పిభవన నిమ్నత కు, ద్రావిత అణుభారానికి

మధ్యగల సంబంధమును రాబట్టండి.

10. Define Eutectic point and congruent point.

యుటెక్టిక్ బిందువు, సంగత ద్రవీభవన స్థాన బిందువు లను నిర్వచించండి

12. Write the differences between electrolytic cell and electrochemical (galvanic) cells.

ఎలక్ట్రోలైటిక్ సెల్ మరియు ఎలక్ట్రోకెమికల్ (గాల్వానిక్) సెల్ మధ్య భేదాలను

వ్రాయుము.

12. Calculate the EMF of the cell  $\text{Cd}/\text{Cd}^{2+}/\text{Cu}^{2+}/\text{Cu}$  at room temperature, standard reduction potential of Cd and Cu electrodes are respectively -0.40V and 0.34V.

గది ఉష్ణోగ్రత వద్ద  $\text{Cd}/\text{Cd}^{2+}/\text{Cu}^{2+}/\text{Cu}$  చర్య యొక్క EMF విలువను లెక్కించండి. Cd మరియు Cu

ఎలక్ట్రోడ్ల యొక్క ప్రామాణిక నిర్మాణ సామర్థ్యములు వరుసగా -0.40V మరియు 0.34V.

### PART-C

Answer ALL Questions

**4x2 = 8M**

13. Which electronic transition has a high  $\epsilon$  value in acetone?

ఎసిటోన్ లోగల ఏ ఎలక్ట్రానిక్ పరివర్తన యొక్క  $\epsilon$  విలువ ఎక్కువగా ఉంటుంది.

14. What is coupling constant (J)?

కప్లింగ్ స్థిరాంకము (J) అనగా నేమి?

15. What is degree of freedom?

స్వేచ్ఛ ఉద్దీ అనగా నేమి?

16. Draw the conductometric titration graph of strong acid versus weak base.

బలమైన ఆమ్లం మరియు బలహీన క్షారముల మధ్య కండక్టోమెట్రిక్ అంశమాపన గ్రాఫ్ గీయుము.

**LABORATORY COURSE -IV****30 hrs.****Practical -IV: Titrimetric Analysis****(At the end of Semester-IV)****50 Marks****Titrimetric analysis**

1. Determination of carbonate and bicarbonate mixture
2. Determination of Fe(II) using  $K_2Cr_2O_7$
3. Determination of Fe(II) using  $KMnO_4$  with oxalic acid as primary standard
4. Determination of Zn by EDTA
5. Determination of Ni by EDTA
6. Determination of Zn by ferrocyanide (precipitation titration)
7. Iodometry
8. Determination of hardness of water

**External Examination, Semester-IV**

Max Marks: 50

Max Time : 3 hrs

**Scheme of Valuation For External Examination**

1. For Practical - 40 Marks
2. For Record - 10 Marks

**Break up of marks for practicals:**

- Procedure (in first 10 minutes) - 10 Marks Break up of marks for Procedure:
  - a. Principle with equation and no. of moles - 5 Marks
  - b. Procedure with a brief explanation of 3 stages of analysis mentioning the solutions taken in burette & pipette, indicator used and end point. - 5 Marks
- Preparation of Standard solution - 4 Marks
- Standardization of intermediate solution - 4 Marks
- For tabulation of readings in 2 neat tabular forms - 5 Marks
- Calculations - 4 Marks
- Viva- 5 Marks
- For the result < 1% error - 8 Marks

**Note:**

1. If the student does the experiment correctly and reports the volumes perfectly and May fail to arrive at correct answer by doing wrong calculation, 5 marks shall be deducted for wrong calculations.
2. Percentage of error shall be calculated on the weights actually reported but not on the volumes.
3. The scheme is expected to follow scrupulously.
4. The examiner is instructed to maintain worksheet in which he shall record the volumes, concentrations, weights the student is expected to report and actually reported and the percentage of error. This work sheet is maintained batch wise and shall be enclosed with answer scripts batch wise.

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**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM**

**SYLLABUS FOR VI SEMESTER**

**III B.Sc. CHEMISTRY ELECTIVE – VIIA**

**TOTAL HOURS: 45**

**ANALYTICAL METHODS IN CHEMISTRY**

**UNIT-I**

**Quantitative analysis:** **10 h**

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

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

**UNIT-II**

**7h**

**Treatment of analytical data:** 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:** **8 h**

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**

**10 h**

**Chromatography:** Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, R<sub>f</sub> values, factors effecting R<sub>f</sub> values.

Paper Chromatography: Principles, R<sub>f</sub> values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography - applications.

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

Thin layer Chromatography (TLC): Advantages - Principles, factors effecting R<sub>f</sub> 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.

**ADDITIONAL UNIT - INTELLECTUAL PROPERTY RIGHTS**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law – Copyright Ownership

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

**REFERENCE BOOKS**

1. Analytical Chemistry by Skoog and Miller
2. A textbook of qualitative inorganic analysis by A.I. Vogel
3. Nano chemistry by Geoffrey Ozin and Andre Arsenault
4. Stereochemistry by D. Nasipuri
5. Organic Chemistry by Clayden
6. Deborah E. Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
7. Kompal Bansal & Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
8. Prabhuddha Ganguli: ‘ Intellectual Property Rights’ Tata Mc-Graw – Hill, New Delhi
9. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.



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III B.SC. CHEMISTRY ELECTIVE PAPER – VIIA

SEMESTER – VI

ANALYTICAL METHODS IN CHEMISTRY

S. NO.	Chapter	Hours Required	Essay Question (08 M) knowledge	Short Answer Question (04 M) Understanding	Very Short Answer Question (02 M) Skill / Application
1.	Quantitative analysis	10	02	01	01
2.	Treatment of analytical data	07	02	02	01
3.	Separation techniques in chemical analysis	08	02	01	01
4.	Chromatography-I	10	01	02	--
5.	Chromatography-II	10	01	02	01
<b>Total no of Questions</b>		<b>45</b>	<b>08</b>	<b>08</b>	<b>04</b>

**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM**  
**THREE YEAR B.Sc., DEGREE EXAMINATIONS**  
**SEMESTER-VI**  
**MODEL QUESTION PAPER**  
**PAPER VII-A: ELECTIVE – A**  
**ANALYTICAL METHODS IN CHEMISTRY**

**Time: 3Hrs**

**Max. Marks: 60 M**

**PART-A**

**4X 8 =32Marks**

**I.** Answer **ALL** of the following questions. Each question carries **EIGHT** marks.

క్రింది వానిలో అన్ని ప్రశ్నలకు సమాధానములు వ్రాయండి .ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు

1. A) Describe the choice of indicators for acid-base titrations.  
 ఆమ్ల-క్షార అంసమాపక సూచికను ఎన్నుకొను విధానము వివరింపుము .

**(OR)**

B) What is the principle of Gravimetric analysis and explain co-precipitation and Post-precipitations with suitable examples.

భారత్మక విశ్లేషణము యొక్క సూత్రము ఏమిటి .మరియు సహా-అవక్షేపపు మరియు ఉత్తర - అవక్షేపపులను ఉదాహరణలలో వ్రాయండి .

2. A) i) Define and explain the terms accuracy and precision

ii) Define standard deviation and confidence limit.

i) ఖచ్చితత్వము మరియు సున్నితత్వము అను పదములను తెలిపి వాటి గూర్చి వివరించండి .

ii) క్రమ విచలనం మరియు విశ్వాస పరిమితులను నిర్వచించండి .

**(OR)**

B) Discuss various types of errors.

వివిధ రకాల దోషాలను గుర్చి చర్చించుము .

3. A) Write the principle and application of solvent extraction.

ద్రావణి నిష్కర్షణకు సూత్రమును మరియు అనువర్తనాలను వ్రాయండి .

**(OR)**

B) Explain any two methods for solvent extraction.

ద్రావణి నిష్కర్షణకు ఏవేని రెండు పద్ధతులను వివరింపుము .

4. A) Give the experimental procedure of paper chromatography. Write any of its applications.

కాగిత క్రోమటోగ్రఫీ యొక్క ప్రయోగాత్మక విధానము ఇచ్చి ఏవేని రెండు అనువర్తనాలను వ్రాయండి.

(OR)

- B) Write the preparation of thin layer chromatography plates. Explain the principle and applications of thin layer chromatography

పలుచని పొర క్రోమటోగ్రఫీ పలకల యొక్క తయారీని వ్రాయండి. పలుచని పొర క్రోమటోగ్రఫీ యొక్క సూత్రము మరియు అనువర్తనాలను వ్రాయండి.

**PART-B**

**5 X 4 = 20 Marks**

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

క్రింది వానిలో ఏవైనా ఐదు ప్రశ్నలకు సమాధానములు వ్రాయండి. ప్రతి ప్రశ్నకు నాలుగు మార్కులు

5. Discuss the complex metric titrations with examples.

సంక్లిష్ట అసమాపనాలు గూర్చి ఉదాహరణలతో వివరింపుము.

6. Explain about precipitation and coagulation.

అవక్షేపపు మరియు స్కంధానములను వివరింపుము.

7. Write about standard deviation.

క్రమ విచలనము గూర్చివ్రాయుము .

8. How do you estimate Fe (III) using solvent extraction method?

ద్రావణి నిష్కర్షణ పద్ధతీని ఉపయోగించి Fe (III) ను ఎలా నిర్ణయిస్తారు .

9. Describe the development of chromatogram in paper chromatography.

కాగిత క్రోమటోగ్రఫీ లో క్రోమటోగ్రామ్ అభివృద్ధిగూర్చివ్రాయుము .

10. What are the factors affecting  $R_f$  value.

$R_f$  విలువను ప్రభావితం చేసే అంశాలు ఏమిటి .

11. What type of adsorbents and solvents used in thin layer chromatography.

పలుచని పొర క్రోమటోగ్రఫీ నందు ఎటువంటి అధిశోషకములు మరియు ద్రవణులను ఉపయోగిస్తారు.

12. Write the applications of High Performance Liquid Chromatography.

అధిక సామర్థ్య ద్రవ క్రోమటోగ్రఫి యొక్క ఉపయోగములు తెలుపుము.

### PART – C

4 X 2 = 8 Marks

**III** Answer **ALL** of the following questions. Each question carries **TWO** marks

క్రింది అన్ని ప్రశ్నలకు సమాధానములు వ్రాయండి .ప్రతి ప్రశ్నకు రెండు మార్కులు

13. What is co-precipitation and post-precipitations?

సహా –అవక్షేపపు మరియు ఉత్తర – అవక్షేపపు అనగా నేమి ?

14. Define accuracy and precision.

ఖచ్చితత్వము మరియు సున్నితత్వము తెల్పండి.

15. What is  $R_f$  value . Write the formula of  $R_f$  value.

$R_f$  విలువను అనగానేమి ?  $R_f$  విలువను యొక్క సూత్రమును వ్రాయుము.

16. Define Stationary Phase and Mobile Phase.

స్థిర ప్రావస్థ మరియు చర ప్రావస్థ లను తెల్పండి.

## CHEMISTRY LABORATORY COURSE – VII-A

(at the end of semester VI)

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

**50 Marks**

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

## CHEMISTRY LABORATORY COURSE – VII-A

(at the end of semester VI)

**Time:** 3 hrs.

Max.Marks:50

### SCHEME OF VALUATION

For Record	- 10 Marks
For Viva- voce For	- 5 Marks
Practical	- 35 Marks

#### Splitting of Practical Marks

i)	Procedure in first 10 min	: 5 Marks
ii)	Formula with units	: 5 Marks
iii)	Neat tabulation	: 5 Marks
iv)	Correct calculation	: 20 Marks
	Error < 10%	: 20 Marks
	Error 10-15 %	: 15 Marks
	Error > 15 %	: 10 Marks (Minimum Marks)

**GOVERNMENT ARTS COLLEGE (A), RAJAMAHENDRAVARAM.**  
**SYLLABUS FOR VI SEMESTER**  
**III B.Sc. CHEMISTRY ELECTIVE – VIIB**  
**ENVIRONMENTAL CHEMISTRY**  
**ACADEMIC YEAR 2018 - 19**

**No. of Hours:45 Hrs**

**UNIT-I**

**Introduction to Environmental Chemistry. 8 h**

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 Non-renewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydrological cycle.

**UNIT-II**

**AirPollution. 8h**

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**

**Waterpollution. 9 h**

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**

**Radioactive Pollution and Chemical Toxicology. 10 h**

**Radioactive Pollution:** Definition and types of radio active pollution, biological effects of radioactive pollution, cellular phones, Networks and nuclear power plants as a source of radiation

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

**UNIT-V****Ecosystem and biodiversity.****10 h**

**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 - bio geographical classification of India – biodiversity at national, global and regional level.

**ADDITIONAL UNIT - INTELLECTUAL PROPERTY RIGHTS**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law – Copyright Ownership

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

**REFERENCE BOOKS:**

1. Fundamentals of Ecology by M.C. Dash
2. A Textbook of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir K. Banerji
4. Deborah E. Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
5. Kompal Bansal & Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
6. Prabhuddha Ganguli: ‘ Intellectual Property Rights’ Tata Mc-Graw – Hill, New Delhi
7. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.

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III B.SC. CHEMISTRY SEMESTER – VI

ELECTIVE PAPER – VIIB: ENVIRONMENTAL CHEMISTRY

**ACADEMIC YEAR 2018 - 2019**

Sl. No.	Chapter	Essay Question (08M) knowledge	Short Answer Question (04 M) Understanding	Very Short Answer Question (02 M) Skill / Application
1.	Introduction of Environmental Chemistry	02	01	01
2.	Air Pollution	02	02	01
3.	Water Pollution	02	01	01
4.	Radioactive Pollution & Chemical Toxicology	01	03	--
5.	Ecosystem and Biodiversity	01	01	01
<b>Total no of Questions</b>		08	08	04



**III YEAR B.Sc. DEGREE EXAMINATION**

**SEMESTER VI**

**Paper –VII B: ELECTIVE – B: ENVIRONMENTAL CHEMISTRY**

**MODEL PAPER**

**ACADEMIC YEAR 2018-19**

**Time: 3 hours**

**Maximum Marks: 60M**

**PART - A**

Answer All Questions, each Question carries EIGHT marks.

అన్ని ప్రశ్నలకు సమాధానాలు వ్రాయుము? ప్రతి సమాధానం నకు ఎనిమిది మార్కులు.

**4 x 8 = 32**

**Marks**

1. a) Explain the segments of the environment.?

పర్యవరణం లోని ఖండికలను వివరించుము?

(OR)

- b) Write about renewable energy sources.?

కృత్రిమ శక్తి వనరుల గూర్చి వ్రాయుము?

2. a) Discuss in detail about air pollution.?

వాయు కాలుష్యం గూర్చి వివరంగా చర్చించుము?

(OR)

- b). Describe the green house effect.?

హరిత గృహ ప్రభావం గూర్చి వివరించుము?

3. a) Explain the methods to convert permanent hard water to soft water.?

శాశ్వత కఠినజలం ను సాధుజలం గా మార్చు విధానాలను వివరించండి?

(OR)

- b). Principle of wastage treatment and Industrial waste water treatment.?

వ్యర్థజలం ను శుద్ధి చేయు సూత్రము మరియు పరిశ్రమల వ్యర్థజలంను ఏవిధంగా శుద్ధి చేస్తారు?

4. a). Give detailed account on biodiversity?

జీవవైవిధ్యం గూర్చి సవివరంగా తెలియ జేయుము?

- b). Define Radioactive pollution and Explain adverse effects of radioactive pollution on biological system

రేడియోధార్మిక కాలుష్యం ను నిర్వచించి ? జీవవ్యవస్థ పై రేడియోధార్మిక కాలుష్యం వల్ల సంభవించు

జీవ సంబంధ ప్రతికూలతలను వివరించుము?

## PART - B

Answer any FIVE of the following questions. **5X4 =20 Marks**

ఏవైనా ఐదంటికి సమాధానాలు వ్రాయుము?

1. Explain the importance of environment in now-a-days.  
ప్రస్తుత రోజులలో పర్యవరణం యొక్క ప్రాముఖ్యతను వివరించండి?
2. What is Bhopal gas disaster?  
బోపాల్ గ్యాస్ దుర్ఘటన అనగానేమి?
3. Explain formation and depletion of Ozone?  
ఓజోన్ పొర క్షీణత గూర్చి వివరించండి?
4. Explain Eutrophication and its Effects?  
యూట్రోఫికేషన్ అనగా నేమి ? దాని ఫలితాలను వివరించండి?
5. Explain adverse effects of cellular networks radiation?  
సెల్ ఫోన్ నెట్ వర్క్స్ వలన కలుగు దుష్ఫలితాలను వివరించండి?
6. Explain Pesticides and its biochemical effects?  
పురుగు మందులు అనగానేమి? వాటి జీవ రసాయన ప్రభావం వివరించండి?
7. Explain toxic effects of Lead and Mercury?  
లెడ్ మరియు పాదరసం యొక్క విషప్రభావం వివరించండి?
8. What are the Functions of Eco system?  
ఆవరణ వ్యవస్థ యొక్క విధులేవి ?

## PART – C

**4X2 = 8 Marks**

Answer All Questions, Each Question, carries two marks

అన్ని ప్రశ్నలకు సమాధానాలు వ్రాయుము?

9. Define Thermal power and Atomic energy?  
ఉష్ణశక్తి మరియు పరమాణుశక్తి అనగానేమి?
10. What is photochemical smog?  
కాంతి రసాయన పొగ అనగానేమి?
11. Define COD and BOD?  
COD మరియు BOD లను నిర్వచించుము?
12. What is Food chain and Bio mass?  
ఆహారపు గొలుసు మరియు జీవ ద్రవ్యరాశి అనగానేమి?

... @ @ @ ...



Error < 10% : 20 Marks

Error 10-15% : 15 Marks

Error > 15% : 10 Marks (Minimum Marks)

**GOVERNMENT ARTS COLLEGE (A), RAJAMAHENDRAVARAM.**  
**SYLLABUS FOR VI SEMESTER**  
**III B.Sc. CHEMISTRY ELECTIVE – VIIC**  
**GREEN CHEMISTRY**  
**ACADEMIC YEAR 2018 - 19**

**Total Hours : 45**

**UNIT-I**

**10hr**

**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 reactions (100% atom economic). Organic reactions by Sonication method: apparatus required examples of sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).

**UNIT-II**

**10 h**

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

**Super critical CO<sub>2</sub>:** Preparation, properties and applications, (decaffeination, dry cleaning)

**UNIT-III**

**10 h**

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

**UNIT-IV**

**5 h**

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

**UNIT V**

**10 h**

Examples of green synthesis / reactions and some real world cases: 1. Green synthesis of the following compounds: adipic acid, catechol, disodium imino diacetate (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).

## **ADDITIONAL UNIT - INTELLECTUAL PROPERTY RIGHTS**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

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## **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
8. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
9. Kompal Bansal & Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
10. Prabhuddha Ganguli: ‘ Intellectual Property Rights’ Tata Mc-Graw – Hill, New Delhi
11. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.

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**III B.SC. CHEMISTRY ELECTIVE PAPER – VIIC**

**SEMESTER – VI**

**GREEN CHEMISTRY**

<b>Sl. NO.</b>	<b>Chapter</b>	<b>Essay Question ( 08 M ) knowledge</b>	<b>Short Answer Question ( 04 M ) Under standing</b>	<b>Very Short Answer Question ( 02 M ) Skill / Application</b>
<b>1.</b>	<b>Green Chemistry</b>	<b>02</b>	<b>01</b>	<b>01</b>
<b>2.</b>	<b>Selection of solvent</b>	<b>02</b>	<b>02</b>	<b>01</b>
<b>3.</b>	<b>Microwave and Ultrasound assisted green synthesis</b>	<b>01</b>	<b>01</b>	<b>01</b>
<b>4.</b>	<b>Green catalysis</b>	<b>01</b>	<b>02</b>	<b>--</b>
<b>5.</b>	<b>Green Synthesis</b>	<b>02</b>	<b>02</b>	<b>01</b>
<b>Total no of Questions</b>		<b>08</b>	<b>08</b>	<b>04</b>

**GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM**

**III B.Sc., DEGREE EXAMINATIONS**

**SEMESTER-VI: PAPER VII- C**

**ELECTIVE – VIIC: GREEN CHEMISTRY**

**MODEL QUESTION PAPER**

**Time: 3Hrs**

**Max. Marks: 60 M**

**PART-A**

**4 X 8 =32 Marks**

**I.** Answer **ALL** of the following questions. Each question carries **EIGHT** marks.  
క్రింది వానిలో ఏవైనా అన్ని ప్రశ్నలకు సమాధానములు వ్రాయండి. ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు

1. A) Explain the basic principles of green chemistry.  
హరిత రసాయన శాస్త్రము యొక్క ప్రాథమిక సూత్రాలను వ్రాయండి .

**(OR)**

- B) Illustrate the sonication method with any two reactions.

సోనికేషన్ పద్ధతిలో ఏవైనా రెండు చర్యలను వివరించండి .

2. A) Write about the reactions in ionic liquids.  
అయానిక ద్రావణాలలో చర్యలను గూర్చి వ్రాయండి .

**(OR)**

- B) Describe the preparation and properties of super critical Carbon dioxide.

సందిగ్ధ CO<sub>2</sub> యొక్క తయారీ మరియు ధర్మాలను చర్చించుము.

3. A) Explain the synthesis of fused Anthroquinines by microwave assisted organic synthesis.  
సుక్ష్మ తరంగ సహాయక కర్పన సంశ్లేషణ ద్వారా గలన ఆంథ్రాక్విన్లోన్ల యొక్క సంశ్లేషణాన్ని వివరించండి .

**(OR)**

- B) Write the green synthesis procedures for Cannizaro reaction and Aldol condensation.

కనిజారో చర్య మరియు ఆల్డోల్ సంఘననము హరిత సంశ్లేషణ విధానములో వ్రాయండి .

4. A) What is Phase transfer catalyst? How do they function?  
దశ బదిలి ఉత్ప్రేరకము అనగానేమి ? అవి ఎలా పనిచేయును .



(OR)

B) Describe the green synthesis of Diel's – Alder reaction of Hofmann elimination.

డిల్స్-ఆల్డర్ చర్య మరియు హోఫ్ మన్ బహిష్కరణలను హరిత సంశ్లేషణ విధానములో వివరించండి .

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

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

క్రింది వానిలో ఏవైనా నాలుగు ప్రశ్నలకు సమాధానములు వ్రాయండి .ప్రతి ప్రశ్నకు ఐదు మార్కులు

5. What is the need of green chemistry?  
హరిత రసాయన శాస్త్రం యొక్క అవసరము ఏమిటి?
6. Write a note on atom economy reactions.  
పరమాణు దక్షత చర్య మీద వ్యాఖ్య వ్రాయండి .
7. Heck reaction.  
హెక్ చర్య .
8. Write about solid supported synthesis.  
ఘన సహాయ సంశ్లేషణము గూర్చి వ్రాయండి .
9. What are the advantages of microwaves assisted organic synthesis.  
సుక్ష్మ తరంగ సహాయక కర్పన సంశ్లేషణము యొక్క ఉపయోగము ఏమిటి?
10. Bio catalysis.  
జీవ ఉత్పేరణ.
11. How do you perform Stricker synthesis by green synthesis method?  
హరిత సంశ్లేషణ పద్ధతి ద్వారా స్ట్రీక్కర్ సంశ్లేషణని ఎలా ప్రదర్శిస్తారు.
12. Ultra sound assisted reactions.  
అతి ధ్వని సహాయక చర్యలు .

**PART – C****4X 2 = 8 Marks**

**III.** Answer **ALL** of the following questions. Each question carries **TWO** marks

క్రింది వానిలో ఏవైనా అన్ని ప్రశ్నలకు సమాధానములు వ్రాయండి .ప్రతి ప్రశ్నకు రెండు మార్కులు

13. Write the sono chemical Wittig reaction.  
సోనో రసాయన విట్టిగ్ చర్యను వ్రాయండి .
14. Write Suzuki reaction.

సుజకి చర్యను వ్రాయండి .

15. What is Heterogeneous catalysis? Write any two uses of Zeolites.

విజాతి ఉతప్రేరణ అనగానేమి ? జయోలైట్స్ యొక్క ఏవేని రెండు ఉపయోగాలను వ్రాయండి .

16. Write the sono chemical Simmons – Smith reaction.

సిమ్మన్స్ – స్మిత్ సోనో రసాయన చర్యను వ్రాయుము .

**CHEMISTRY LABORATORY COURSE – VII-C**

(at the end of semester VI)

**3 h / w**

**50 Marks**

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

**CHEMISTRY LABORATORY COURSE – VII-C**

(at the end of semester VI)

**Max. Marks:50****Time:** 3 hrs.**SCHEME OF VALUATION**

For Record - 10 Marks  
For Viva-  
voce For - 5 Marks  
Practical - 35 Marks

**Splitting of Practical Marks**

- i) Procedure in first 10 min : 5 Marks  
ii) Formula with units : 5 Marks  
iii) Neat tabulation : 5 Marks  
iv) Correct calculation : 20 Marks
- Error < 10% : 20 Marks  
Error 10-15 % : 15 Marks  
Error > 15 % : 10 Marks (Minimum Marks)

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**DEPARTMENT OF CHEMISTRY**  
**CBCS Syllabus for B.Sc. III Year**  
**Effective from 2017 – 2018 onwards**  
**Paper - VIII-A-1 Semester – VI**  
**POLYMER CHEMISTRY**

**TOTAL HOURS : 45**  
**12 h**

**UNIT-I**

**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, Fibres 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**

**10 h**

**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**

**6 h**

Kinetics of Free radical polymerization, Glass Transition temperature (T<sub>g</sub>) and Determination of T<sub>g</sub>: Free volume theory, WLF equation, factors affecting glass transition temperature (T<sub>g</sub>).

**UNIT-IV**

**9 h**

Polymer additives:

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

**UNIT-V**

**8 h**

Polymers and their applications:

Preparation and industrial applications of Polyethylene, Polyvinyl chloride, Teflon, Terelene, Polyacrylonitrile, Nylon6,6 and 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, New York, 1967.

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III B.SC. CHEMISTRY PAPER VIII-A-1  
SEMESTER – VI

POLYMER CHEMISTRY

Sl. NO.	Chapter	Essay Question ( 08 M ) knowledge	Short Answer Question ( 05 M ) Under standing	Very Short Answer Question ( 02 M ) Skill / Application
1.	Introduction of polymers	02	02	01
2.	Techniques of Polymerization	02	02	--
3.	Kinetics of polymers	01	02	01
4.	Polymer additives	02	01	01
5.	Polymers and their applications	01	01	01
Total no of Questions		08	08	04

**MODEL QUESTION PAPER**  
**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY VIII-A-1**  
**POLYMER CHEMISTRY**

**Time: 3 hours**

**Maximum Marks: 60**

**PART- A**

**4 x 8 = 32 Marks**

Answer **ALL** the questions. Each carries **EIGHT** marks.  
 అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి 8 మార్కులు.

1. A) Give an account of classification of polymers.

ఫాలిమర్ ల వర్గీకరణను గూర్చి తెలుపుము

**(OR)**

- b) Write the mechanism of free radical polymerization.

స్వేచ్ఛా ప్రాతిపదికల ఫోలిమరికరణ చర్యా విధానమును వ్రాయుము.

2. a) How is molecular weight of a polymer determined by Viscometry

స్పిగ్గతా మాపనము ద్వారా ఫాలిమర్ ల అణుభారాలను ఎట్లు నిర్ణయిస్తారు?

**(OR)**

- b) Give an account on bulk and solution polymerization techniques.

బల్క్ మరియు ద్రావణ ఫోలిమరికరణము గూర్చి తెలుపుము.

3. a) Discuss the use of fillers and plasticizers in improving the properties of polymers.

ఫాలిమర్ల ధర్మాలను వృద్ధి చెందించుటలో ఫిల్లర్లు మరియు ప్లాస్టిసైజర్ ల ఉపయోగాలను గూర్చి చర్చించుము.

**(OR)**

- b) Write notes on flame retardants and cross linking agents.

ఉష్ణ నిరోధకాలు మరియు వ్యత్యస్త ఫాలిమర్ల గూర్చి వ్యాఖ్య వ్రాయుము.

4. a) Discuss the kinetics of free radical polymerization.

స్వేచ్ఛా ప్రాతిపదికల ఫోలిమరికరణము యొక్క గతిశాస్త్రమును చర్చించుము.

**(OR)**

- b) Write the preparation and industrial applications of polythene and teflon.

ఫాలిథీన్ మరియు టెఫ్లాన్ తయారీ మరియు పరిశ్రమలలో వాటి అనువర్తనాలను వ్రాయుము

**PART- B**

**5 x 4 = 20 Marks**

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

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి నాలుగు మార్కులు.

5. What are thermo plastics and thermo setting plastics?

థర్మో ప్లాస్టిక్ మరియు థర్మో సెటింగ్ ప్లాస్టిక్ లు అనగానేమి?

6. Write about condensation polymerization.

సంఘనన ఫోలిమరికరణము గూర్చి వ్రాయుము.

7. Define number average and weight average molecular weights.

సంఖ్య సరాసరి మరియు భార సరాసరి అణు భారాలను నిర్వచించుము.

8. Write a note on emulsion polymerization.  
ఎమల్షన్ సోలిమరీకరణముపై ఒక వ్యాఖ్య వ్రాయుము.
9. Give the Williams-Landel-Ferry equation.  
విలియమ్-లాండెల్-ఫెర్రి సమీకరణమును తెల్పుము.
10. Illustrate the colourants and photosensitizers.  
వర్ణకారకాలు మరియు కాంతి స్పందనకారులను సోదాహరణముగా తెల్పుము.
11. What are the factors affecting T<sub>g</sub>?  
T<sub>g</sub> ను ప్రభావితము చేయు అంశాలేవి?
12. Write any two applications of PVC and PAN  
PVC మరియు PAN ల ఏవేని రెండు అనువర్తనాలను వ్రాయుము

### PART- C

4 x 2 = 8 Marks

Answer ALL the questions Each carries Two marks

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి 2 మార్కులు

1. What is co polymer give example  
సహా పాలిమర్ అనగా నేమి
2. What is glass transition temperature?  
గాజు పరివర్తన ఉష్ణోగ్రత అనగానేమి?
3. What is nucleating agent? Give example  
న్యూక్లియేటింగ్ కారకం అనగా నేమి ఉదాహరణ ఇమ్ము
4. Write the preparation and give one application of nylon-6,6  
నైలాన్-6,6 ల తయారీ మరియు పరిశ్రమల లో వాటి అనువర్తనాలను వ్రాయుము.



**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
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**Effective from 2017 – 2018 onwards**  
**Paper - VIII-A-2 Semester – VI**  
**INSTRUMENTAL METHODS OF ANALYSIS**

**UNIT – I****TOTAL HOURS: 45****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:****8 h**

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).

**UNIT – III****10 h**

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.

**UNIT – IV****Separation techniques****12 h**

**Solvent Extraction:** Principle and process, Batch extraction, continuous extraction and counter current extraction. Applications, determination of Iron (III).

**Chromatography:** classification of chromatography methods, principles of differential migration, adsorption phenomenon, nature of adsorbents, solvent systems, stationary and mobile phases  $R_f$  values, factors effecting  $r_f$  values. Paper Chromatography, principles, experimental procedures, choice of paper, developments of chromatogram, ascending, descending, radial and two dimensional, applications. Thin layer chromatography, advantages, principles, factors effecting  $R_f$  values, experimental procedures, preparation of plates, development of the chromatogram, detection of the spots, applications. Column Chromatography, principle and experimental

procedure, applications. High Performance Liquid Chromatography & Gas Liquid Chromatography, principles and applications, importance of column technology (packing & capillary), super critical fluids.

#### **UNIT – V**

##### **Elemental Analysis:**

**11 h**

##### **Molecular Spectrometry (electrical discharges).**

Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas)

**NMR spectroscopy:** Principle, Instrumentation, Factors affecting chemical shift, spin coupling, Applications.

**Electro analytical Methods:** Potentiometry & Voltammetry

**Radio chemical Methods:** X-ray analysis and electron spectroscopy (surface analysis)

#### **REFERENCE BOOKS**

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

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**III B.SC. CHEMISTRY PAPER VIII-A-2**

**SEMESTER – VI**

**INSTRUMENTAL METHODS OF ANALYSIS**

Sl. NO.	Chapter	Essay Question ( 08 M ) knowledge	Short Answer Question ( 05 M ) Under standing	Very Short Answer Question ( 02 M ) Skill / Application
1.	<b>Introduction to spectroscopic methods of analysis</b>	02	01	01
2.	<b>Molecular spectroscopy</b>	01	02	--
3.	<b>UV-Visible/ Near IR</b>	02	01	01
4.	<b>Separation techniques</b>	02	02	01
5.	<b>Elemental Analysis</b>	01	02	01
<b>Total no of Questions</b>		08	08	04

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY VIII-A-2**  
**INSTRUMENTAL METHODS OF ANALYSIS**  
**MODEL QUESTION PAPER**

**Time: 3 hours**

**Maximum Marks: 60**

**PART- A**

**4 x 8 = 32 Marks**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి ఎనిమిది మార్కులు.

1. a) Write about classification of analytical methods.

విశేషణ పద్ధతుల వర్గీకరణ గూర్చి వ్రాయుము.

**(OR)**

- b) Explain the classification of errors.

దోషాల వర్గీకరణను వివరించుము.

2. a) Describe the absorption and scattering behaviour of molecules.

అణువుల శోషణ మరియు పరిక్షేపణ ప్రవర్తనను వర్ణించుము.

**(OR)**

- b) Explain the principle and instrumentation of NMR spectroscopy.

NMR వర్ణ పటశాస్త్రములో ఇమిడి ఉన్న సూత్రాన్ని మరియు పరికర అమరికను వివరించుము.

3. a) Give detailed account on photocells, photo multipliers and diode-array detectors.

కాంతిఘటాలు, కాంతి వర్ణకాలు మరియు డయోడ్-ఎర్రై లను గూర్చి సంగ్రహముగా తెల్పుము.

**(OR)**

- b) How do you differentiate absorption and fluorescence?

శోషణము మరియు ప్రతిదీప్తిలను వేరుగా ఎట్లు గుర్తించెదవు?

4. a) Discuss the principle and uses of gas-liquid chromatography.

వాయు-ద్రవ క్రోమాటోగ్రఫీ యొక్క సూత్రము మరియు అనువర్తనాలను గూర్చి చర్చించుము.

**(OR)**

- b) Explain different solvent extraction methods.

వివిధ ద్రావణ నిష్కర్షణ విధానములను వివరించుము.

**PART- B**

**5 x 4 = 20 Marks**

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

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి నాలుగు మార్కులు.

5. Explain about significant figures with examples.

ప్రాధాన్యత సంఖ్యలు అనగానేమి? ఉదాహరణలలో వివరించుము.

6. What are the advantages of FTIR?

FTIR యొక్క ఉపయోగాలేవి?

7. Discuss the various techniques of wavelength dispersion.

తరంగదైర్ఘ్య విక్షేపణం యొక్క వేర్వేరు పద్ధతులను గూర్చి చర్చించుము.

8. How double beam instruments are superior to single beam instruments?  
ద్విపుంజ వర్ణపటమాపకము, ఏకపుంజ వర్ణపటమాపకము కంటే ఏ విధంగా మెరుగైనది?

9. Briefly explain any two development methods of chromatogram in paper chromatography.

కాగితం క్రోమటోగ్రఫీ లోని ఏవైన రెండు అభివృద్ధి పద్ధతులను క్లుప్తముగా వివరించుము.

10. Describe the procedure for column packing.

స్తంభ సంపుటికరణ విధానమును వర్ణించుము.

11. What are the factors affecting chemical shift?

రసాయన స్థానంతరాన్ని ప్రభావితము చేయు అంశాలు ఏవి?

12. Discuss the principle involved in voltametry.

వోల్టామెట్రీలో ఇమిడియున్న సూత్రాన్ని చర్చించుము.

### PART- C

4 x 2 =

#### 8 Marks

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి రెండు మార్కులు.

13. Define accuracy and precision?

ఖచ్చితత్వం మరియు సునిశితత్వం నిర్వచించండి

14. What is the principle involved in U.V Spectroscopy?

U.V Spectroscopy నందు ఇమిడి వున్న సూత్రం ఏమిటి

15. What are the factors affecting  $R_f$  values

$R_f$  విలువలను ప్రభావితం చేసే అంశాలు ఏమిటి

16. What is Chemical Shift?

రసాయన స్థానభ్రంశం అనగా నేమి?

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**CBCS Syllabus for B.Sc. III Year**  
**Effective from 2017 – 2018 onwards**  
**Paper - VIII-A-3 Semester – VI**  
**ANALYSIS OF DRUGS, FOOD PRODUCTS & BIO-CHEMICAL ANALYSIS**

**TOTAL HOURS: 45**

**Unit – I** **8h**

**Drugs-I**: Introduction - Drug & disease (definition) -Sources - Plant Animal & synthetic. - Terminology - Pharmacy - Pharmacology – Pharmacophore - Pharmacodynamics - Pharmacokinetics (ADME, Receptors – brief treatment) - Metabolites and Anti metabolites.

**Unit – II** **8h**

**Drugs-II**: 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** **10 h**

Analysis of the following drugs and pharmaceuticals preparations: (Knowledge of molecular formula, structure and analysis) Analysis of analgesics and antipyretics like aspirin and paracetamol Analysis of anti malarials like chloroquine.

Analysis of drugs in the treatment of infections and infestations: Amoxycillin, chloramphenicol, metronidazole, penicillin, tetracycline, cephalexin (cefalexin).

Anti tuberculous drug- isoniazid.

**UNIT - IV** **10 h**

Food Adulteration Determination of Food Adulteration, Determination of Moisture, Ash, Crude fat or ether-extract, Soluble extractor, Crude protein, True protein, Crude fiber, Starch, Analysis of Sugars (Carbohydrate), Estimation of Sucrose in a given sample of cane sugar, Determination of Phosphorous in plant or food material, Destruction of organic matter, Important points,

**UNIT - V** **9 h**

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.Wincciam and Bobbles (Henry J) - Instrumental methods of analysis of food additives.
9. H.Edward-The Chemical analysis of foods; practical treatise on the examination of food stuffs and the detection of adulterants.
10. The quantitative analysis of drugs- D.C.Garratt-Chapman & Hall.
11. A text book of pharmaceutical analysis by K.A.Connors-Wiley-International.
12. Comprehensive medicinal chemistry-Ed Corwin Hansch Vol 5, Pergamon Press.

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III B.SC. CHEMISTRY PAPER VIII-A-3

SEMESTER – VI

ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIO-CHEMICAL ANALYSIS

Sl. No.	Chapter	Essay Question ( 08 M ) knowledge	Short Answer Question ( 05 M ) Under standing	Very Short Answer Question ( 02 M ) Skill / Application
1.	Drugs-I : Introduction	02	01	01
2.	Drugs-II : Nomenclature	01	02	01
3.	Analysis of the following drugs and pharmaceuticals preparations	02	02	01
4.	Drugs-IV	02	01	01
5.	Clinical analysis of blood	01	02	--
Total no of Questions		08	08	04



**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- A - 3**  
**ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS & BIO-CHEMICAL ANALYSIS**  
**MODEL QUESTIONPAPER**

**Time: 3 hours**

**Maximum Marks: 60**

**PART- A**

**4 x 8 = 32 Marks**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి 8 మార్కులు.

- 1) a) Give a detailed account on pharmacodynamics and pharmacokinetics.  
 ఫార్మకోడైనమిక్స్ మరియు ఫార్మకోకైనెటిక్స్ గూర్చి విపులముగా తెల్పుము.

(OR)

- b) Explain the following terms with suitable examples.

i) Metabolites      ii) Anti-metabolites

ఈ క్రింది పదాలను తగిన ఉదాహరణలతో వివరించుము.

i) మెటబొలైట్స్      ii) ఆంటి మెటబొలైట్స్

- 2) a) Discuss the classification of drugs based on therapeutic activity.  
 ఔషధ క్రియాశీలత ఆధారంగా ఔషధాల వర్గీకరణను గూర్చి చర్చించుము.

(OR)

- b) Give in detail the estimation of cholesterol and glucose of blood.

రక్తములోని కొలెస్ట్రాల్ మరియు గ్లూకోజ్ ను నిర్ణయించు పద్ధతులను గూర్చి సంగ్రహముగా తెల్పుము.

- 3) a) How do you prepare and analyze chloroquine?  
 క్లోరోక్విన్ ను ఏ విధంగా తయారుచేసి విశ్లేషణ చేయుదువు?

- b) How do you prepare and analyze aspirin?  
 ఆస్పిరిన్ ను ఏ విధంగా తయారుచేసి విశ్లేషణ చేయుదువు?

- 4) a) what is meant by Food Adulteration. Explain the determination of common Food Adulteration by any six methods.

ఆహారము కల్తీ అగుట అనగానేమి? ఏవైనా ఆరు సాధారణ ఆహార కల్తీ పద్ధతులను గూర్చి వివరించుము.

(OR)

- b) Estimation of Sucrose in a given sample of cane sugar.

ఇవ్వబడిన కేను షుగర్ శాంపులు నుండి సూక్రోజు ను ఎట్లు నిర్ణయిస్తారు.

**PART- B****5 x 4 = 20 Marks**

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

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి నాలుగు మార్కులు.

- 1) What are Pharmacodynamics Drugs?  
ఫార్మాకో డైనమిక్ డ్రగ్స్ అనగానేమి?
- 2) Write the nomenclature of drugs with suitable examples.  
తగిన ఉదాహరణలు లో ఔషధముల నామకరణమును తెలుపండి.
- 3) Analysis of penicillin in the treatment of infections and infestations
- 4) Determine the crude protein and starch in a food sample
- 5) What are the trace elements present in the body?  
శరీరంలో వుండు సూక్ష్మమూలకాలు ఏవి?
- 6) Describe the types of administration of drugs.  
ఔషధ సేవనము యొక్క వివిధ రకాలను వర్ణించుము
- 7) Give the synthesis and theoretic activity of paracetamol  
పారాసెటమాల్ యొక్క ఔషధ క్రియాశీలత గూర్చి వ్రాయుము
- 8) Write a short note on composition of blood.  
రక్తము యొక్క సంఘటనము గూర్చి వ్రాయుము.

**PART- C****4 x 2 = 8 Marks**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి రెండు మార్కులు.

- 1) Define pharmacophore give example  
ఫార్మాకోఫోర్ మరియు పదాల నిర్వచించుము
- 2) Give clinical and generic name of aspirin  
అస్పిరిన్ యొక్క క్లినికల్ మరియు సాధారణ నామాలను రాయండి?
- 3) Define analgesics and antipyretics. Give examples  
బాధా నివారిణులు మరియు జ్వర నివారిణులను నిర్వచించుము.
- 4) What is true protein?  
నిజ ప్రోటీన్ అనగా నేమి

**SYLLABUS FOR VI SEMESTER  
CHEMISTRY LABORATORY COURSE – VIII-A-1/ VIII-B-1/ VIII-C-1**

**No. of h/w : 2  
50 Marks**

1. Preparation of Aspirin
2. Preparation of Paracetamol
3. Preparation of Acetanilide
4. Preparation of Barbituric Acid
5. Preparation of Phenylazo  $\beta$ -naphthol

**CHEMISTRY LABORATORY COURSE - VIII-A-1/ VIII-B-1/ VIII-C-1**  
(at the end of semester VI)

**Max. Marks:** 50

**Time:** 3 hrs.

**SCHEME OF VALUATION**

For Record - 10 Marks  
For Viva-voce - 5 Marks For  
Practical - 35 Marks

**Splitting of Practical Marks**

- |                     |            |
|---------------------|------------|
| i) Procedure        | : 20 Marks |
| ii) Equation        | : 5 Marks  |
| iii) M.P.           | : 5 Marks  |
| iv) Report of yield | : 5 Marks  |

**SYLLABUS FOR VI SEMESTER  
CHEMISTRY LABORATORY COURSE – VIII-A-2/ VIII-B-2/ VIII-C-2**

**No. of h/w : 2  
50 Marks**

1. Electrochemistry:

Determination of redox potential of  $\text{Fe}^{2+}/\text{Fe}^{3+}$  by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.

2. pH metry:

i) Preparation of phosphate buffer solutions.

ii) pH metric titration of weak acid, acetic acid with strong base, NaOH and calculation of dissociation constant.

3. Colorimetry:

i) Verification of Beer-Lambert law for  $\text{KMnO}_4$  and determination of concentration of the given solution.

ii) Verification of Beer-Lambert law for  $\text{K}_2\text{Cr}_2\text{O}_7$  and determination of concentration of the given solution.

iii) Verification of Beer-Lambert law for  $\text{CuSO}_4$  and determination of concentration of the given solution.

iv) Composition of complex of  $\text{Cu}^{2+}$ -EDTA disodium salt.

**CHEMISTRY LABORATORY COURSE - VIII-A-2/ VIII-B-2/ VIII-C-2**  
(at the end of semester VI)

**Max. Marks:** 50

**Time:** 3 hrs.

**SCHEME OF VALUATION**

For Record - 10 Marks  
For Viva-voce - 5 Marks For  
Practical - 35 Marks

**Splitting of Practical Marks**

- i) Procedure in first 10 min. : 5 Marks
  - ii) Formula with units : 5 Marks
  - iii) Neat tabulation & correct calculation : 5 Marks
- Error < 10% : 20 Marks
- Error 10-15 % : 15 Marks
- Error > 15 % : 10 Marks (Minimum Marks)

**SYLLABUS FOR VI SEMESTER  
CHEMISTRY LABORATORY COURSE – VIII-A-3/ VIII-B-3/ VIII-C-3**

**50 Marks**

**PROJECT WORK**

Answer ALL the questions. Each carries TEN marks.

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**DEPARTMENT OF CHEMISTRY**  
**CBCS Syllabus for B.Sc. III Year**  
**Effective from 2018 – 2019 onwards**  
**Paper - VIII-B-1 Semester – VI**

**FUEL CHEMISTRY AND BATTERIES**

**Total Hours : 45**

**UNIT –I**

**12 h**

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**

**6 h**

**Petroleum and petrol chemical industry:**

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

**UNIT-III**

**10 h**

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), clear fuels, petro chemicals: vinyl acetate, propylene oxide, isoprene, butadiene, toluene and its derivative xylene.

**UNIT-IV**

**10 h**

**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**

**7 h**

**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.



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**III B.SC. CHEMISTRY SEMESTER – VI**

**CLUSTER ELECTIVE – VIII B-I**

**FUEL CHEMISTRY AND BATTERIES**

<b>Sl. NO.</b>	<b>Chapter</b>	<b>Essay Question ( 08 M ) knowledge</b>	<b>Short Answer Question ( 04 M ) Under standing</b>	<b>Very Short Answer Question ( 02 M ) Skill / Application</b>
<b>1.</b>	<b>UNIT –I</b>	<b>02</b>	<b>02</b>	<b>00</b>
<b>2.</b>	<b>UNIT –II</b>	<b>02</b>	<b>01</b>	<b>01</b>
<b>3.</b>	<b>UNIT –III</b>	<b>02</b>	<b>02</b>	<b>00</b>
<b>4.</b>	<b>UNIT –IV</b>	<b>02</b>	<b>01</b>	<b>01</b>
<b>5.</b>	<b>UNIT –V</b>	<b>00</b>	<b>02</b>	<b>02</b>
<b>Total no of Questions</b>		<b>08</b>	<b>08</b>	<b>04</b>

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- B - 1**  
**FUEL CHEMISTRY AND BATTERIES**  
**MODEL QUESTIONPAPER**

**Maximum Marks: 60**

**Time: 3 hours**

**SECTION-A**

**4 x 8 = 32 Marks**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి ఎనిమిది మార్కులు.

1. A) Write in detail about renewable and non-renewable energy sources.  
 పునరుద్ధింపబడు మరియు పునరుద్ధింపలేని శక్తి వనరులను గూర్చి సంగ్రహముగా వ్రాయుము.

**(OR)**

- B) Write about the composition and uses of producer gas and water gas.  
 ప్రొడ్యూసర్ గ్యాస్ మరియు వాటర్ గ్యాస్ ల సంఘటనమును మరియు ఉపయోగాలను వ్రాయుము.

2. A) Explain the composition of the crude petroleum.  
 ముడి చమురు సంఘటనమును వివరించుము.

**(OR)**

- B) Describe the refining of petroleum.  
 పెట్రోలియంను శుద్ధి చేయుటను వర్ణించుము.

3. A) Discuss about fractional distillation.  
 అంశిక స్వేదన ప్రక్రియ గూర్చి చర్చించుము.

**(OR)**

- B) Write about the non-petroleum fuels.  
 పెట్రోలియంమేతర ఇంధనాల గూర్చి వ్రాయుము.

4. A) Explain the classification of lubricants.  
 కందెనల వర్గీకరణను వివరింపుము.

**(OR)**

- B) What are the properties of lubricants?  
 కందెనల ధర్మాలేవి?

**SECTION-B**

**5 x 4 = 20 Marks**

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

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి నాలుగు మార్కులు.

5. What are the uses of coal in various industries?  
 వివిధ పరిశ్రమలలో బొగ్గు యొక్క ఉపయోగాలను వ్రాయుము.

6. Discuss the gasification of coal.  
 బొగ్గును వాయువీకరించు విధానమును గూర్చి చర్చించుము.

7. Write the applications of different petroleum products.  
 వివిధ పెట్రోలియం ఉత్పత్తుల యొక్క అనువర్తనాలను వ్రాయుము

8. Short note on cracking.

భంజనముపై లఘువ్యాఖ్య.

9. Write about synthetic fuels.

కృత్రిమ ఇంధనాలు గూర్చి వ్రాయుము.

10. What are conducting and non-conducting lubricating oils?

వాహక, అవాహక కందెన నూనెలు అనగానేమి?

11. Fuel cells.

ఇంధన ఘటములు

12. Write about the primary and secondary batteries.

ప్రాథమిక మరియు ద్వితీయ బ్యాటరీలను గూర్చి వ్రాయుము.

### SECTION-C

4 x 2 = 8 Marks

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి రెండు మార్కులు.

13. What is carbonisation of coal?

బొగ్గు కర్బోనికరణ అనగా ఏమి?

14. What are conducting lubricants?

వాహక కందెనలు అనగా ఏమి?

15. Write about polymer cell.

పోలిమర్ ఘటము గూర్చి వ్రాయండి

16. Write about the working of the Li-Battery

Li-బ్యాటరీ పని తీరు గూర్చి వ్రాయండి

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**DEPARTMENT OF CHEMISTRY**  
**CBCS Syllabus for B.Sc. III Year**  
**Effective from 2018 – 2019 onwards**  
**Paper - VIII-B-2 Semester – VI**

**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**

**No. of h/w : 3h**

**UNIT-I**

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

**8 h**

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**

**15 h**

**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**

**8 h**

**Fertilizers:**

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

**UNIT – IV**

**8 h**

**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**

**6 h**

**Alloys:**

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

**Chemical explosives:**

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

**REFERENCE BOOKS**

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

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**III B.SC. CHEMISTRY CLUSTER – VIII B-2**

**SEMESTER – VI**

**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**

Sl. NO.	Chapter	Essay Question ( 08 M ) knowledge	Short Answer Question ( 04 M ) Under standing	Very Short Answer Question ( 02 M ) Skill / Application
1.	UNIT –I	02	01	01
2.	UNIT –II	02	02	00
3.	UNIT –III	02	01	01
4.	UNIT –IV	00	02	02
5.	UNIT –V	02	02	00
Total no of Questions		08	08	04

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- B - 2**  
**INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE**  
**MODEL QUESTIONPAPER**

**Maximum Marks: 60**

**Time: 3 hours**

**SECTION- A**

**4 x 8 = 32 Marks**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతీ ప్రశ్నకు ఎనిమిది మార్కులు.

1. A) Discuss the unusual oxidation states of carbon and nitrogen.

కార్బన్ మరియు నైట్రోజన్ ల యొక్క అసాధారణ ఆక్సీకరణ స్థితులను గూర్చి చర్చించుము.

(OR)

- B) Describe the anomalous behaviour of lithium and boron.

లిథియం మరియు బోరాన్ అసాధారణ ప్రవర్తనను వర్ణించుము.

2. A) Give the composition and properties of coloured glass and photosensitized glass.

వర్ణపూరిత గాజు మరియు కాంతి స్పందన గాజుల యొక్క సంఘటనము మరియు ధర్మాలను తెలుపుము.

(OR)

- B) Explain the manufacturing of cement and its setting process.

సిమెంట్ యొక్క తయారీ మరియు దాని సెటింగ్ ప్రక్రియను వివరించుము.

3. A) Write about the manufacturing of any two nitrogen fertilizers.

ఏవేని రెండు నైట్రోజన్ ఎరువుల తయారీని వ్రాయుము .

(OR)

- B) Write about the manufacturing of any two phosphorous fertilizers.

ఏవేని రెండు ఫాస్ఫోరస్ ఎరువుల తయారీని వ్రాయుము.

4. A) Give the process of manufacturing of steel.

స్టీల్ ను తయారు చేయు విధానమును వ్రాయుము.

(OR)

- B) Write the preparation and explosive properties of RDX.

RDX యొక్క తయారీ మరియు విస్ఫోటన ధర్మాలను వ్రాయుము.

**SECTION- B**

**5 x 4 = 20 Marks**

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

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతీ దానికి నాలుగు మార్కులు.

5. Write about diagonal relationship.

కర్ణసంబంధము గూర్చి వ్రాయుము.

6. Discuss the classification of glasses.

గాజుల వర్గీకరణను గూర్చి చర్చించుము.

7. Write about Carbon nanotubes  
కార్బన్ నానో గొట్టాలు గూర్చి వ్రాయండి
8. Describe the manufacturing of urea.  
యూరియా తయారీ విధానమును వర్ణించుము.
9. What are emulsifying agents? Give examples.  
ఎమల్సికరణ కారకాలు అనగానేమి? ఉదాహరణ నిమ్ము.
10. Explain about metallic coatings.  
లోహపు పూతలను గూర్చి వివరించుము.
11. Write a note on non-ferrous alloys.  
నాన్ ఫెర్రస్ మిశ్రమలోహాలను గూర్చి వ్రాయుము.
12. Explain the properties of steels.  
స్టీల్ ల ధర్మాలను వివరింపుము.

### SECTION- C

4 x 2 = 8 Marks

Answer **ALL** the questions. Each carries **two** marks.  
అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి రెండు మార్కులు.

13. What are allotropes of carbon?  
కార్బన్ రూపాంతరాలు ఏమిటి?
14. What are NPK fertilizers?  
NPK- ఎరువులు అంటే ఏమిటి
15. What are enamel paints?  
ఎనామిల్ పెయింట్ లు అంటే ఏమిటి?
16. Write an example for eco-friendly paint.  
పర్యావరణ హిత పెయింట్లకు ఉదాహరణలు రాయండి.



**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**DEPARTMENT OF CHEMISTRY**  
**CBCS Syllabus for B.Sc. III Year**  
**Effective from 2018 – 2019 onwards**  
**Paper - VIII-B-3 Semester – VI**  
**ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS**

	<b>No. of h/w: 3h</b>
<b>UNIT-I</b>	<b>9 h</b>
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.	
<b>UNIT-II</b>	<b>8 h</b>
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 methoxy and N-methyl groups.	
<b>UNIT-III</b>	<b>10 h</b>
Analysis of fertilizers: urea, NPK fertilizer, superphosphate. Analysis of DDT, BHC, endrin, endosulfone, malathion, parathion. Analysis of starch, sugars, cellulose and paper.	
<b>UNIT-IV</b>	<b>9 h</b>
Gas Analysis: carbon dioxide, carbon monoxide, oxygen, hydrogen, saturated hydrocarbons, 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 sulphur.	
<b>UNIT-V</b>	<b>9 h</b>
Analysis of Complex Materials:	
<b>Analysis of cement</b> - loss on ignition, insoluble residue, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydride.	
<b>Analysis of glasses</b> - Determination of silica, sulphur, barium, arsenic, antimony, total R <sub>2</sub> O <sub>3</sub> , calcium, magnesium, total alkalies, aluminium, chloride, fluoride.	

**REFERENCE 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. Tarapuravala & sons.

5. J.J.ElvingandI.M.Kolthoff - Chemicalanalysis-A series of monographson analyticalchemistryand its applications-InterScience VolIto VII.
6. G.Z.Weig- Analytical methods forpesticides, plant growthregulators and foodadditives- VolsIto VII.
7. S.L.Chopra&J.S.Kanwar- AanalyticalAgricultrual Chemistry- Kalyani Publishers.
8. R.M.UpadhyayandN.L.Sharma -Manual of soil, plant, waterandfertilizeranalysis- Kalyani Publishers.

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**III B.SC.CHEMISTRY CLUSTER – VIII B-3**

**SEMESTER – VI**

**ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS**

<b>Sl. NO.</b>	<b>Chapter</b>	<b>Essay Question ( 08 M ) knowledge</b>	<b>Short Answer Question ( 04 M ) Under standing</b>	<b>Very Short Answer Question ( 02 M ) Skill / Application</b>
<b>1.</b>	<b>UNIT-I</b>	<b>02</b>	<b>02</b>	<b>00</b>
<b>2.</b>	<b>UNIT-II</b>	<b>02</b>	<b>01</b>	<b>00</b>
<b>3.</b>	<b>UNIT-III</b>	<b>02</b>	<b>01</b>	<b>01</b>
<b>4.</b>	<b>UNIT-IV</b>	<b>02</b>	<b>02</b>	<b>01</b>
<b>5.</b>	<b>UNIT-V</b>	<b>00</b>	<b>02</b>	<b>02</b>
<b>Total no of Questions</b>		<b>08</b>	<b>08</b>	<b>04</b>

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- B - 3**  
**ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS**  
**MODEL QUESTIONPAPER**

**Max. Marks: 60**

**Time: 3 hours**

**PART-A**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి ఎనిమిది మార్కులు.

**4 x 8 = 32 Marks**

1. a) How do you analyze lead chromate and zinc chromate present in paints?

పెయింట్ లలోని లెడ్ క్రోమేట్ మరియు జింక్ క్రోమేట్ లను ఎట్లు విశ్లేషించెదరు?

**(OR)**

b) How do you determine the total fatty matter and free alkali of soaps?

సబ్బులలోని క్రోవు పదార్థము మరియు స్వేచ్ఛా క్షారములను ఎట్లు నిర్ణయించెదరు?

2. a) Give the procedure for the determination of iodine value and acid value in oil samples.  
నూనె నమూనాలలోని అయోడిన్ విలువ మరియు ఆమ్ల విలువలను నిర్ణయించు పద్ధతులను తెల్పుము.

**(OR)**

b) Describe the analysis of benzene.

బెంజిన్ యొక్క విశ్లేషణను వర్ణించుము.

3. a) Discuss the analysis of urea and DDT.

యూరియా మరియు DDT ల విశ్లేషణను చర్చించుము

**(OR)**

b) Discuss the analysis of starch and paper.

స్టార్చ్ మరియు కాగితం యొక్క విశ్లేషణను చర్చించుము.

4. a) Write about octane number and cetane number.

ఆక్టేన్ సంఖ్య మరియు సీటీన్ సంఖ్యలను గూర్చి వ్రాయుము.

**(OR)**

b) How are water gas and producer gas analyzed?

ప్రోడ్యూసర్ గ్యాస్ మరియు వాటర్ గ్యాస్ లను ఎలా విశ్లేషిస్తారు?

**PART-B**

Answer any **FIVE** of the following questions. Each carries **Four** marks. **5x4 = 20 Marks**

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి నాలుగు మార్కులు.

5. How do you determine the moisture in soaps?

సబ్బులలోని తీమను ఎలా నిర్ణయిస్తారు?

6. Give the procedure for the determination of total lead in paints.

పెయింట్ లలోని మొత్తం లెడ్ ను నిర్ణయించు విధానమునిమ్ము.

7. Write a note on saponification value.

సపానిఫికేషన్ విలువపై వ్యాఖ్య వ్రాయుము.

8. Explain the analysis of BHC.

BHC యొక్క విశ్లేషణను వివరించుము.

9. How carbon monoxide is analysed in gases?

వాయువులలోని కార్బన్ మోనాక్సైడ్ ను ఎట్లు విశ్లేషిస్తారు?

10. Explain the determination process of nitrogen in gases.

వాయువులలోని నైట్రోజన్ ను నిర్ణయించు విధానమును వివరించుము.

11. Describe the determination of lime in cement.

సిమెంట్ లోని లైమ్ ను నిర్ణయించడాన్ని వర్ణించుము.

12. Describe the determination of silica in glass.

గాజులోని సిలికాను నిర్ణయించుటను వర్ణించుము.

### PART-C

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి రెండు మార్కులు.

**4 x2 =8 Marks**

13. What is NPK fertilizer?

NPK ఎరువులు అనగా ఏమి?

14. What is kerosene oil gas?

కిరోసిన్ ఆయిల్ అనగా ఏమిటి?

15. What is insoluble residue?

కరగని అవశేషాలు అనగా ఏమిటి?

16. What is meant by total silica?

మొత్తం సిలికా అంటే ఏమిటి?

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CBCS Syllabus for B.Sc. III Year  
Effective from 2017 – 2018 onwards  
Paper - VIII-C-1 Semester – VI  
ORGANIC SPECTROSCOPIC TECHNIQUES**

**Total No. of Hrs: 45**

**UNIT-I**

**10 h**

**Nuclear Magnetic Resonance Spectroscopy- I**

Nuclear spin, Principles of NMR - Classical and Quantum Mechanical methods, Magnetic moment and Spin angular momentum. Larmor 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**

**5 h**

**Nuclear Magnetic Resonance Spectroscopy- II**

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**

**10 h**

**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**

**5 h**

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

**UNIT-V**

**15 h**

**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 Methyl radical ( $CH_3\cdot$ ), Benzene anion ( $C_6H_6^-$ ), Isoquinine,  $[Cu(H_2O)_6]^{+2}$  and  $[Fe(CN)_5NO]^{-3}$

**REFERENCE BOOKS**

5. Analytical Chemistry by Skoog and Miller
6. A textbook of qualitative inorganic analysis by A.I. Vogel
7. Nanochemistry by Geoffrey Ozin and Andre Arsenault
8. Stereochemistry by D. Nasipuri
10. Organic Chemistry by Clayden
11. Deborah E. Bouchoux: "Intellectual Property". Cengage learning, New Delhi
12. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
13. Prabhuddha Ganguli: 'Intellectual Property Rights' Tata Mc-Graw – Hill, New Delhi
14. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.

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III B.SC. CHEMISTRY PAPER VIII-C-1

SEMESTER – VI

ORGANIC SPECTROSCOPIC TECHNIQUES

Sl. NO.	Chapter	Essay Question (08 M) knowledge	Short Answer Question (05 M) Understanding	Very Short Answer Question (02 M) Skill / Application
1.	UNIT-I	01	02	01
2.	UNIT-II	01	02	--
3.	UNIT-III	02	02	01
4.	UNIT-IV	02	01	01
5.	UNIT-V	02	01	01
Total no of Questions		08	08	04



**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- C - 1**  
**ORGANIC SPECTROSCOPIC TECHNIQUES**  
**MODEL QUESTIONPAPER**

**Maximum Marks: 60**

**Time: 3 hours**

**PART- A**

**4 x 8 = 32 Marks**

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

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి ఎనిమిది మార్కులు.

a) i) What is the principle of NMR spectroscopy.

1. NMR వర్ణపటశాస్త్రములో ఇమిడి ఉన్న సూత్రమును వ్రాయుము.

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

రసాయన స్థానాంతరీకరణమును నిర్వచించుము. రసాయన స్థానాంతరీకరణమును

ప్రభావితము చేయు అంశాలేవి?

**(OR)**

b) What is FTNMR? What are the advantages of it?

FTNMR అనగానేమి? దాని ప్రయోజనాలేవి

2. a) Write about Born-oppenheimer approximation.

బోర్న్-ఒపెన్ హేమర్ ఉజ్జాయింపు గూర్చి వ్రాయుము.

**(OR)**

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

అతినీలలోహిత-దృగ్గోచర వర్ణపటశాస్త్రములోని ఉద్వార్ధ-ఫీజర్ నియమాలు ఏమి?

3. a) How is Beer-Lambert's law useful in quantitative determination of **Mn(II)** and **Fe(II)**?

**Mn(II)** మరియు **Fe(II)** లను పరిమాణాత్మకంగా నిర్ణయించుటలో బీర్-లాంబర్ట్ నియమము ఎట్లు

ఉపయోగపడును?

**(OR)**

b) Give the experimental procedure of simultaneous determination of chromium and manganese in a mixture using Beer-Lambert's law.

క్రోమియం మరియు మాంగనీసు లను బీర్-లాంబర్ట్ నియమము ఉపయోగించి ఒకేసారి నిర్ణయించు

ప్రయోగ పద్ధతినీ తెలుపుము.

4. a) Explain the principle and experimental techniques involved in ESR studies.

ESR అధ్యయనంలో ఇమిడిఉన్న సూత్రము మరియు ప్రయోగ పద్ధతినీ వివరించుము

**(OR)**

b) Write notes on 'g' value and hyperfine structure.

‘g’ విలువ మరియు హైపర్ ఫైన్ నిర్మాణము గూర్చి వ్యాఖ్య వ్రాయుము.

### PART- B

5 x 4 = 20 Marks

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

క్రింది వానిలో ఏదేని ఐదు ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి నాలుగు మార్కులు.

5. Write about spin-spin relaxation.  
స్పిన్-స్పిన్ రిలాక్సేషన్ గూర్చి వ్రాయుము.
6. Describe the factors influencing the coupling constant.  
యుగళీకరణ స్థిరాంకమును ప్రభావితము చేయు అంశాలను వర్ణించుము.
7. Explain about spin decoupling.  
స్పిన్ డిక్ప్లింగ్ ను వివరింపుము.
8. What are the applications of NMR spectroscopy in medical diagnostics?  
వ్యాధి నిర్ధారణలో NMR వర్ణపటశాస్త్రము యొక్క అనువర్తనాలేవి?
9. Write about Franck-Condon principle.  
ఫ్రాంక్-కాండాన్ సూత్రమును గూర్చి వ్రాయుము.
10. What are the different types of electronic transitions?  
వివిధ రకాల ఎలక్ట్రానిక్ పరివర్తనాలు ఏమి?
11. State and explain Beer-Lambert law.  
బీర్-లాంబర్ట్ నియమమును తెల్పి, వివరింపుము
12. How ESR studies are useful to study the structure of free radicals?  
స్వేచ్ఛా ప్రాతిపదికల నిర్మాణాన్ని అధ్యయనం చేయుటలో ESR ఎట్లు ఉపయోగపడును?

### PART- C

4 x 2 = 8 marks

Answer All Questions Each Carry TWO Marks

అన్ని ప్రశ్నలకు సమాధానము నిమ్ము. ప్రతి దానికి రెండు మార్కులు.

13. What is coupling constant?  
యుగళీకరణ స్థిరాంకము అనగా నేమి?
14. Define Chromophores and Auxochrome.  
క్రోమోఫోర్ మరియు ఆగ్నోక్రోమే లను నిర్వచించండి
15. What is molar extinction coefficient?  
మోలార్ విలుప్తత గుణకం అనగా నేమి
16. Write any two similarities between NMR&ESR

NMR&ESR మధ్య రెండు సోలికలను రాయండి

**GOVT. COLLEGE (A), RAJAHMUNDRY.  
DEPARTMENT OF CHEMISTRY (2018-19)  
CBCS Syllabus for B.Sc. III Year  
Effective from 2017 – 2018 onwards  
Paper - VIII-C-2 Semester – VI  
ADVANCED ORGANIC REACTIONS**

No. of h/w: 3

Total hours: 45

**UNIT – I**

**Organic Photochemistry**

**8 h**

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) photo reduction, mechanism, influence of temperature, solvent, nature of hydrogen donors, structure of substrates on the course of photo reduction.

**UNIT – II**

**Organic Photochemistry**

**8 h**

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**

**9 h**

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

**UNIT – IV**

**8 h**

**Synthetic reactions:** Mannich reaction – Mannich bases – Robinson annulations. The Shapiro reaction, Stork–enamine reaction. Use of dithioacetals - Umpolung, phase transfer catalysis - mechanisms and use of benzyl trialkyl ammonium halides. Wittig reaction.

**UNIT –V:****New Synthetic Reactions****12 h**

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

**REFERENCE 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.

**GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM**  
**VI - SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- C -2**  
**MODEL PAPER**  
**ADVANCED ORGANIC REACTIONS**

**Time: 3 hours**

**Maximum Marks: 60**

**PART- A**

**Answer ALL the questions. Each question carries 8 marks.**

**4 x 8 = 32 Marks**

క్రింది వానికి జవాబులు వ్రాయుము. ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు.

1. a) What is photo reduction? How it is affected by temperature and solvent?  
 కాంతి క్షయకరణం అనగానేమి? ఉష్ణోగ్రత మరియు ద్రావణిచేత ఎట్లా ప్రభావితం అగును.

(OR)

- b) Explain the following: క్రింది వానిని వివరించుము.

i) Singlet and triplet states    i) ఏక మరియు త్రిక స్థితులు

ii) Jablonski diagram    ii) జబ్లొంకి చిత్రం

2. a) Discuss the Norrish type-I cleavage with an example.

a) నార్విష్ టైప్ - I విచ్ఛిత్తిని ఒక ఉదాహరణలో వివరించుము.

(OR)

- b) Write note on the following: క్రింది వాటిపై వ్యాఖ్య వ్రాయుము.

i) Mannich reaction మానిచ్ చర్య    ii) Wittig reaction విట్టింగ్ చర్య

3. a) Give a detailed account on the protection of carbonyl groups.

కార్బోనైల్ సమాహమును రక్షించుట గురించి సంగ్రహముగా తెల్పుము.

(OR)

- b) How amine group is protected by acylation and benzylation.

ఎమిన్ సమాహము ఎసైలేషన్ మరియు బెంజైలేషన్ ద్వారా ఎట్లు రక్షించబాడును.

4. a) Explain the following reactions: క్రింది చర్యలను వివరించుము.

i) Baylis-Hillman reaction బేలిస్-హిల్మాన్ చర్య    ii) Heck reaction హెక్ చర్య

(OR)

- b) Explain the following reactions:

i) Suzuki coupling సుజికి కప్లింగ్

ii) Stille coupling స్టిల్లె కప్లింగ్

**PART- B**

**Answer any 5 of the following questions. Each question carries 4 marks. 5 x 4 = 20 Marks**

క్రింది 5 ప్రశ్నలకు జవాబులు వ్రాయుము. ప్రతి ప్రశ్నకు నాలుగు మార్కులు.

5. Write notes on inter-system crossing.

అంతర వ్యవస్థ వ్యత్యస్థిత గూర్చి వ్యాఖ్య వ్రాయుము.

6. Describe the photochemistry of benzene.

బెంజీన్ యొక్క కాంతి రసాయనశాస్త్రమును వివరించుము.

7. Give a brief account on the protection of carboxylic acids by ester formation.  
కార్బాక్సిలిక్ ఆమ్లమును ఎస్టరుగా మార్చుట ద్వారా రక్షించుట గురించి క్లుప్తముగా తెలుపుము.
8. How does carbonate formation protect diols?  
కార్బోనేట్ ఏర్పడటం ద్వారా డైహైలస్ ఎట్లు రక్షింపబడును?
9. i) Di- $\pi$  methane rearrangement      i) Di- $\pi$  మీథేన్ పునరమరిక
10. What is Stork-enamine reaction?  
స్టార్క్ - ఈనమిన్ చర్య అనగానేమి?
11. Explain the Mukayama aldol reaction.  
ముకయామ- ఆల్డల్ చర్య తెలుపుము.
12. Discuss about Ugi reaction.  
యుగి చర్య తెలుపుము.

### PART- C

Answer ALL the questions. Each question carries 2 marks.

4 x 8 = 32 Marks

13. Barton reaction - బార్టన్ చర్య
14. Robinson annulation - రాబిన్సన్ అన్యలేషన్
15. Phase transfer catalysis - ప్రావస్థా బదిలీ ఉత్ప్యరణము
16. Grubb catalyst – గ్రబ్ ఉత్ప్యరకం

**GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.Sc., CHEMISTRY - PAPER VIII- C -2**  
**ADVANCED ORGANIC REACTIONS**  
**BLUE PRINT**

**Weightage of the content**

<b>Unit No.</b>	<b>Unit Name</b>	<b>Hours required</b>	<b>8 Marks questions</b>	<b>4 Marks questions</b>	<b>2 Marks questions</b>
I	Organic Photochemistry	8	2	2	-
II	Organic Photochemistry	8	1	1	1
III	Protecting Groups and Organic Reactions	9	2	2	-
IV	Synthetic reactions	8	1	1	2
V	New Synthetic Reactions	12	2	2	1
<b>Total</b>		<b>45</b>	<b>8</b>	<b>8</b>	<b>4</b>

**Weightage of the objectives**

<b>Sl.No.</b>	<b>Objectives</b>	<b>% of objectives</b>
1	Knowledge	25
2	Understanding	40
3	Skill	20
4	Application	15

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM  
DEPARTMENT OF CHEMISTRY  
CBCS Syllabus for B.Sc. III Year Effective from 2017 – 2018  
Paper - VIII-C-3 Semester – VI

PHARMACEUTICAL AND MEDICINAL CHEMISTRY

No. of h/w: 3

**UNIT- I: Pharmaceutical chemistry Terminology:** 8h  
Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics  
(ADME, Receptors - brief treatment) Metabolites and Anti metabolites.

**UNIT-II: Drugs:** 8 h  
**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:** 12 h

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: Pharmacodynamics drugs:** 8 h

1. Antiasthma Drugs (Solbutamol) 2. Antianginals (Glycerol Trinitrate)

3. Diuretics (Frusemide)

**UNIT-V: HIV-AIDS:** 9 h

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



**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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM  
SIXTH SEMESTER END EXAMINATIONS  
III B.Sc., CHEMISTRY - PAPER VIII- C -3  
Pharmaceutical and medicinal chemistry

**BLUE PRINT**

**Weightage of the content**

Unit No.	Unit Name	Hours required	8 Marks questions	4 Marks questions	2 Marks questions
I	Pharmaceutical chemistry Terminology	8	2	2	1
II	Drugs	8	2	2	
III	Synthesis and therapeutic activity of the compounds	12	2	2	1
IV	Pharmacodynamics drugs	8	1	1	1
V	HIV-AIDS	9	1	1	1
	<b>Total</b>	45	8	8	4

**Weightage of the objectives**

Sl.No.	Objectives	% of objectives
1	Knowledge	25
2	Understanding	40
3	Skill	20
4	Application	15

**MODEL QUESTION PAPER**  
**GOVERNMENTR COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM**  
**SIXTH SEMESTER END EXAMINATIONS**  
**III B.SC., CHEMISTRY - PAPER VIII-C-3**  
**PHARMACEUTICAL & MEDICINAL CHEMISTRY**

Time :3 Hrs.

Max. Marks : 60

**SECTION - A**I. Answer **ALL** of the following questions. Each question carries **EIGHT** marks.క్రింది వానిలో ఏదైనా **ఆన్ని** ప్రశ్నలకు సమాధానాలు వ్రాయండి. ప్రతి ప్రశ్నకు ఎనిమిది మార్కులు.  $4 \times 8 = 32$  M

1. (A) Give a detailed account on pharmacodynamics and pharmacokinetics.  
 ఫార్మకోడైనమిక్స్ మరియు ఫార్మకోకైనెటిక్స్ గూర్చి విపులంగా తెల్పము.

(OR)

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

ఈ క్రింది పదాలను తగిన ఉదాహరణలతో వివరించుము.

- (i) మెటబాలైట్స్ (ii) ఆంటి మెటబాలైట్స్

2. (A) How drugs are classified according to their structure ?  
 ఔషధాలు, వాటి నిర్మాణము ఆధారంగా ఎట్లు వర్గీకరింపబడినవి ?

(OR)

- (B) Discuss the classification of drugs based on therapeutic activity.  
 ఔషధ క్రియాశీలత ఆధారంగా ఔషధాల వర్గీకరణను గూర్చి చర్చించుము.

3. (A) Write about the synthesis of chloroquin.  
 క్లోరోక్విన్ యొక్క సంశ్లేషణ విధానమును వ్రాయుము.

(OR)

- (B) Write about the synthesis and therapeutic activity of paracetamol.  
 పారాసెటమోల్ యొక్క సంశ్లేషణ మరియు క్రియాశీలతను గూర్చి వ్రాయుము.

4. (A) Write about the synthesis of solbutamol.  
 సోల్బ్యుటమోల్ యొక్క సంశ్లేషణ విధానమును వ్రాయుము.

(OR)

- (B) What do you know about CD-4 and CD-8 cells.  
 CD-4 మరియు CD-8 కణాల గూర్చి నీకు ఏమి తెలియును

**SECTION - B**

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

క్రింది వానిలో ఏదైనా ఐదు ప్రశ్నలకు సమాధానాలు వ్రాయండి. ప్రతి ప్రశ్నకు నాలుగు మార్కులు.  $5 \times 4 = 20$  M

5. Define pharmacy and pharmacology.  
ఫార్మసీ మరియు ఫార్మకాలజీ పదాలను నిర్వచించుము.
6. Define pharmacophore and give two examples.  
ఫార్మకోఫోర్ ను నిర్వచించి రెండు ఉదాహరణలివ్వము.
7. Write the clinical, genetic and trade names of paracetamol.  
పారాసెటమాల్ యొక్క క్లినికల్, జనరల్ మరియు వ్యాపార నామములు వ్రాయుము.
8. Describe the types of administration of drugs.  
ఔషధ సేవనము యొక్క వివిధ రకాలను వర్ణించుము.
9. Write about the therapeutic activity of chloroquine.  
క్లోరోక్విన్ యొక్క ఔషధ క్రియాశీలతను గూర్చి వ్రాయుము.
10. Define hypnotics and tranquilizers.  
హిప్నోటిక్ మరియు ట్రాంక్విలైజర్స్ లను నిర్వచించుము.
11. What are known as pharmacodynamic drugs?  
ఫార్మకోడైనమిక్ ఔషధాలు అని వేననందురు ?
12. Write notes on retro virus.  
రెట్రో వైరస్ గూర్చి వ్యాఖ్య వ్రాయుము.

**SECTION - C**

**III. Answer ALL of the following questions. Each question carries TWO marks.**

క్రింది వానిలో ఏదైనా అన్ని ప్రశ్నలకు సమాధానాలు వ్రాయండి. ప్రతి ప్రశ్నకు రెండు మార్కులు.  $4 \times 2 = 8$  M

13. Define pharmacology.  
ఫార్మకాలజీని నిర్వచించుము.
14. Write any two examples for antibiotics.  
ఏదైనా రెండు యాంటిబయోటిక్స్ కు ఉదాహరణలు వ్రాయుము.
15. Write the structure of Solbutamol.  
సోల్బుటమాల్ యొక్క నిర్మాణాన్ని వ్రాయుము.
16. Write the structure of Indinavir.  
ఇండివేసిర్ యొక్క నిర్మాణాన్ని వ్రాయుము.



**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM**  
**DEPARTMENT OF CHEMISTRY**  
**CBCS Syllabus for B.Sc. I Year Effective from 2018 – 2019 onwards**  
**Semester – II Paper II - ANALYTICAL CHEMISTRY-2**  
**QUANTITATIVE METHODS OF ANALYSIS**

**Total hours : 60**

**UNIT - I**

**GRAVIMETRIC ANALYSIS – I**

**12hrs**

A. Precipitation methods

B. Volatilization methods. (The analyte or its decomposition products are volatilized at a suitable temperature. The volatile product is then collected and weighed, or, alternatively, the mass of the product is determined indirectly from the loss in mass of the sample. E.g., determination of the sodium hydrogen carbonates content of antacid tablets)

**UNIT - II**

**12hrs**

**GRAVIMETRIC ANALYSIS – II**

Properties of precipitates and precipitating reagents: Particle size, Filterability of Precipitates (factors that determine particle size, formation of precipitates and particle size) - Colloidal Precipitates (coagulation of colloids, peptization of colloids, treatment of colloidal precipitates) - Crystalline Precipitates (particle size and filterability) - Co-precipitation (surface adsorption, mixed-crystal formation, occlusion, and mechanical entrapment, co precipitation errors) - Precipitation from Homogeneous Solution (The use of the technique of homogeneous solutions to effect precipitation).

Drying and Ignition of precipitates

Practical gravimetric procedures.

**UNIT – III**

**12hrs**

**VOLUMETRIC ANALYSIS**

A. Definitions: Titrimetry, Volumetric titrimetry, Gravimetric titrimetry, Coulometric titrimetry.

B. The equivalence point, the end point

Classification of volumetric methods, theory of indicators and buffers -

Equilibria Principles - Aqueous and non-aqueous acid-base titration - Redox titrations - Complexometric titrations - Precipitation titrations.

C. Sigmoidal Titration Curves for Neutralization Titrations.

**UNIT – IV****12hrs****CENTRIFUGATION METHODS:**

- A. Introduction
- B. Sedimentation and relative centrifugal force.
- C. Different types of rotors.
- D. Density gradient
- E. Types of centrifugation techniques.

**UNIT-V****12hrs****INTRODUCTION TO ENVIRONMENTAL ANALYSIS:**

- A. Sampling method
- B. Environmental pollution from industrial effluents and radiochemical waste.
- C. Introduction to water and waste analysis.

**GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM.**  
**DEPARTMENT OF CHEMISTRY**  
**I B.SC. ANALYTICAL CHEMISTRY SEMESTER – II**  
**QUESTION PAPER BLUE PRINT FROM 2018-19 ONWARDS**  
**PAPER-II: QUANTITATIVE METHODS OF ANALYSIS**

Sl. NO.	Chapter	Essay Question ( 08 M ) knowledge	Short Answer Question ( 04 M ) Under standing	Very Short Answer Question ( 02 M ) Skill / Application
1.	<b>Gravimetric Analysis-I</b>	01	01	--
2.	<b>Gravimetric Analysis-II</b>	03	02	01
3.	<b>Volumetric Analysis</b>	02	02	01
4.	<b>Centrifugation Methods</b>	01	02	01
5.	<b>Introduction to Environmental Analysis</b>	01	01	01
<b>Total no of Questions</b>		08	08	04

**GOVERNMENT COLLEGE (A), RAJAHMUNDRY.**  
**B.Sc. FIRST YEAR ANALYTICAL CHEMISTRY SEMESTER -II**  
**MODEL QUESTION PAPER FROM 2018-19 ONWARDS**  
**QUANTITATIVE METHODS OF ANALYSIS**  
**MODEL QUESTION PAPER**

TIME: 3hr.

MARKS: 60 M

PART - A

Answer ALL the Questions

**4 X 8 =32 M**

1. (A) What is Gravimetric Analysis? Explain various Precipitation methods of Gravimetric Analysis.

(OR)

- (B) Explain the Titration Curves for Neutralization Titrations.

2. (A) Explain any four properties of Precipitates and Precipitation reagents.

(OR)

- (B) Give a detailed account procedure for Practical Gravimetric Analysis.

3. (A) What is volumetric titrimetry. Explain the classification of Methods of Volumetric Analysis.

(OR)

- (B) Define Indicator and Explain the Theories of Indicators.

4. (A) What is Centrifugation and Write about different types of Centrifugation techniques.

(OR)

- (B) Give a detailed account on Environmental Pollution from Industrial effluents and Radio Chemical Waste.

PART - B

Answer any **FIVE** Questions

**5x4 = 20 M**

5. Write a brief note on Volatilization methods.



6. What are Colloidal Precipitates and Write about Coagulation of Colloids.
7. Write about Complexometric Titrations with one example.
8. Explain any two types of Rotors.
9. Write a short note on Analysis of Water.
10. What is Co-Precipitation and Explain the Types of Co-Precipitation.
11. Write about various Indicators used in Redox Titrations.
12. Write about the Density Gradient.

**PART-C**

Answer **ALL** Questions

**4x2 = 8M**

17. Define Occlusion. Give one Example.
14. What are Equivalence Point and End Point?
15. Define Sedimentation and Give one example.
16. What is Radio Chemical Waste?

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**LABORATORY COURSE – II**Quantitative Analysis**30HRS**

1. Determination of the pKa and Equivalent Weight of a weak acid by potentiometric pH titration.
2. Determination of the strength of the given magnesium Sulphate solution using EDTA and Eriochrome black -T as the indicator.
3. Determination of the capacity of an anionic exchange resin.
4. Separation of cadmium and zinc on an ion exchange resin.
5. Homogeneous precipitation of the Nickel as its Dimethylglyoxime.
6. Analysis of soil
  - i) Determination of pH of soil.
  - ii) Determination of total soluble salts.
  - iii) Determination of carbonate and bicarbonate.
  - iv) Determination of calcium, magnesium and iron.

## Suggested Readings:

1. Analytical Chemistry- Methods of Separation (R.V. Dilts).
2. Laboratory Handbook of Chromatographic Methods (O. Mikes, R.A.Chalmers).
3. F.W. Fifield and D. Kealy: Analytical Chemistry.
4. Vogel's textbook of quantitative chemical analysis, 6 edition.
5. Vogel's textbook of quantitative chemical analysis, 7 edition.
6. Keith Wilson and John Walker: Practical Biochemistry.

**LABORATORY COURSE –II****PRACTICAL - VI: VOLUMETRIC ANALYSIS**

(At the end of Semester I)

**Max. Marks: 50 Marks**

**Time: 3 hrs.**

**SCHEME OF VALUATION:**

For Record - 10 Marks

For Practical - 40 Marks

**Splitting of Practical Marks:**

- i) Procedure in first 10 min. : 5 Marks
- ii) Formula with units : 5 Marks
- iii) Neat tabulation : 5 Marks
- iv) Correct calculation : 5 Marks

Error < 10%: 20 Marks

Error 10-15 %: 15 Marks

Error > 15 %: 10 Marks (Minimum Marks)

**List of Recommended Books:**

1. Principles of Physical Chemistry Puri ,sharma, pathania
2. Text Book of Physical Chemistry Samuel Gladstone
3. Principles of Physical Chemistry Peter Atkins,Julio de
4. Physical Chemistry G.W. CASTELLON
5. Fundamentals of molecular spectroscopy by Collin.N.Banwell and Elaine M.McCash
6. Modern ElectroChemistry Jom Bockeis &A.K.N.Reddy
7. Kinetic and Mechanism of Chemical Transformations J.RajaRam &J.C.KuriaCose
8. Theoretical Thermodynamics S.Gladstone
9. Spectroscopic identification of organic compounds by Robert M.Silverstein & Francis X.Webster
10. Spectroscopy(organic spectroscopy book) Pavia and others
11. Organic chemistry textbooks Carry and Sundberg Part(A) and part(B)
12. spectroscopy H.Kaur
13. Organic Chemistry text book Jerry & March
14. Inorganic Chemistry text book Shriver & Atkins
15. Book for Symmetry and Group theory AllenVincent
16. Bruice,Organic Chemistry Paula Yirani Bruice
17. Advanced Physical Chemistry Gurudeep Raj
18. Chemical Kinetics Laidler
19. An introduction to Electro chemistry Suewel Glasstone
20. Spectroscopy B.K Sharma
21. Physical Chemistry W.J Moore
22. Spectroscopy Straw & Walker
23. Physical Organic Chemistry Wiberg
24. Kinetics and Mechanism Frost and Perason
25. Chemical Kinetics- the study of Reaction Rates in Solution Kenneth A.Connors
26. An introduction to polymer chemistry R.B Seymour
27. Fundamentals of polymer Science and Engineering Anil Kumar and S.K.Gupta
28. Chemical applications of group theory F.A. Cotton
29. Group theory and its application to chemistry K.V Ramana
30. Introduction to quantum chemistry A.K. Chandra