GOVERNMENT COLLEGE (A)
RAJAMAHENDRAVARAM

(Accredited by NAAC "A" Grade)

UG BOARD OF STUDIES - 2020-21

DEPARTMENT OF CHEMISTRY
For the Academic Year 2020-21

B.Sc.,(GENERAL), B.Sc. (MCAC) & B.Sc.CHEM (HONS)

On 26th June, 2020

Curriculum for the Academic Year 2020-21

Proceedings of the Principal, Government College [A], Rajamahendravaram
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 College [A], Rajahmundry – **Boards of Studies** (BoS) – Nomination of Members - Orders Issued.

Ref: - UGC Guidelines for Autonomous Guidelines 2018.

ORDER:

The Principal, Government College [A], Rajamahendravaram is pleased to constitute **Board of studies in CHEMISTRY** for framing the syllabi in Telugu 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	Dr. G. V. Ramana, Lecturer in Chemistry, SKVT College, Rajamahendravaram	Subject Expert
4	Sri V. Sridhar, Lecturer in Chemistry SVRK Govt. Degree College (M), Nidadavolu.	Subject Expert
5	Dr. K. Deepthi, Assistant Professor, Department of Chemistry, Adikavi Nannaya University, Rajamahendravaram	University Nominee
6	Dr. S. Ramana, Chemist, ONGC, Rajamahendravaram	Expert from Industry/Corporate Sector
7	Ms.	Student Nominee

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

(a) 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
(b) Suggest methodologies for innovate teaching and evaluation techniques
(c) Suggest panel of names to the Academic council for appointment of examiners
(d) Coordinate research, teaching, extension and other activities in the department of the college.

The term of the members will be two 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 once a year.

PRINCIPAL
GOVERNMENT COLLEGE [A]
RAJAHMUNDRY

Copy to:

1. The above individuals
2. File

DEPARTMENT OF CHEMISTRY,

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

Composition of the Board of Studies Committee

S.No.	Category	Designation	Names of the Members of Board of Studies	Remarks
1	Educational	Chairperson	Sri C. V. Ramana, Lecturer in charge/HoD, Department of Chemistry, Government College (A), 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	Dr. G. V. Ramana, Lecturer in Chemistry, SKVT College, Rajamahendravaram	
5	Subject Expert	Member	Sri V. Sridhar, Lecturer in Chemistry Govt. Degree College, Tadepalligudem.	
6	Faculty	Members	All Faculty Members, Department of Chemistry, Government College (A), 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**
- **Botany, Chemistry & Horticulture (EM)**
- **Zoology, Chemistry & Aquaculture (EM)**

Honours Courses

- **B.Sc. Chemistry (Honours)**

DEPARTMENT OF CHEMISTRY,

GOVT. COLLEGE (A), RAJAMAHENDRAVARAM.

LIST OF ACTIVITIES PROPOSED FOR THE ACADEMIC YEAR

2020-21

MONTH	ACTIVITY PROPOSED
JUNE - 2020	Departmental staff meeting through video conference to review results and class work allotment
	Conduct of Online Classes
	Preparation of curricular plans, time-tables etc.,
	Preparation of **e–content** generation
JULY - 2020	Planning to conduct Student Centric Activity
	Conduct of Online Classes
	Student awareness programmes on ragging& eve teasing - consequences , self-discipline, career guidance, higher education opportunities etc.,
AUGUST 2020	18th August - **World Helium Day** 26th August - **Lavoisier birth day**
SEPTEMBER 2020	16th-**Ozone day** – Guest Lecture is to be conducted
OCTOBER 2020	23rd **MOLE Day**
	Planning to conduct National Seminar In the month of February.
NOVEMBER 2020	11th **National Education D**ay - Outreach Programme to nearby school
DECEMBER 2020	4th **Chemical Disaster Prevention Day**
	Chem. Fest-2020 (Group Discussions, Quiz competitions, Poster Presentation)
JANUARY 2021	10 days coaching for PG entrance examinations in chemistry
FEBRUARY 2021	National Level Seminar on “ “
	28th - **National Science Day**

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

INDEX 2020-21

AGENDA

1. **New Theory and Practical Syllabus for the Semesters III, IV, V & VI**
   For B.Sc (Chemistry), B.Sc. (MCAC), and B.Sc Chemistry (Honours) Programmes

2. **Model Question Papers**

3. **Blue Prints**

4. **Additional Inputs in the Curriculum.**

5. **Practical's Scheme of Valuation**

6. **Internal Assessment Component.**

7. **Other Academic Activities of the department.**

8. **Any other proposal with the permission of the chair.**

DEPARTMENT OF CHEMISTRY,

GOVT. COLLEGE (A), RAJAMAHENDRAVARAM

TABLE SHOWING ALLOCATION OF CREDITS

FOR B.Sc. CHEMISTRY (GENERAL) COURSE

S. No.	Course Code	Title of the Course	Hrs/ Week	Max. Marks	Marks in SEE	Marks In CIA	Credits
1	CHE-101	Module: Inorganic Chemistry Module: Organic Chemistry	04	100	50	50	03
2	CHE-101P	Practical: Qualitative Analysis of Simple Salt	03	50	50	-	02
3	CHE-102	Module: General Chemistry Module: Physical Chemistry	04	100	50	50	03
4	CHE-102P	Practical: Qualitative Analysis of Mixture Salt	03	50	50	-	02
5	CHE-103	Module: Inorganic Chemistry Module: Organic Chemistry	04	100	50	40	03
6	CHE-103P	Practical:	03	50	50	-	02
7	CHE-104	Module: Spectroscopy Module: Physical Chemistry	04	100	50	40	03
8	CHE-104P	Practical:	03	50	50	-	02
9	CHE-105	Module: Applied Inorganic Chemistry Module: Applied Organic Chemistry	04	100	60	40	03
10	CHE-105P	Practical: Organic Functional Group Analysis	03	50	50	-	02
11	CHE-106	Module: Applied Organic Chemistry Module: Applied Physical Chemistry	04	100	60	40	03
12	CHE-106P	Practical: Physical Chemistry	03	50	50	-	02
		III B.Sc. Semester - VI					
13	CHE-111	VII-A: Analytical Methods In Chemistry	03	100	60	40	03
14	CHE-111P	Practical: Separations/ Titrations	03	-	50	-	02
15	CHE-112	VII-B: Environmental Chemistry	03	100	60	40	03
16	CHE-112P	Practical: Volumetric Analysis	03	-	50	-	02
17	CHE-113	VII-C: Green Chemistry	03	100	60	40	03

18	CHE-113P	Practical: Green Analysis	03	-	50	-	02
19	CHE-114	VIII-A1: Polymer Chemistry	03	100	60	40	03
20	CHE-115	VIII -A2: Instrumental Methods of Analysis	03	100	60	40	03
21	CHE-116	VIII -A3: Analysis of Drugs, Food Products & Biochemical Analysis	03	100	60	40	03
22	CHE-117	VIII -B1: Fuel Chemistry & Batteries	03	100	60	40	03
23	CHE-118	VIII -B2: Inorganic Materials of Industrial Importance	03	100	60	40	03
24	CHE-119	VIII -B3: Analysis of Industrial Products	03	100	60	40	03
25	CHE-120	VIII -C1: Organic Spectroscopic Techniques	03	100	60	40	03
26	CHE-121	VIII -C2: Advanced Organic Reactions	03	100	60	40	03
27	CHE-122	VIII-C3: Pharmaceutical & Medicinal Chemistry	03	100	60	40	03
28	CHE- 123	VIII -D1: Food Additives and Analytical Techniques	03	100	60	40	03
29	CHE- 124	VIII -D2: : Chemical Aspects in Food Quality and Packaging	03	100	60	40	03
30	CHE-125	VIII-D3: Food Adulteration and Food Analysis	03	100	60	40	03
31	CHE-126	VIII - E1: Soils and Fertilizers	03	100	60	40	03
32	CHE-127	VIII - E2: Pest Management	03	100	60	40	03
33	CHE-128	VIII- E3: Agricultural Chemistry	03	100	60	40	03
34	CHE-114P/ 117P/120P/ 123P/126P	Practical VIIIA1/B1/C1/D1/E1: Organic Compound Preparations	03	-	50	-	02
35	CHE-115P/ 118P/121P/ 124P/127P	Practical VIIIA2/B2/C2/D2/E2: Instrumentation	03	-	50	-	02
36	CHE-16P/ 119P/122P/ 125P/128P	Practical VIII A3/B3/C3/D3/E3: Project Work	03	-	50	-	02

DEPARTMENT OF CHEMISTRY,

GOVT. COLLEGE (A), RAJAMAHENDRAVARAM

TABLE SHOWING ALLOCATION OF CREDITS

FOR B.Sc. CHEMISTRY (MCAC) COURSE

S. No.	Course Code	Title of the Course	Hrs/ Week	Max. Marks	Marks in SEE	Marks In CIA	Credits
1	ACH 101	Module: Basic principles & Laboratory operations	04	100	50	50	03
2	ACH-101P	Practical: Volumetric Analysis	03	50	50	-	02
3	ACH-102	Module: Quantitative Methods of Analysis	04	100	50	50	03
4	ACH-102P	Practical: Quantitative Analysis	03	50	50	-	02
5	ACH-103	Module: Separation methods – I	04	100	50	40	03
6	ACH-103P	Practical: Seperation Techniques	03	50	50	-	02
7	ACH-104	Module: Separation methods – II	04	100	50	40	03
8	ACH-104P	Practical: Seperation Techniques	03	50	50	-	02
9	ACH-105	Module: Analytical biochemistry and environmental chemistry	04	100	60	40	03
10	ACH-105P	Practical: Analysis of Bi Products	03	50	50	-	02
11	ACH-106	Module: Instrumental methods of analysis	04	100	60	40	03
12	ACH-106P	Practical: Instrumentation	03	50	50	-	02
13	ACH-107	VII-A: Analysis of Applied Industrial Products	03	100	60	40	03
14	CHE-107P	Practical: Analysis of Applied Industrial Products	03	-	50	-	02
15	CHE-112	VIII-A1: Fuel Chemistry and Batteries	03	100	60	40	03
16	CHE-112P	Practical:	03	-	50	-	02
17	CHE-113	VIII-A2: Inorganic Materials of Industrial Importance	03	100	60	40	03
18	CHE-113P	Practical:	03	-	50	-	02
19	CHE-114	VIII-A3: Analysis of Industrial Products	03	100	60	40	03
20	CHE-114P	Practical: Submit Project Report after one month Interdisciplinary programme in IPR & QC.	03	100	60	40	03

DEPARTMENT OF CHEMISTRY,

GOVT. COLLEGE (A), RAJAMAHENDRAVARAM

TABLE SHOWING ALLOCATION OF CREDITS

FOR B.Sc. CHEMISTRY (HONOURS) COURSE

S. No.	Course Code	Title of the Course	Hrs/ Week	Max. Marks	Marks in SEE	Marks In CIA	Credits
I B.Sc. – SEMESTER-I							
1	CHH-101	Module-IA: Inorganic Chemistry-I	04	100	50	50	03
2	CHH-101P	Practical: Titrimetric Analysis	03	50	50	-	02
3	CHH 102	Module-IB: Physical Chemistry-I					
4	CHH 102P	Practical: Physical Chemistry					
I B.Sc. – SEMESTER-II							
5	CHE-103	Module-IIA: Organic Chemistry -I	04	100	50	50	03
6	CHE-103P	Practical: Organic Analysis	03	50	50	-	02
7	CHE-104	Module-IIB: Physical Chemistry-II	04	100	50	40	03
8	CHE-104P	Practical: Phase Equilibria	03	50	50	-	02
II B.Sc. – SEMESTER-III							
9	CHH-105	Module-IIIA: Inorganic Chemistry-II	04	100	50	40	03
10	CHH-105P	Practical: Titrimetric Analysis	03	50	50	-	02
11	CHH-106	Module-IIIB: Organic Chemistry –II	04	100	60	40	03
12	CHH-106P	Practical: Organic Reactions	03	50	50	-	02
13	CHH-107	Module-IIIC: Physical Chemistry-III	04	100	60	40	03
14	CHH-107P	Practicals: Conductometry & Kinetics	03	50	50	-	02
II B.Sc. – SEMESTER-IV							
15	CHH-108	Module-IVA: Inorganic Chemistry-III	03	100	60	40	03
16	CHH-108P	Practical: Gravimetric & Preparations Analysis	03	-	50	-	02
17	CHH-109	Module-IVB: Organic Chemistry – III	03	100	60	40	03
18	CHH-109P	Practical: Organic Qualitative Analysis.	03	-	50	-	02
19	CHH-110	Module-IVC: Physical Chemistry-IV	03	100	60	40	03
20	CHH-110P	Practicals: Colorimetry & Spectroscopy	03	-	50	-	02

III B.Sc. – SEMESTER-V							
19	**CHH-111**	**Module-VA: Inorganic Chemistry-IV**	**03**	**100**	**60**	**40**	**03**
20	**CHH-111P**	**Practical:**	**03**	**-**	**50**	**-**	**02**
21	**CHH-112**	**Module-VB: Organic Chemistry-IV**	**03**	**100**	**60**	**40**	**03**
22	**CHH-112P**	**Practical: Estimations**	**03**	**-**	**50**	**-**	**02**
23	**CHH-113**	**Module-DSE1: Inorganic Materials of Industrial Importance**	**03**	**100**	**60**	**40**	**03**
24	**CHH-113P**	**Practical: Inorganic Materials of Industrial Importance**	**03**	**-**	**50**	**-**	**02**
25	**CHH-114**	**Module-DSE2: Analytical Methods in Chemistry**	**03**	**100**	**60**	**40**	**03**
26	**CHH-114P**	**Practical: Separation Techniques**	**03**	**-**	**50**	**-**	**02**
III B.Sc. – SEMESTER-VI							
27	**CHH-115**	**Module-VIA: Inorganic Chemistry-IV**	**03**	**100**	**60**	**40**	**03**
28	**CHH-115P**	**Practical: Qualitative Semi Micro Analysis.**	**03**	**-**	**50**	**-**	**02**
29	**CHH-116**	**Module-VIB: Organic Chemistry-V**	**03**	**100**	**60**	**40**	**03**
30	**CHH-116P**	**Practical: Qualitative Analysis**	**03**	**-**	**50**	**-**	**02**
31	**CHH-117**	**Module-DSE3: Polymer Chemistry**	**03**	**100**	**60**	**40**	**03**
32	**CHH-117P**	**Practical: Polymer Analysis**	**03**	**-**	**50**	**-**	**02**
33	**CHH-118**	**Module-DSE4: Instrumental Methods of Chemical Analysis**	**03**	**100**	**60**	**40**	**03**
34	**CHH-118P**	**Practical: Project Work**	**03**	**-**	**50**	**-**	**02**

DEPARTMENT OF CHEMISTRY, GOVT. COLLEGE (A), RAJAHMUNDRY.

Minutes of the Board of Studies Meeting June 2020.

DATE: 27-06-2020 **TIME: 11 AM**

The Board of studies meeting of Chemistry Department is convened on 27-06-2020 at 11 AM under the Chairmanship of Sri C.V. Ramana, in-charge of the department. The members present discussed various aspects such as changes made in the Syllabus and Model Question papers of 1, 2, 3, 4, 5, & 6 semesters both for theory and practical of B.Sc (Chemistry), B.Sc. (MCAC), and B.Sc Chemistry (Honours) Programmes for implementing them during the academic year 2019-2020 onwards.

RESOLUTIONS: **It is resolved to**

1 **Design, introduce and implement Syllabus and Model Question papers of 3, 4, 5, & 6 semesters both for theory and practical of B.Sc (Chemistry), B.Sc. (MCAC), and B.Sc Chemistry (Honours) Programmes as per Choice Based Credit System from the Academic Year 2020-21.**

2 **Implementing Research Based Pedagogical evaluation methods in the curriculum for internal assessment**

3 **Implementing Certificate course on Basic Analytical Techniques from this Calendar year 2019.**

4 **In view of the Corvid – 19 Disaster, Preparing e-content for the syllabus in four Quadrants as: Soft Copy of Notes, Video Lessons and Related Multiple Choice Questions**

5 **The structure of all courses is given in tabular form**

6 **As per the CBCS the core subject CHEMISTRY comprises of SIX courses in chemistry like six semesters as per previous practice.**

- **For B.Sc. first year there will be CORE I in semester -I and Core II in semester –II**
- **For B.Sc. second year there will be CORE III in semester -III and Core IV in semester -IV**
- **For B.Sc. third year there will be CORE V in semester -V and Core VI in semester –VI**

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

For First & Second Years:

It has been decided to introduce Continuous Internal assessment marks for a total of **50 marks from the academic year 2019-20,** which are to be distributed as follows:

S.No.	Component			*Distribution of Marks*
1	CIE I (after completion of 50% of syllabus)			*20*
2	CIE II (Online Exam)			*10*
3	ATTENDANCE	Above 95%	5	*5*
		91% to 95%	4	
		86% to 90%	3	
		81% to 85%	2	
		75% to 80%	1	
		Below 75%	0	
Pedagogical Strategies				
4	ASSIGNMENT			*5*
5	Participation or Paper Presentation in Student Seminars/Workshops/Group Discussions/ Quiz/ Student Study Project/Field Visit/Survey			*5*
6	Viva-voce			*5*
TOTAL				*50*

The minimum pass mark for both internal and external examinations is 18 marks (36%), but as a whole student is subjected to get 40% marks (40 out of total 100 marks) to pass the subject.

For Third Year:

For Third year students from 2018-19 academic year onwards the following Evaluation pattern is followed.

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.e24 Marks)

Average of two	25 Marks	11/2 Hours	The passing minimum CIA will be 40% (IE., 16 marks)
Assignments	5 Marks		
Attendance /student Seminars	5 Marks		
Viva	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. The pattern of question papers of I & II Year semester end examinations,

For First & Second Years 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 x 7 = 28
- In section 'B' the candidate has to answer four short answer type questions out of Eight Questions. Marks: 4 x 4= 16
- In section 'C' the candidate has to answer all the three very short answer type questions. Marks: 3 x 2 = 6
- Total Marks: 28+16 + 06 =50 Marks

For Third Years 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 x 8 = 32
- In section 'B' the candidate has to answer five short answer type questions out of Eight Questions Marks: 5 x 4= 20
- In section 'C' the candidate has to answer all the four very short answer type questions. Marks: 4 x 2 = 8
- Total Marks: 32+20 + 08 =60 Marks

7. 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.

8 For First, Second and Third Years the Internal Practical Examination, will be 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 for those academic years.

9 For B.Sc. first year students admitted in 2019-20 on wards the practical syllabus is Qualitative Analysis, and for B.Sc. second year student's Spectroscopy and Physical Chemistry practicals and for third year Organic Chemistry and Physical Chemistry practicals along with Instrumentation will be implemented.

Chairman,

Board of Studies,

Department of Chemistry.

ADDITIONS AND DELETIONS FOR THE ACADEMIC YEAR 2020-21

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.

I B.Sc. CHEMISTRY PAPER-I

SEMESTER I					
S.No	**Topic deleted**	**No. of hours**	**Topic incorporated**	**No. of hours**	**Justification**
1	-	-	Theory of Qualitative Analysis	04 Hours	To have thorough knowledge on what is happening in practicals

II B.Sc. CHEMISTRY PAPER-III

SEMESTER III					
S.No	**Topic deleted**	**No. of hours**	**Topic incorporated**	**No. of hours**	**Justification**
1	-	-	Nucleophilic substitution reactivity of various halogen compounds, ram's rule, Nucleophilic substitution reactivity of various halogen compounds. Hoffmann Bromide Degradation	04 Hours	To have thorough for attending various competitive exams and for M.Sc. Entrance tests of different Universities

II B.Sc. CHEMISTRY PAPER-V

SEMESTER V					
S.No	**Topic deleted**	**No. of hours**	**Topic incorporated**	**No. of hours**	**Justification**
1	Molecular Spectroscopy	05 Hours	Material Science	05 Hours	The deleted Topic was repeated in V Sem. To have knowledge on Nano Materials

Note: Introduced new papers for B.Sc. (MCAC) in V and VI semesters, and introduced remaining papers of B.Sc. Chemistry (Honours) III, IV, V and VI semesters with enriching them with new topics as detailed in their Credit tables.

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, viz.

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 OF THE B.Sc. CHEMISTRY (HONOURS) COURSE:

It is of fundamental importance to all branches of chemistry dealing with pharmaceuticals, IT skills, Cosmetics & Perfumes, Environmental Protection, Pesticides etc. In this three year course spread over six semesters, there are 14 Core course papers and 8 Elective Papers of chemistry and 4 Mathematics papers.

OUTCOMES OF THE B.Sc. CHEMISTRY (HONOURS) COURSE:

After graduating in B.Sc. Chemistry (Honours) Course the students can pursue academics in Chemistry, Research, bioinformatics, Cosmetic science, Environmental Management System 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	Signature
1.	Dr. K. Deepthi, University Nominee Adi Kavi Nannaya University, Rajahmundry.	
2.	Dr. S. Ramana, Industrial Nominee Chemist, ONGC, Rajahmundry.	
3.	Dr. G.V. Ramana, Local Nominee, S.K.V.T. Degree College, Rajahmundry.	
4.	Sri V. Sridhar, Subject Expert, SVRK GDC (M), Nidadavolu	
5.	Sri J. Yacobe, Staff Member	
6.	Dr. B. Madhav, Staff Member	
7.	Dr. B. Mallikarjuna, Staff Member	
8.	Dr. (Smt). K. Anitha, Staff Member	
9.	Dr. K. Raveendra Babu, Staff Member	
10.	Dr. M. Trinadh, Staff Member	
11.	Sri V. Satyanarayana, Staff Member	
12.	Smt. J. Sasi Sree, Staff Member	
13.	Dr. E.S.R.S. Sharma, Staff Member	
14.	Sri B.S.V. Prasad, Staff Member	
15.	Smt. M. Usha Rani, Staff Member	
16.	Smt. N. Bhargavi, Staff Member	
17.	Smt. P. Surya Sree, Staff Member	
18.	Sri. K. Srinivasa Rao, Staff Member	

19.	Smt. B. Baby Nalini, Staff Member	
20.	Kum B. Maha Lakshmi, Staff Member	
21.	Sri G. Durga Prasad, Staff Member	
22.	Sri I. Ramesh, Staff Member	
23.	Sri KVV. Ranga Rao, Staff Member	
24.	Sri K. Ramesh, Staff Member	
25.	Kum Roshan Jaha, Staff Member	
26.	Sri SVVS. Durga Prasad, Staff Member	
27.	Smt. R. Praneetha Sree, Staff Member	
28.	Sri Ch. Siva Krishna, Staff Member	
29.	Smt. G. Bhagyavathi, Staff Member	
30.		
31.		
32.		
33.		

The following documents submitted to the Academic coordinator and Controller of Examinations:

1. Resolutions of Board of Studies Meeting
2. Syllabus of II, IV, and VI semesters.
3. Model question papers for II, IV, and VI semesters
4. List of revised Examiners (if any)
5. Any other new proposals

Date: 27-06-2020.

Chairman,
Board of Studies,
Department of Chemistry.

List of Examiners and Paper Setters:

S. No.	Name of the Lecturer/Reader	College	Paper Taught
03	V. Soma Sekhara Rao	GDC, Alamuru	All
04	Dr. V. Sambasiva Rao	GDC, TUNI.	All
05	A. Sai Sundar	Govt. College, Jangareddigudem	All
06	Dr. T. Narasimha murthy	GDC, Mandapeta	All
07	U. Venkatacharyulu	Govt. College, Jaggampeta	All
08	Ms. V. Ananta Lakshmi	ASD GDC(W), Kakinada	All
09	T.V.V. Satyanarayana	GDC, Ramachandrapuram	All
10	T. Sreevaram	GDC, Ravulapalem	All
11	D. Suneetha	GDC, Yeleswaram	All
12	V. Badrinarayana Rao	GDC.(W) Kakinada	All
13	E.V.S Subrahmanyam	GDC, Razole	All
14	M.M. Pacha	GDC, Ramachandrapuram	All
15	R. Brahmaji	GDC, Ramachandrapuram	All
16	U. Satyanarayana	GDC, Tuni	All
17	T. Vara Prasad	P.R.G. C.(A) Kakinada	All
18	D. Ramarao	P.R.G. C.(A) Kakinada	All

19	K. Anand	GDC, Chinthalapudi	All
20	V. Mallikrajuna Sharma	P.R.G.C, Kakinada	All
21	G. Srinivasa Reddy	DCR College, G.Mamidada	All
24	D. Chenna Rao	ASD GDC(W), Kakinada	All
25	T. Srinivasa Rao	GDC (M), Nidadavolu	All
26	V. Sridhar	GDC (M), Nidadavolu	All
27	M. V. Prem Sagar	GDC (M), Nidadavolu	All
29	DSN. Raju	---Do--	All
30	A. Venkata Rao	GDC, Ramachandrapuram	All
31	T. Nageswara Rao	K.G.R.L., Bhimavaram	All
33	B. Rama Krishna	SKST(W)DC, Tanuku	All
34	Dr. G. V. Ramana	SKVT C, Rajahmundry	All
35	P. Siva Kumar	GDC, Mandapeta	All
	University Nominee	Local Nominee	

Date: 27-06-2020.

Chairman,
Board of Studies,
Department of Chemistry.

Government College (A), Rajamahendravaram

(*Accredited by NAAC "A" Grade)*

Department of Chemistry

Certificate of Submission

These following documents are submitted to the Academic Coordinator and Controller of Examinations:

1. Hard copy of the approved curriculum which includes minutes of U.G. Board of studies, approved syllabus, blue print for the question papers and model question papers for all semesters and list of approved examiners .

2. CD containing the approved curriculum which includes minutes of U.G. Board of Studies, approved syllabus, blue print for the question papers and model question papers for all semesters and list of approved examiners.

Chairman
(C. V. Ramana)

Academic Coordinator

Controller of Examinations

GOVERNMENT COLLEGE (A)
RAJAMAHENDRAVARAM

(Accredited by NAAC "A+" Grade)

UG BOARD OF STUDIES - 2020-21

DEPARTMENT OF CHEMISTRY
For the Academic Year 2020-21

B.Sc (General)

Curriculum for the Academic Year 2020-21

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

INDEX 2020-21 for B.Sc (General)

DEPARTMENT OF CHEMISTRY,

GOVT. COLLEGE (A), RAJAMAHENDRAVARAM

TABLE SHOWING ALLOCATION OF CREDITS FOR B.Sc. (GENERAL)

S. No.	Course Code	Title of the Course	Hrs/ Week	Max. Marks	Marks in SEE	Marks In CIA	Credits
I B.Sc. Semester - I							
1	CHE-101	Module: Inorganic Chemistry Module: Organic Chemistry	04	100	50	50	03
2	CHE-101P	Practical: Qualitative Analysis of Simple Salt	03	50	50	-	02
I B.Sc. Semester – II							
3	CHE-102	Module: General Chemistry Module: Physical Chemistry	04	100	50	50	03
4	CHE-102P	Practical: Qualitative Analysis of Mixture Salt	03	50	50	-	02
II B.Sc. Semester - III							
5	CHE-103	Module: Inorganic Chemistry Module: Organic Chemistry	04	100	50	40	03
6	CHE-103P	Practical:	03	50	50	-	02
II B.Sc. Semester - IV							
7	CHE-104	Module: Spectroscopy Module: Physical Chemistry	04	100	50	40	03
8	CHE-104P	Practical:	03	50	50	-	02
III B.Sc. Semester - V							
9	CHE-105	Module: Applied Inorganic Chemistry Module: Applied Organic Chemistry	04	100	60	40	03
10	CHE-105P	Practical: Organic Functional Group Analysis	03	50	50	-	02
11	CHE-106	Module: Applied Organic Chemistry Module: Applied Physical Chemistry	04	100	60	40	03
12	CHE-106P	Practical: Physical Chemistry	03	50	50	-	02
III B.Sc. Semester - VI							
13	CHE-111	VII-A: Analytical Methods In Chemistry	03	100	60	40	03

14	CHE-111P	Practical:	03	-	50	-	02
15	CHE-112	VII-B: Environmental Chemistry	03	100	60	40	03
16	CHE-112P	Practical:	03	-	50	-	02
17	CHE-113	VII-C: Green Chemistry	03	100	60	40	03
18	CHE-113P	Practical:	03	-	50	-	02
19	CHE-114	VIII-A1: Polymer Chemistry	03	100	60	40	03
20	CHE-115	VIII -A2: Instrumental Methods of Analysis	03	100	60	40	03
21	CHE-116	VIII -A3: Analysis of Drugs, Food Products & Biochemical Analysis	03	100	60	40	03
22	CHE-117	VIII -B1: Fuel Chemistry & Batteries	03	100	60	40	03
23	CHE-118	VIII -B2: Inorganic Materials of Industrial Importance	03	100	60	40	03
24	CHE-119	VIII -B3: Analysis of Industrial Products	03	100	60	40	03
25	CHE-120	VIII -C1: Organic Spectroscopic Techniques	03	100	60	40	03
26	CHE-121	VIII -C2: Advanced Organic Reactions	03	100	60	40	03
27	CHE-122	VIII-C3: Pharmaceutical & Medicinal Chemistry	03	100	60	40	03
28	CHE-	VIII -D1: Organic Spectroscopic Techniques	03	100	60	40	03
29	CHE-	VIII -D2: Advanced Organic Reactions	03	100	60	40	03
30	CHE-	VIII-D3: Pharmaceutical & Medicinal Chemistry	03	100	60	40	03
31	CHE-	VIII - E1: Organic Spectroscopic Techniques	03	100	60	40	03
32	CHE-	VIII - E2: Advanced Organic Reactions	03	100	60	40	03
33	CHE-	VIII- E3: Pharmaceutical & Medicinal Chemistry	03	100	60	40	03
34		Practical VIIIA1/B1/C1/D1/E1:	03	-	50	-	02
35		Practical VIIIA2/B2/C2/D2/E2:	03	-	50	-	02
36		Practical VIII A3/B3/C3/D3/E3: Project Work	03	-	50	-	02

GOVERNMENT COLLEGE (A),

RAJAHMUNDRY. B.Sc. FIRST YEAR

CHEMISTRY SEMESTER –I

CHE 101: INORGANIC AND PHYSICAL CHEMISTRY

60 hrs. (4h/w)

Course Outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of p-block elements
2. Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
3. Apply the concepts of gas equations, pH and electrolytes while studying other chemistry courses.

INORGANIC CHEMISTRY

24 h

UNIT -I

Chemistry of p-block elements 8h

Group 13: Preparation & structure of Diborane.
Group 14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of Phosphonitrilic halides {(PNCL)n where n=3, 4

Group 16: Oxides and Oxoacids of Sulphur (structures only)

Group 17: Pseudo halogens, Structures of Interhalogen compounds.

UNIT-II

1. Chemistry of d-block elements: 6h

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

2. Chemistry of f-block elements: 6h

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

configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

3. Theories of bonding in metals: 4 h

Valence bond theory and free electron theory, explanation of thermal and electrical conductivity of metals based on these theories, Band theory- formation of bands, explanation of conductors, semiconductors and insulators.

PHYSICAL CHEMISTRY (36 h)

UNIT-III

Solid State 10 h

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

UNIT-IV

1. Gaseous state: Vanderwaals equation of state. Andrew's isotherms of carbon dioxide continuity of state. Critical phenomena. Relationship between critical constants and Vanderwaals constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

2. Liquid state

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

UNIT-V: Solutions, Ionic equilibrium& dilute solutions 6h

1. Solutions: Azeotropes-HCl-H2O system and ethanol-water system. Partially miscible liquids-phenol- water system. Critical solution temperature (CST), Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

2. Ionic equilibrium 3h

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

3. Dilute solutions 7h

Colligative properties- RLVP, Osmotic pressure, Elevation in boing point and depression in freezing point. Experimental methods for the determination of molar mass of a non-volatile solute using osmotic pressure, Elevation in boing point and depression in freezing point. Abnormal colligative properties. Van't Hoff factor.

Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. Semester- end Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

List of Reference Books

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

LABORATORY COURSE -I 30**hrs (2 h / w)**

Practical-I Analysis of SALT MIXTURE (At the end of Semester-I)

Qualitative inorganic analysis (Minimum of Six mixtures should be analysed)

50 M

Course outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic mixture
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

Analysis of SALT MIXTURE 50 M

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

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate. **Cations:** Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Potassium and Ammonium.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

B.Sc., FIRST YEAR CHEMISTRY SEMESTERII

SYLLABUS

COURSE II - ORGANIC AND GENERAL CHEMISTRY

60 hrs (4h/w)

Course outcomes:

At the end of the course, the student will be able to;

1. Understand and explain the differential behaviour of organic compounds based on fundamental concepts learnt.
2. Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
3. LearnandidentifymanyorganicreactionmechanismsincludingFreeRadical Substitution, Electrophilic Addition and Electrophilic Aromatic Substitution.
4. Correlate and describe the stereo chemical properties of organic compounds and reactions.

ORGANIC CHEMISTRY

UNIT-I:

Recapitulation of Basics of Organic Chemistry Carbon-Carbon sigma bonds (Alkanes and Cycloalkanes)

General methods of preparation of alkanes- Wurtz and Wurtz Fittig reaction, Corey House synthesis, physical and chemical properties of alkanes, Isomerism and its effect on properties, Free radical substitutions; Halogenation, concept of relative reactivity v/s selectivity. Conformational analysis of alkanes (Conformations, relative stability and energy diagrams of Ethane, Propane and butane).General molecular formulae of cycloalkanes and relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram, Conformations of mono substituted cyclohexane.

UNIT-II:

Carbon-Carbon pi Bonds (Alkenes and Alkynes) General methods of preparation, physical and ofE1, E2, E1 reactions, Saytzeff and Hoffmann eliminations, Additions, mechanism (Markownikoff / Anti Markownikoff suitable examples, Syn and anti-addition;additionofH_2,X_2,

12h

Chemical properties. Mechanism Electrophilic addition) with HX. oxymercuration - demercuration, hydroboration-oxidation, Ozonolysis, hydroxylation, Diels Alderreaction,1,2- and1,4-additionreactionsinconjugateddienes.

Reactions of alkynes: acidity, electrophilic and nucleophilic additions, hydration to form carbonyl compounds, Alkylation of terminal alkynes.

UNIT-III:

Benzene and its reactivity 12h

Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclo propenyl cation, cyclopentadienyl anion and tropylium cation) Reactions - General mechanism of electrophilic aromatic substitution, mechanism of nitration, Friedel- Craft's alkylation and acylation. Orientation of aromatic substitution - ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

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

GENERAL CHEMISTRY

24 h

UNIT-IV:

1. Surface chemistry and chemical bonding

Surface chemistry 6h

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

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

2. Chemical Bonding 6h

Valence bond theory, hybridization, VB theory as applied to ClF_3, $Ni(CO)_4$, Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N2, O2, CO and NO).

3. HSAB 2h

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

UNIT-V:

Stereochemistry of carbon compounds 10h

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.
Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation.
Chiral molecules- definition and criteria(Symmetry elements)- Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.
D,L, R,S and E,Z- configuration with examples.
Definition of Racemic mixture - Resolution of racemic mixtures (any 3 techniques)

Co-curricular activities and Assessment Methods:

Continuous Evaluation: Monitoring the progress of student's learning
Class Tests, Work sheets and Quizzes
Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
Semester-End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

List of Reference
Books Theory:

Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

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

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

Practical:

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

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

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

Additional Resources:

Solomons, T. W. G.; Fryhle, C. B. &Snyder, S. A. Organic Chemistry, 12th Edition,

Wiley. Bruice, P. Y. Organic Chemistry, Eighth Edition, Pearson.

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

Nasipuri, D. Stereochemistry of Organic Compounds: Principles and Applications,

Third Edition, New Age International.

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

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

Practical-II Volumetric Analysis

(At the end of Semester-II)

Course outcomes:

At the end of the course, the student will be able to;

1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. Understand and explain the volumetric analysis based on fundamental concept slearnt in ionic equilibria
3. Learn and identify the concepts of a standard solutions, primary and secondary standards
4. Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

Volumetric analysis 50 M

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Determination of Fe (II) using KMnO4 with oxalic acid as primary standard.
3. Determination of Cu (II) using Na2S2O3 with K2&2O7 as primary standard.
4. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. SECOND YEAR CHEMISTRY SEMESTER –III

CHE 103: ADVANCED ORGANIC CHEMISTRY & INORGANIC CHEMISTRY

60 hrs (4 h / w)

ORGANIC CHEMISTRY (30 h)

UNIT – I

Halogen compounds **5 h**

Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aryl alkyl, allyl, vinyl, benzyl halides. Nucleophilic aliphatic substitution reaction- classification into S_N1 and S_N2 – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane. **Nucleophilic substitution reactivity of various halogen compounds**.

Hydroxy Compounds **5h**

Nomenclature and classification of hydroxy compounds.

Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols. Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene. Physical properties- Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water. Identification of alcohols by oxidation with $KMnO_4$, Ceric ammonium nitrate, Luca's reagent and phenols by reaction with $FeCl_3$.

Chemical properties: a) Dehydration of alcohols. b) Oxidation of alcohols by CrO_3, $KMnO_4$. c) Special reaction of phenols: Bromination, Kolbe-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, azocoupling, Pinacol-Pinacolone rearrangement.

UNIT – II

Carbonyl Compounds **10 h**

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

Nucleophilic addition reaction with a) $NaHSO_3$, b) HCN, c) RMgX, d) NH_2OH, e) $PhNHNH_2$, f) 2,4-DNPH, g) Alcohols-formation of hemiacetal and acetal. **Cram's Rule**. Base catalysed

reactions: a) Aldol, b) Cannizzaro's reaction, c) Perkin reaction, d) Benzoin condensation, e) Knoevenagel reaction,f) Haloform reaction. Oxidation of aldehydes- Baeyer-Villiger oxidation of ketones. Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with $LiAlH_4$ and $NaBH_4$. Analysis of aldehydes and ketones with a) 2,4-DNPH test, b) Tollen's test, c) Fehling test, d) Schiff's test e) Haloform test (with equations)

UNIT – III

Carboxylic Compounds **6 h**

Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) Hydrolysis of nitriles, amides b) Hydrolysis of esters by acids and bases with mechanism c) Carbonation of Grignard reagents. Special methods of preparation of aromatic acids by a) Oxidation of side chain. b) Hydrolysis by benzotrichlorides. c) Kolbe reaction. Physical properties: Hydrogen bonding, dimeric association, acidity-strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids. Chemical properties: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification. Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, **Hoffman hypobromite degradation** reaction, Arndt-Eistert synthesis. Halogenation by Hell- Volhard- Zelinsky reaction.

Active Methylene Compounds **4 h**

Acetoacetic ester: keto-enol tautomerism, preparation by Claisen condensation, Acidic hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids. b) Dicarboxylic acids. c) Reaction with urea

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

INORGANIC CHEMISTRY (30 h)

UNIT –IV

Chemistry of d-block elements: **9h**

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

Metal Carbonyls **7h**

EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni. Metal nitrosyles. Metallocenes- ferrocene structure.

UNIT- V

Chemistry of f-block elements **8h**

Chemistry of lanthanides - electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides, separation of lanthanides by ion exchange method and solvent extraction method.

Theories of bonding in metals **6h**

Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

List of Reference Books

1. Text Book of Organic chemistry by Vol I by I.L. Finar Vol I
2. Organic chemistry by P Y Bruice
3. Organic Chemistry by Morrison and Boyd
4. Inorganic Chemistry J E Huheey, E A Keiter and R L Keiter
5. Basic Inorganic Chemistry by Cotton and Wilkinson
6. Concise Inorganic Chemistry by J.D. Lee

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. SECOND YEAR CHEMISTRY SEMESTER –III

MODEL QUESTION PAPER BLUE PRINT FROM 2017-18 ONWARDS

ADVANCED ORGANIC CHEMISTRY & INORGANIC CHEMISTRY

TIME: $2^1/_2$ hr. **MARKS: 50 M**

PART -A

Answer **ALL** the Questions **4X7 = 28 M**

1. **A (OR) B from UNIT- I**
2. A **(OR) B from UNIT- II**
3. **A (OR) B from UNIT-IV**
4. **A from UNIT III (OR) B from UNIT V**

PART – B

Answer any **FOUR** Questions **4x4 = 16 M**

5. **UNIT- I**
6. **UNIT- II**
7. **UNIT- III**
8. **UNIT- IV**
9. **UNIT- V**
10. **UNIT- II**
11. **UNIT- III**
12. **UNIT- V**

PART-C

Answer ALL Questions **3x2 = 6M**

13. **UNIT- I**
14. **UNIT- II**
15. **UNIT- III**
16. **UNIT- IV**

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
III SEMESTER END EXAMINATIONS
II B. SC. CHEMISTRY MODEL QUESTION PAPER

Duration: $2^1/_2$ hrs. **Max. Marks: 50 M**

PART -A

Answer **ALL** the Questions **4X7 = 28 M**

1. (A) Explain mechanism and stereochemistry differences of S_N1 and S_N2 reactions?
   S_N1 S_N2

   (OR)

   (B) Explain with mechanism 1) Riemer-Tiemann reaction 2) Pinacol-Pinacolone rearrangement.

2. (A) Explain the following with mechanism with suitable examples. a) Aldol reaction b) Benzoin condensation.

   (OR)

   (B) Write the identification tests of aldehydes and ketones a) 2,4-DNPH test, b) Tollen's test, d) Schiff's test e) Haloform test.

3. (A) Explain why the d-block elements show color and catalytic properties.
   (B) Explain the following. a) EAN rule with examples b) metallocenes c) metal nitrosyls

4. Explain the acidic nature of active methylene compounds? Write the synthesis and two applications of malonic ester.

   OR

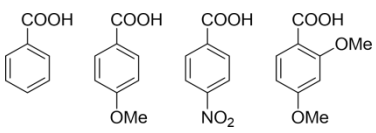
   (B) What is lanthanoid contraction? Why it arises? Write three of its consequences.

PART – B

Answer any **FOUR** Questions **4x4 = 16 M**

5. Arrange the following halogen compounds in their order of reactivity towards nucleophilic substitution. A) Ethyl bromide b) benzyl bromide c) vinyl bromide.
6. Alkenes and carbonyl compounds have double bonds but they react differently. Why?

7. Arrange the following molecules in in acidity order. And Justify.



8. Describe about complex formation ability of transition elements.

9. Write free electron theory and explain how it will explain the thermal conductivity.

10. Write Fries reaction, Bayer-Villiger oxidation.

11. How do you synthesize. $RCOOH \longrightarrow RCH_2COOH$.

$RCOOH \longrightarrow RCH_2COOH$?

12. Write about ion exchange chromatography for separation of lanthanides.

PART-C

Answer ALL Questions 3x2 = 6M

13. How do you distinguish 1°, 2°, 3° alcohols with $KMnO_4$.

1°, 2°, 3° $KMnO_4$

14 What are active methylene compounds?

15. What are p-type and n-type semiconductors?

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. SECOND YEAR CHEMISTRY SEMESTER –III

ORGANIC CHEMISTRY & INORGANIC CHEMISTRY

CHE 103P: INSTRUMENTATION PRACTICAL SYLLABUS

Hours: 45 (3 h / W) **Max Marks: 50 M**

PHYSICAL CHEMISTRY: **40 M**

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

IR SPECTRAL ANALYSIS: **10 M**

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

SCHEME OF EVALUATION

Physical Chemistry **40 M**

For Conductometric Titrations:

1. Procedure: 5 (Principle: 4M and for rough graph: 1M)
2. Experiment: 25
3. Graph: 5
4. Calculation: 3
5. Report: 2

For Critical Solution Temperature:

Procedure: 5 (Principle: 4M and for rough graph: 1M)

1. Experiment: 25
2. Graph: 5
3. Calculation: 3
4. Report: 2

IR Spectral Analysis **10 M**

For finding of unsaturation: 5M

For functional group: 5 M

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR II B.Sc., IV SEMESTER
FROM 2019 -20 ONWARDS

CHE – 104: SPECTROSCOPY & PHYSICAL CHEMISTRY

Total Hours: 60

UNIT-I: SPECTROSCOPY – I **14 Hours**

A) SPECTROPHOTOMETRY **7 Hours**

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 **7 Hours**

Interaction of electromagnetic radiation with molecules and types of molecular spectra, energy levels of molecular orbitals (σ, , 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 $_{max}$.

UNIT-II: SPECTROSCOPY – II **16 Hours**

a) INFRARED SPECTROSCOPY **6 Hours**

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 Hours**

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.

UNIT-III: DILUTE SOLUTIONS AND PHASE RULE **16 Hours**

a) DILUTE SOLUTIONS **10 Hours**

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 **6 Hours**

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: ELECTROCHEMISTRY **14 Hours**

a) ELECTROCHEMISTRY-I **10 Hours**

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

b) ELECTROCHEMISTRY-II **4 Hours**

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. Bockris and A. K. N. Reddy
5. Advanced Physical Chemistry by Atkins
6. Introduction to Electrochemistry by S. Glasstone
7. Elementary organic spectroscopy by Y.R. Sharma
8. Spectroscopy by P. S. Kalsi

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
DEPARTMENT OF CHEMISTRY
BLUE PRINT FOR II B.Sc., IV SEMESTER
FROM 2019 -20 ONWARDS

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: SPECTROSCOPY – I	02 (1 from a + 1 from b)	02	01
2.	UNIT-II: SPECTROSCOPY – II	02 (1 from a + 1 from b)	02	01
3.	UNIT-III: DILUTE SOLUTIONS AND PHASE RULE	02 (1 from a + 1 from b)	02	01
4.	UNIT-IV: ELECTROCHEMISTRY	02 (1 from a + 1 from b)	02	
TOTAL NO. OF QUESTIONS		08	08	03

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DEPARTMENT OF CHEMISTRY
MODEL QUESTION PAPER FOR II B.Sc., IV SEMESTER
FROM 2019 -20 ONWARDS

SPECTROSCOPY & PHYSICAL CHEMISTRY

Time: 2 ½hr. **Marks: 50M**

PART -A

Note: Answer All the Questions.

4X7 = 28 M

1. (A) How do you estimate the amount of chromium in potassium dichromate and manganese in Manganous Sulphate spectrophotometrically.

Or/

(B) Define chromophore and auxochrome. How does the conjugation, affect the $_{max}$.

2. (A) Give a short note on the factors that influence the stretching & bending vibrations.

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

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

Or/

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

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

Or/

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

PART– B

Note: Answer any **FOUR** Questions **4x4 = 16 M**

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

4. Write about various types of electronic transitions.

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

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

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

10. Define Eutectic point and congruent point.

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

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

Cd/Cd+2//Cu^{+2}/Cu EMF . Cd Cu

-0.40V 0.34V.

PART-C

Note: Answer ALL Questions

3x2 = 6M

13. Which electronic transition has a high ϵ value in acetone?

14. What is coupling constant (J)?

15. What is degree of freedom?

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DEPARTMENT OF CHEMISTRY
PRACTICAL COURSE SYLLABUS FOR II B.Sc., IV SEMESTER
FROM 2019 -20 ONWARDS

104P: TITRIMETRIC ANALYSIS

Time: 45 Hours (3h/w)

1. Determination of carbonate and bicarbonate mixture
2. Determination of Fe (II) using $K_2Cr_2O_7$
3. Determination of Fe (II) using KMnO4 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

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PRACTICAL COURSE FOR II B.Sc., IV SEMESTER
FROM 2019 -20 ONWARDS

TITRIMETRIC ANALYSIS
SCHEME OF VALUATION(EXTERNAL)

Max Marks: 50 **Time: 3 Hours**

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: 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

DEPARTMENT OF CHEMISTRY

New CBCS Syllabus for B.Sc. III Year

PAPER – V, SEMESTER – V (Effective from 2017 – 2018 onwards)

CHE 105: APPLIED INORGANIC CHEMISTRY AND ORGANIC CHEMISTRY

MODULE – I (INORGANIC CHEMISTRY)

1. Coordination Chemistry: 10 Hrs.

- **IUPAC Nomenclature of Co-ordination Compounds :**
- **Bonding Theories of Co-ordination Compounds :**
  - Review of **Werner's Theory** and **Sidgwick's Concept** of Coordination.
  - **Valence Bond Theory** – Geometries of any two complexes with coordination numbers 4 (tetrahedral and Square planar) and 6 (Octahederal) – limitations of Valence Bond Theory.
  - **Crystal Field Theory** – Splitting of d-orbitals in Octahedral, tetrahedral and square planar complexes (with one example each) – low spin and high spin complexes – factors affecting crystal – field splitting energy – merits and demerits of crystal – field theory.
- **Isomerism in coordination compounds :** Structural isomerism and stereo Isomerism (with two examples each) – Stereochemistry of complexes with 4 and 6 coordination numbers (with two examples each).

2. Stability of Metal Complexes : 4 Hrs.

- Thermodynamic Stability and Kinetic Stability.
- Any five factors affecting the stability of metal complex.
- **Chelate** Effect.
- Determination of Composition of complex by : **Job's Method & Mole ratio method.**

Additional Input : Any four factors influencing the complex formation.

3. Spectral and Magnetic Properties of Metal Complexes: 4 Hrs.

- Electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$ ion.
- Types of magnetic behavior, spin – only formula, calculation of magnetic moments (taking any four examples), experimental determination of magnetic susceptibility – Gouy method.

Additional Input: Any four applications of complex compounds.

4. Reactivity of Metal Complexes **4 Hrs.**

- **Labile and inert complexes** (with two examples each),
- Ligand substitution reactions – SN_1 and SN_2,
- Substitution reactions of **Square Planar Complexes** (with two examples),
- Trans effect and applications of trans effect.
- **Hard and Soft Acids Bases (HSAB)**
- Classification of hard and soft acids and bases.
- Pearson's concept of hardness and softness.
- Two applications of HSAB Principles – Stability of compounds / complexes, predicting the feasibility of reaction.

Additional Input : Acid base strength of HSAB.

5. Bioinorganic Chemistry **3 Hrs.**

- Essential elements – definition & classification.
- Any four biological functions of Na, K, Ca, Fe, Co, and Chloride (Cl).
- Metalloporphyrins – Hemoglobin, structure and function, Chlorophyll – it's role in photosynthesis.

Additional Input : Cyanocobalamine (Vitamin B_{12}) – functions.

MODULE – II (ORGANIC CHEMISTRY)

(1). NITROGEN COMPOUNDS : **15 Hrs.**

- **Nitrohydrocarbons :**
  - **Nomenclature,** classification and structure of aliphatic nitro hydrocarbons
  - **Tautomerism** of nitroalkanes leading to aci and keto form.
  - Any two **preparations** of Nitroalkanes
  - **Reactivity** of nitroalkanes –
    1. Halogenation **(without mechanism)**
    2. Reaction with HONO (Nitrous acid) – **(without mechanism)**
    3. Nef reaction **(without mechanism)**

4. Mannich reaction **(without mechanism)**

5. Mannich reaction leading to Michael addition and **Reduction (without mechanism)**

❖ **Amines**

➢ **Aliphatic Amines**

I. **Nomenclature,** Classification into 1^0, 2^0, 3^0 Amines and Quarternary ammonium compounds.

II. **Preparative methods of primary amines** :

For 1^0, 2^0, 3^0 Amines : Reductive Amination **(without mechanism).**

For 1^0 Amines :

1. Ammonolysis of alkyl halides **(without mechanism)**
2. Gabriel synthesis **(without mechanism)**
3. Hoffman's bromamide reaction **(with mechanism)**

III. Chemical Properties :

1. Hinsberg separation of mixture of 1^0, 2^0, 3^0 amines.
2. Alkylation of primary and secondary amines **(without mechanism).**
3. Acylation of primary and secondary amines **(without mechanism).**
4. Carbylamine reaction of primary amines **(without mechanism).**
5. Reaction with Nitrous acid of 1^0, 2^0, 3^0 **(without mechanism).**
6. Oxidation of primary amines **(without mechanism).**

➢ **Aromatic Amines**

I. Nomenclature, Classification into 1^0, 2^0, 3^0 Amines and Quarternary ammonium compounds.

II. Preparative methods of primary aromatic amines :

1. Amination of aryl halides **(without mechanism)**
2. From carboxylic acids – Schmidt reaction **(without mechanism)**
3. Hoffman's degradation reaction – from amides **(without mechanism)**

III. Chemical Properties of primary aromatic amines :

1. Alkylation **(without mechanism)**

2. Acylation **(without mechanism)**
3. Carbylamine reaction **(without mechanism)**
4. Reaction with Nitrous acid **(without mechanism)**
5. Oxidation **(without mechanism)**

IV. Physical Properties and basic character of amines :

- Substituent effect (Electron releasing, Electron withdrawing groups) on basicity of amines taking one example for each substituent group.
- **Steric effect** – Comparative basic strength of N-methylaniline and N-ethylaniline.
  - Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline.
  - Comparative basic strength of aniline, N-methylaniline and N, N-dimethyl aniline (in aqueous medium)

<u>Applications of Amines in Biological Systems</u>:

Definition, two examples and two functions of the following:

- **Hormones :** Adrenalin and Noradrenaline
- **Neurotransmitters:** Dopamine and Serotonine.
- **Analgesic alkaloids:** Morphine and Codeine.
- **Electrophic Substitution of Aromatic Amines** – Bromination and Nitration **(with mechanisms).**

  Additional Input: Sulphonation of Aniline – Importance of Sulphanilic acid in Sulpha drugs.

(2). HETEROCYCLIC COMPOUNDS: 5 Hrs.

Five – Membered ring compounds:

- **Introduction and definition:** Simple Five membered ring compounds with one hetero atm. Ex. **Furan, Thiophene and Pyrrole**.

- **Numbering** the ring systems of **Furan, Thiophene and Pyrrole** as per Greek letter and numbers.
- **Aromatic character of Furan, Thiophene and Pyrrole** – 6 – electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom).
- **Resonance structures of Furan, Thiophene and Pyrrole :** Indicating electron surplus carbons and electron deficient hetero atom.

Preparation of furan, pyrrole and thiophene from 1,4-dicarbonyl compounds only (Paul-Knorr synthesis).

- **Physical properties** – Explanation of feebly acidic character of pyrrole.
- **Chemical Properties –**

1. Electrophilic substitution **of Furan, pyrrole and thiophene** at 2 or 5 position – Halogenation, Nitration and Sulphonation under mild conditions **(without mechanism)**
2. Reactivity of furan as 1, 3-diene, Diels Alder reaction.
3. Sulphonation of thiophene **(without mechanism)**

Six – Membered rings

Pyridine :

1. **Resonance structure** of pyridine
2. **Basicity of pyridine** – Comparison with pyrrole.
3. Any one Electrophillic and one Nucleophilic Reactions of pyridine **(without mechanisms)**
4. Importance of heterocyclic ring system in natural products like Haemoglobin, Chlorophyll, antibiotics like Penicillins.

Additional Input : Structure of alkaloids quinoline and Isoquinoline.

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III B.Sc. Chemistry Paper – V

Semester – V

Applied Inorganic Chemistry and Organic Chemistry

Sl. No.	Chapter	Essay Question (8 M)	Short Answer Question (4 M)	Very Short Answer Questions (2 M)
		Unit – I		
1.	Coordination Chemistry	2	1	-
2.	Stability of Metal Complexes	1	1	-
3.	Spectral and Magnetic Properties of metal complexes	--	1	1
4.	Reactivity of metal complexes	1	1	-
		Unit – II		
5.	Hard and Soft acids bases (HSAB)	1		1
6.	Bioinorganic Chemistry	--	2	1
7.	Nitrogen Compounds	2	1	1
8.	Heterocyclic Compounds	1	1	-
	Total Questions	**08**	**08**	**04**

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MODEL QUESTION PAPER

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

FIFTH SEMESTER END EXAMINATIONS

III B.Sc., CHEMISTRY PAPER - V

INORGANIC AND ORGANIC CHEMISTRY

Time: 3 hrs ***Max. Marks: 60M***

SECTION – A

Answer all questions 4x8 = 32M

UNIT – I

1. Discuss the valence bond theory of complex compounds. How does this theory explain the geometry of coordination number 6.
   .

(OR)

What are thermodynamic and kinetic stabilities of metal complexes. Give any four factors

2. (a). Explain Nucleophilic uni molecular substitution (SN^1) in metal complexes with mechanism.

(OR)

3. What are amines ? Explain Hinsberg's separation of mixture of 1^0, 2^0, 3^0 amines.
4. (a). How did Furan, Pyrrole, Thiophene's are prepared from 1, 4-di Carbonyl compounds.

   (b). Write any two substitution reactions of Furan, Pyrrole and Thiophene.

(OR)

5. Explain Pearson's concept of hard and soft acids and bases and write its applications.

6. What is Crystal Field Splitting? Explain Crystal Field Splitting in tetrahedral complexes.

(OR)

8 a. Write any two methods of preparation of Aryl Amines.

b. Compare the basic strength of Ammonia, methyl amine, N,N – dimethyl amine and aniline.

SECTION-B

Answer any FIVEOUR questions 5x4= 20M

7. Explain the Adsorption spectrum of $[Ti(H_2O)_6]^{3+}$.
.
10. Write about optical isomerism in coordination number 6 complexes.

11. Discuss about crystal field splitting of d - orbitals in tetrahedral complexes.
12. How did composition of complexes determined by Mole - Ratio method?
13. Write about substitution in square planar complexes.
14. Write Nef reaction.
15. Write a note on basicity of Pyridine.
16. Write structure and functions of Haemoglobin.

SECTION- C

Answer ALL questions 4x2= 8 M

Write Carbylamine reaction.

17. Give any two functions of Cobalt.
18. Give examples to Soft and Hard bases.
19. What is spin- only formula?

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GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

CBCS Syllabus for B.Sc. III Year

SEMESTER – V, Paper – VI (Effective from 2017 – 2018 onwards)

CHE 106: APPLIED PHYSICAL CHEMISTRY AND ORGANIC CHEMISTRY

MODULE – I (Applied Physical Chemistry)

1. Chemical Kinetics: 8 Hrs.

- **Rate of reaction,** factors influencing the rate of a reaction – concentration, temperature, light, catalyst.
- Any one **experimental method** to determine the rate of reaction.
- Definition of **order and molecularity** of simple reactions with two examples each.
- Derivation **rate constants and time half change** for first, second (where 2A Products i.e., when both reactants are same and two reactants are different A + B products) and zero order reactions.
- **Two examples** each for first, second and zero order reactions.
- Any one method to **determine the order of reactions.**
- **Effect of temperature** on rate of reaction, Arrhenius equation, concept of activation energy.
- **Theories of reaction rates – collision theory** of bimolecular gaseous reactions. **The transition state theory** of bimolecular reactions (elementary treatment).

  Additional Input : Order and molecularity of complex reactions.

2. Thermodynamics : 14 Hrs.

- **Some basic concepts of Thermodynamics –**
  1. System and surroundings
  2. Types of thermodynamic systems
  3. Macroscopic system and macroscopic properties
  4. State of a system and state variables
  5. Extensive and intensive properties
  6. Types of thermodynamic processes

7. Reversible and irreversible processes
8. Internal energy and enthalpy
9. State and path functions
    - ❖ The first law of thermodynamics – statement
    - ❖ Heat capacities and their relationship
    - ❖ Joule's law
    - ❖ Joule – Thomson coefficient
    - ❖ Calculation of w, q for the expansion of perfect ideal gas under isothermal and adiabetic conditions for reversible processes.
    - ❖ Temperature dependence of enthalpy of formation – Kirchoff's equation.
    - ❖ Second law of thermodynamics – Different statements of the law.
    - ❖ Carnot cycle and its efficiency
    - ❖ Carnot theorem
    - ❖ Concept of entropy – entropy as a state function
    - ❖ Entropy changes in reversible, and irreversible processes.
    - ❖ The Gibbs (G) and Helmholtz (A) energies
    - ❖ Variation of G with P, V and T.
    - ❖ Gibbs – Helmholtz equations – one application of Gibbs – Helmholtz equations.

Additional Input : Different statements of First Law of Thermodynamics.

3. Photochemistry : 6 Hrs.

- ❖ Differences between **thermal and photochemical** processes.
- ❖ Laws of photochemistry – **Grothus – Draper's Law** and **Stark – Einstein's law** of photochemical equivalence.
- ❖ **Quantum Yield**
- ❖ Photochemical hydrogen – chlorine, hydrogen – bromine reactions.
- ❖ **Jablonski diagram** depicting various processes occurring in the excited state, qualitative description of **fluorescence, phosphorescence,** non-radiative processes (internal conversion, intersystem crossing).

- **Photosensitized reactions** – energy transfer processes (simple example).

Additional Input : Applications of fluorescence & Phosphorescence processes.

MODULE – II (Applied Organic Chemistry)

1. Carbohydrates : 6 Hrs.

Monosaccharides :

All discussion to be confined to (+) glucose as an example of aldohexoses and (-) fructose as example of ketohexoses.

Structural Elucidation of D-(+) glucose :

- Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrins formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acid).
- Configuration of glucose based on D-glyceraldehyde as primary standard (no proof for configuration is required).
- Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation).
- Cyclic structure of glucose.
- Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers).
- Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformational formula).

Structural Elucidation of Fructose :

Evidences of 2 – Keto Hexose structure, formation of Penta Acetate, formation of Cyanohydrin its hydrolysis and reduction by HI. Cyclic structure of Fructose (Furanose structure and Haworth formula) Osazone formation from Glucose and Fructose. Definition of Anomers with examples.

Interconversion of Monosaccharides :

- Aldopentose to aldo hexose. Ex : Arabinose to D-Glucose, D-Mannose (Kiliani – Fischer method).
- Epiers, Epimerisation – Lobry de bruyn van Ekenstein rearrangement.
- Aldohexose to Aldopentose. Eg : D-glucose to D-arabinose by Ruff's degradation.

- Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (fructose) to aldohexose (Glucose).

Additional Input : Disaccharide – Sucrose (Elementary treatment)

2. Biomolecules : Amino acids and proteins – Nucleic acids : 6 Hrs.

Amino acids Introduction :

- **Definition** of Amino acids
- **Classification** of Amino acids into :
  1. Alpha, beta, and gama amino acids.
  2. Natural and essential amino acids – definition and examples,
  3. Classification of alpha amino acids into acidic, basic and neutral amino acids with two examples each.

Methods of Synthesis:

General methods of synthesis of alpha amino acids (specific examples – Glycine, and leucine) by following methods:

a) From halogenated carboxylic acid **(without mechanism)**

b) Malonic ester synthesis **(without mechanism)**

c) Strecker's synthesis **(without mechanism)**

Physical Properties :

- Optical activity of naturally occurring amino acids : L-configuration, irrespective of sign rotation.
- **Zwitterion structure** – salt like character
- Solubility, melting points, amphoteric character
- Definition of **isoelectric point**.

Chemical Properties:

Two reactions of alpha amino acids involving both amino and carboxyl groups – Action of heat, action with metallic ions. **(without mechanism).**

- **Peptides and Proteins :**

Definition and primary structures with two examples each.

- **Nucleic acids – Elementary treatment :**

  Definition and two examples of the following :

  - Nucleic acids
  - Nucleosides
  - Nucleotides
  - Nitrogen bases

  Additional Input: Importance of amino acids in biological systems.

3. Material Science: 5 Hrs.

Superconductivity, Characteristics of Superconductors, Meissner effect, types of Superconductors and applications.

Nano-materials - Synthetic, techniques, bottom – up – sol – gel method, top – down- electro deposition method , Properties and applications of nano – materials, Composites – definition ,general characteristics, particle reinforce and fiber composites and their applications.

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III B.Sc. Chemistry Paper – VI

Semester – V

Applied Physical Chemistry and Organic Chemistry

Sl. No.	Chapter	Essay Question (8 M)	Short Answer Question (4 M)	Very Short Answer Questions (2 M)
1.	Chemical Kinetics	2	1	1
2.	Thermodynamics	2	3	
3.	Photochemistry	1	1	1
4.	Carbohydrates	1	2	1
5.	Amino acids & Proteins	1	1	
6.	Material Science	1	-	1
	Total Questions	**08**	**08**	**04**

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MODEL QUESTION PAPER

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

FIFTH SEMESTER END EXAMINATIONS

III B.Sc., CHEMISTRY PAPER - VI

PHYSICAL AND ORGANIC CHEMISTRY

Time: 3 hrs ***Max. Marks: 60M***

SECTION – A

Answer any FOUR questions from the following. 4x8=32M

1. What is Rate of Reaction? Derive the Rate Equation of Second Order Reaction having same type of reactants.

(OR)

2. (a). State First Law of Thermodynamics. Derive expression for First Law of Thermodynamics.
   (b). What is Heat Capacity of a system. Derive the equation Cp - Cv = R.

UNIT – I

3. Define concept of Entropy. Derive entropy change in reversible process and irreversible processes.

(OR)

4. What is meant by Quantum Yield? Quantum yield for the reaction $H_2 + Br_2 \longrightarrow$ 2HBr is very low. Explain.
   Give an account of open chain and cyclic structure of Fructose.

(OR)

5. How did alanine is prepared by Malonic ester Synthesis and Strecker Synthesis. Write two chemical reactions of α- aminoacids.

7 . Explain any two methods of determination of Order of a reaction.

What are Nano-materials? Write the methods of preparation of Nano materials? Write any two applications?

SECTION-B

Answer any FIVE questions 5x4= 20M

9. Write the differences between order and molecularity of a reaction.

10. Derive Kirchoff's equation
11. What are Gibb's free energy (G) and Helmholtz free energy (A)?
12. Write short notes on Einstein's law of Photo Chemical Equivalence.

.

13. Explain why Glucose and Fructose gives same osazone.

14. Write brief note on the following (a) Epimerization (b) Mutarotation.
15. Write about classification of amino acids
16. Calculate work done and heat absorbed in expansion of Ideal gas under isothermal processes.

SECTION- C

Answer ALL questions 4x2= 8 M

17. What is activated complex?
18. What is Photosensitization? Give one example.
19. What are anomers?
20. What is Meissner effect? Define Composites?

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GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

LABORATORY COURSE – V

CHE 105P: PRACTICAL PAPER – V (ORGANIC CHEMISTRY)

45 Hrs. (3 H / W)

I. Organic Qualitative Analysis :

i) Identification of an organic compound through the functional group analysis, determination of melting point/ boiling point and preparation of suitable derivatives.

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

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

B.SC., III YEAR V SEMESTER PRACTICAL PAPER – V

ORGANIC CHEMISTRY (WITH EFFECT FROM 2017 – 18)

SCHEME OF VALUATION

Total – 50 Marks
Record – 10 Marks **Practical – 40 Marks**

Break up of Practical – I (40 Marks)

Identification of function group of an organic compound (Systematic procedure should be adopted).

- Colour - 1 Marks
- Physical State - 1 Marks
- Odour - 1 Marks
- MP / BP - 2 Marks
- Ignition Test - 2 Marks
- Litmus Test - 2 Marks
- Solubility & Classification basing on solubility data - 5 Marks
- Detection of extra elements - 4 Marks (2 Marks for extract)
- Unsaturation Test (with bromine water and Bayer's Test) - 4 Marks
  Identification of functional group - 5 Marks
- Confirmatory test for function group (1 test)- 5 Marks
- Anyone derivative of the organic compound-4 Marks (1 x 4)

Report - 4 Marks

Total Marks - 40 Marks

LABORATORY COURSE – VI

CHE 106P: PRACTICAL PAPER – VI PHYSICAL CHEMISTRY

AT THE END OF SEMESTER V **45 hrs (3 h/W)**

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

LABORATORY COURSE – VI
PRACTICAL - VI : PHYSICAL CHEMISTRY
(at the end of semester V)

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 i) Procedure in first 10 min. **:** 5 Marks

ii ii) Formula with units **:** 5 Marks

iii iii) Neat tabulation & correct calculation **:** 5 Marks

Error < 10%: 20 Marks

Error 10-15 %: 15 Marks

Error > 15 %: 10 Marks (Minimum Marks)

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR III B.Sc., VI SEMESTER
FROM 2019 -20 ONWARDS

CHE – 111: VII A - ANALYTICAL METHODS IN CHEMISTRY

TOTAL HOURS: 45

UNIT-I

Quantitative analysis: **10 Hours**

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 **7 Hours**

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 Hours**

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 Hours**

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

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

UNIT –V **10 Hours**

Thin layer Chromatography (TLC): Advantages - Principles, factors effecting R_f values - Experimental procedures - Adsorbents and solvents - Preparation of plates - Development of the chromatogram - Detection of the spots – Applications - Column Chromatography: Principles - experimental procedures - Stationary and mobile Phases - Separation technique – Applications. HPLC: Basic principles and applications.

ADDITIONAL INFORMATION @ INTELLECTUAL PROPERTY RIGHTS

UNIT I

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.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works – Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor Chip Protection Act.

UNIT III

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UNIT IV

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. Nanochemistry 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) Under standing	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
Total no of Questions		45	08	08	04

MODEL QUESTION PAPER
GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM
III B.Sc., DEGREE EXAMINATIONS
SEMESTER-VI
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.

1. A) Describe the choice of indicators for acid-base titrations.

OR/

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

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

ii) Define standard deviation and confidence limit.

OR/

B) Discuss various types of errors.

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

.

OR

B) Explain any two methods for solvent extraction.

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

OR /

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

PART-B

5 X 4 = 20 Marks

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

5. Discuss the complex metric titrations with examples.

.

6. Explain about precipitation and coagulation.

7. Write about standard deviation.

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

9. Describe the development of chromatogram in paper chromatography.

10. What are the factors affecting R_f value.

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

12. Write the applications of High Performance Liquid Chromatography.

PART – C

4 X 2 = 8 Marks

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

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

14. Define accuracy and precision.

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

16. Define Stationary Phase and Mobile Phase.

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GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY ELECTIVE – VIIB
CHE – 112: ENVIRONMENTAL CHEMISTRY
(with effect from 2018 – 19)

No. of Hours: 45Hrs

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: Air Pollution **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: Water Pollution **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: Radio Active Pollution and Chemical Toxicology **10 h**

Radio active 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 INFORMATION @ INTELLECTUAL PROPERTY RIGHTS

UNIT I

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REFERENCE BOOKS:

1. FundamentalsofEcologybyM.C.Dash
2. ATextbookofEnvironmentalchemistrybyW.MooreandF.A.Moore
3. EnvironmentalChemistrybySamirK.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
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III B.SC. CHEMISTRY ELECTIVE PAPER – VIIB

SEMESTER – VI

ENVIRONMETAL CHEMISTRY

ACADEMIC YEAR 2018 - 2019

Sl. NO.	Chapter	Essay Question (08M) knowledge	Short Answer Question (04 M) Under standing	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
Total no of Questions		08	08	04

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY ELECTIVE – VIIB

ENVIRONMENTAL CHEMISTRY
MODEL PAPER (wef 2018-19)

Time: 3 hours **Maximum Marks: 75M**

PART – A

Answer All Questions. Each question carries eight marks. **4 x 8 = 32 Marks**

1) Explain the segments of the environment.

(OR)

b) Write about renewable energy sources?

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

(OR)

b).Describe the Green House Effect?

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

(OR)

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

4) **a).** Give detailed account on biodiversity?

(OR)

b). Define Radioactive pollution and Explain adverse effects of radioactive pollution on Biological system?

PART – B

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

5) Explain the importance of environment in now-a-days.

6) What is Bhopal gas disaster?

7) Explain formation and depletion of Ozone?

8) Explain Eutrophication and it's Effects?

9) Explain adverse effects of cellular networks radiation?

10) Explain Pesticide's and it's biochemical effects?

11) Explain toxic effects of Lead and Mercury?

12) What are the Functions of Eco system?

PART – C

4X2 = 8 Marks

Answer All Questions, Each Question, carries **two** marks

13) er and Atomic energy?

14) What is photochemical smog?

15) Define COD and BOD?

16) What is Food chain and Bio mass?

. . . @@@. . .

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY VI SEMESTER - SYLLABUS FOR VIIC

CHE – 113: GREEN CHEMISTRY

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, Hunds-Diecker 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_2: 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 anthroquinones, Leukart 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).

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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
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III B.SC. CHEMISTRY ELECTIVE PAPER – VIIC

SEMESTER – VI

GREEN CHEMISTRY

Sl. NO.	Chapter	Essay Question (08 M) knowledge	Short Answer Question (04 M) Under standing	Very Short Answer Question (02 M) Skill / Application
1.	Green Chemistry	01	01	01
2.	Selection of solvent	01	02	01
3.	Microwave and Ultrasound assisted green synthesis	01	01	01
4.	Green catalysis	01	02	--
5.	Green Synthesis	01	02	01
Total no of Questions		05	08	04

MODEL QUESTION PAPER

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM

THREE YEAR B.Sc., DEGREE EXAMINATIONS

SEMESTER-VI

PAPER VII- C: ELECTIVE – C

GREEN CHEMISTRY

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.

1. A) Explain the basic principles of green chemistry.

(OR)

B) Illustrate the sonication method with any two reactions.

2. A) Write about the reactions in ionic liquids.

(OR)

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

3. A) Explain the synthesis of fused Anthroquinines by microwave assisted organic synthesis.

(OR)

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

4. A) What is Phase transfer catalyst? How do they function?

(OR)

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

PART-B

5 X 4 = 20 Marks

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

5. What is the need of green chemistry?
6. Write a note on atom economy reactions.
   .
7. Heck reaction.
8. Write about solid supported synthesis.
9. What are the advantages of microwaves assisted organic synthesis.
10. Bio catalysis.
11. How do you perform Stricker synthesis by green synthesis method?
12. Ultra sound assisted reactions.

PART – C

4X 2 = 8 Marks

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

13. Write the sono chemical Wittig reaction.
14. Write Suziki reaction.
15. What is Heterogeneous catalysis? Write any two uses of Zeolities.
16. Write the sono chemical Simmons – Smidth reaction.
    .

CHE – 111P: 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)

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)

CHE – 112P: CHEMISTRY LABORATORY COURSE – VII-B

(at the end of semester VI)

45 hrs (3 h / w)

50 Marks

1. Determination of carbonate and bicarbonate in water samples (acidity and alkalinity)

2. Determination of hardness of water using EDTA
   a) Permanent hardness b) Temporary hardness

3. Determination of Acidity

4. Determination of Alkalinity

5. Determination of chlorides in water samples

CHEMISTRY LABORATORY COURSE – VII-B

(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)

CHE – 113P: CHEMISTRY LABORATORY COURSE – VII-C

(at the end of semester VI)

30 hrs (2 h / w)

50 Marks

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Acetylation of 1^0 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 M

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 : 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

CHE – 114P: POLYMER CHEMISTRY

TOTAL HOURS: 45

UNIT-I **12 h**

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 (Tg) and Determination of Tg: Free volume theory, WLF equation, factors affecting glass transition temperature (Tg).

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 po l y m e r s	01	02	01
4.	Polymer additives	02	01	01
5.	Polymers and their applications	01	01	01
Total no of Questions		08	08	04

MODELQUESTION 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.

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

(OR)

b) Write the mechanism of free radical polymerization**.**

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

(OR)

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

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

(OR)

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

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

.

(OR)

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

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

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

5. What are thermo plastics and thermo setting plastics?
6. Write about condensation polymerization.
7. Define number average and weight average molecular weights.
8. Write a note on emulsion polymerization.
9. Give the Williams-Landel-Ferry equation.
10. Illustrate the colourants and photosensitizers.
11. What are the factors affecting Tg?
12. Write any two applications of PVC and PAN

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

Answer ALL the questions Each carries Two marks

1. What is co polymer give example
2. What is glass transition temperature?
3. What is nucleating agent? Give example
4. Write the preparation and give one application of nylon-6,6

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RAJAMAHENDRAVARAM
DEPARTMENT OF CHEMISTRY
CBCS Syllabus for B.Sc. III Year
Effective from 2017 – 2018 onwards
Paper - VIII-A-2 Semester – VI

CHE – 115P: 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 photoaccoustic. 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) Understanding	Very Sh Answe Questio (02 M Skill / Applicat
1.	Introduction to spectroscopic methods of analysis	02	01	01
2.	Molecular spectroscopy	01	02	--
3.	UV-Visible/ Near IR	02	01	01
4.	Separation techniques	02	02	01
5.	Elemental Analysis	01	02	01
	Total no of Questions	08	08	04

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

Time: 3 hours

2 Marks

Maximum Marks: 60

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

1. a) Write about classification of analytical methods.

(OR)

b) Explain the classification of errors.

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

(OR)

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

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

(O
R)

b) How do you differentiate absorption and fluorescence?

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

(OR)

b) Explain different solvent extraction methods.

.

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

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

5. Explain about significant figures with examples.

6. What are the advantages of FTIR?
7. Discuss the various techniques of wavelength dispersion.

8. How double beam instruments are superior to single beam instruments?
9. Briefly explain any two development methods of chromatogram in paper chromatography.
10. Describe the procedure for column packing.
11. What are the factors affecting chemical shift?
12. Discuss the principle involved in voltametry.

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

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

13. Define accuracy and precision?
14. What is the principle involved in U.V Spectroscopy?
U.V Spectroscopy
15. What are the factors affecting $\mathbf{R_f}$ values
16. What is Chemical Shift?

*****

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

CHE – 116: 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 malerials like choloroquine.
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, Determination of total Na, K, Ca and Mg in food materials by flame photometry.

UNIT - V **9 h**

Clinical analysis of blood: Composition of blood, clinical analysis, trace elements in the body. Estimation of blood chlolesterol, 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

MODEL QUESTIONPAPER

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

Time: 3 hours **Maximum Marks: 60**

PART- A **4 x 8 = 32 Marks**

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

1) a) Give a detailed account on pharmacodynamics and pharmacokinetics.

(OR)

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

2) a) Discuss the classification of drugs based on therapeutic activity.

(OR)

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

3) a) How do you prepare and analyze chloroquine?
b) How do you prepare and analyze aspirin?

4) a) Determine the Na, K, Ca and Mg in food materials by flame photometry.

(OR)

b) Estimation of Sucrose in a given sample of cane sugar,

PART- B

5 x 4 = 20 Marks

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

1) What are Pharmaco dynamics Drugs?

2) Write the nomenclature of drugs with suitable examples.

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?

6) Describe the types of administration of drugs.
7) Give the synthesis and theoretic activity of paracetmol
8) Write a short note on composition of blood.

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

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

1) Define pharmacophore give example

2) Give clinical and generic name of aspirin

3) Define analgesics and antipyretics. Give examples

4) What is true protein?

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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

CHE – 117: 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 CLUSTER – VIII B-I
SEMESTER – VI
FUEL CHEMISTRY AND BATTERIES

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	02	00
2.	UNIT –II	02	01	01
3.	UNIT –III	02	02	00
4.	UNIT –IV	02	01	01
5.	UNIT –V	00	02	02
Total no of Questions		08	08	04

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

Time: 3 hours **Maximum Marks: 60**

SECTION-A

4 x 8 = 32 Marks

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

1. A) Write in detail about renewable and non–renewable energy sources.

(OR)

B) Write about the composition and uses of producer gas and water gas.

2. A) Explain the composition of the crude petroleum.

(OR)

B) Describe the refining of petroleum.

3. A) Discuss about fractional distillation.

(OR)

B) Write about the non-petroleum fuels.

.

4. A) Explain the classification of lubricants.

(OR)

B) What are the properties of lubricants?

SECTION-B

5 x 4 = 20 Marks

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

5. What are the uses of coal in various industries?
6. Discuss the gasification of coal.
7. Write the applications of different petroleum products.
8. Short note on cracking.
9. Write about synthetic fuels.
10. What are conducting and non-conducting lubricating oils?
11. Fuel cells.
12. Write about the primary and secondary batteries.

SECTION-C

4 x 2 = 8 Marks

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

13. What is carbonisation of coal?
14. What are conducting lubricants?
15. Write about polymer cell.
16. Write about the working of the Li-Battery

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

CHE – 118: 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

Time: 3 hours **Maximum Marks: 60**

SECTION- A

4 x 8 = 32 Marks

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

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

(OR)

B) Describe the anomalous behaviour of lithium and boron.

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

(OR)

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

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

(OR)

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

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

(OR)

B) Write the preparation and explosive properties of RDX.

SECTION- B

5 x 4 = 20 Marks

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

5. Write about diagonal relationship.

.

6. Discuss the classification of glasses.

7. Write about Carbon nanotubes

8. Describe the manufacturing of urea.

9. What are emulsifying agents? Give examples.

10. Explain about metallic coatings.

11. Write a note on non-ferrous alloys.
12. Explain the properties of steels.

SECTION- C

4 x 2 = 8 Marks

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

13. What are allotropes of carbon?
14. What are NPK fertilizers?
15. What are enamel paints?
16. Write an example for eco-friendly paint.

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DEPARTMENT OF CHEMISTRY
CBCS Syllabus for B.Sc. III Year
Effective from 2018 – 2019 onwards
Paper - VIII-B-3 Semester – VI
CHE – 119: ANALYSIS OFAPPLIED INDUSTRIALPRODUCTS

No. of Hours: 45

UNIT-I **9 h**

Analysis of soaps: moistureand volatile matter,combined alkali, totalfattymatter,free alkali, totalfattyacid, sodium silicateandchlorides.

Analysis of paints : Vehicle andpigments, Barium Sulphate, totallead,leadchromate, ironpigments, zinc chromate.

UNIT-II **8 h**

Analysis of oils: saponification value, iodinevalue, acid value, ester value,bromine value,acetylvalue. Analysis of industrial solvents like benzene,acetone,methanolandacetic acid,Determination of methoxylandN-methylgroups.

UNIT-III **10 h**

Analysis of fertilizers:urea, NPK fertilizer, superphosphate.Analysis ofDDT,BHC,endrin,endosulfone, malathion, parathion.Analysis of starch, sugars, celluloseand paper.

UNIT-IV **9 h**

Gasanalysis: carbondioxide, carbon monoxide, oxygen,hydrogen, saturated hydrocarbons,unsaturatedhydrocarbons,nitrogen, octanenumber, cetane number.

Analysis ofFuelgaseslike:watergas,producergas, kerosene(oil)gas.

Ultimate analysis: carbon, hydrogen,nitrogen, oxygen, phosphorus and sulphur.

UNIT-V **9 h**

Analysis of Complexmaterials:

Analysis ofcement- losson ignition, insoluble residue,totalsilica,sesqui oxides, lime,magnesia,ferric oxide, sulphuric anhydride.

Analysis ofglasses-Determinaiton of silica, sulphur, barium,arsenic,antimony,total R_2O_3,calcium,magnesium,totalalkalies,aluminium,chloride,floride.

REFERENCEBOOKS

1. F.J.Welcher - Standardmethods of analysis.
2. A.I.Vogel -A text bookof quantitativeInorganicanalysis-ELBS.
3. H.H.WillardandH.Deal- Advancedquantitativeanalysis-Van NostrandCo.
4. F.D.Snell&F.M.Biffen-Commercial methods ofanalysis-D.B.Taraporavala&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 OFAPPLIED INDUSTRIALPRODUCTS

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	02	00
2.	UNIT–II	02	01	00
3.	UNIT–III	02	01	01
4.	UNIT–IV	02	02	01
5.	UNIT–V	00	02	02
Total no of Questions		08	08	04

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

Time: 3 hours **Max. Marks: 60**

PART-A

Answer **ALL** the questions. Each carries **Eight** marks. **.4 x8 =32 Marks**

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

(OR)

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

2. a) Give the procedure for the determination of iodine value and acid value in oil samples.

(OR)

b) Describethe analysisof benzene.

3. a) Discuss the analysis of ureaandDDT.

(OR)

b) Discuss the analysis of starchand paper.

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

.

(OR)

b) How are water gas and producer gas analyzed?

PART-B

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

5. How do you determine the moisture in soaps?
6. Give the procedure for the determination of total lead in paints.
7. Write a note on saponification value.
8. Explain the analysis of BHC.
9. How carbon monoxide is analysed in gases?
10. Explain the determination process of nitrogen in gases.
11. Describe the determination of lime in cement.
12. Describe the determination of silica in glass.

.

PART-C

Answer **ALL** the questions. Each carries **Two** marks. **4 x2 =8 Marks**

13. What is NPK fertilizer?
14. What is kerosene oil gas?
15. What is insoluble residue?
16. What is meant by total silica?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc. SEMESTEWR – VI PAPER – VIII C1

(Effective from 2017 – 2018 onwards)

CHE – 120: 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. Larmour Frequency. Instrumentation. Relaxation - spin-spin & spin lattice relaxation. Shielding constants, Chemical shifts, Shielding and Deshielding mechanism - Factors influencing Chemical shift. Spin-Spin interactions - AX, AX2 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, trines 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}, $NO2^{-}$, 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

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

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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) Under standing	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

Time: 3 hours **Maximum Marks: 60**

PART- A **4 x 8 = 32 Marks**

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

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

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

(OR)

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

2. a) Write about Born-oppenheimer approximation.

(OR)

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

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

(OR)

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

.

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

(OR)

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

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

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

5. Write about spin-spin relaxation.
6. Describe the factors influencing the coupling constant.
7. Explain about spin decoupling.
8. What are the applications of NMR spectroscopy in medical diagnostics?
9. Write about Franck-Condon principle.
10. What are the different types of electronic transitions?

11. State and explain Beer-Lambert law.

12. How ESR studies are useful to study the structure of free radicals?

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

Answer All Questions Each Carry TWO Marks

13. What is coupling constant?

14. Define Chromophores and Auxochrome.

15. What is molar extinction coefficient?

16. Write any two similarities between NMR&ESR

NMR&ESR

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DEPARTMENT OF CHEMISTRY

III B.Sc. – SEMESTER – VI PAPER – VII C2

(Effective from 2017 – 2018 onwards)

CHE – 121: ADVANCED ORGANIC REACTIONS

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

Orgnaic Photochemistry **8 h**

Norrisch cleavages, type I: Mechanism, acyclic cyclicdiones, influence of sensitizer, photo Fries rearrangement. Norrisch type II cleavage: Mechanism and stereochemistry, type II reactions of esters: 1: 2 diketones, photo decarboxylation, Di - π 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, benzoylation, 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. Witting reaction.

UNIT –V :

New Synthetic Reactions **12 h**

Baylis–Hillman reaction, RCM olefm metathesis, Grubb catalyst, Mukayama aldol reaction, Mitsunobu reaction, McMurrey reaction, Julia–Lythgoe olefination, and Peterson's stereoselective olefination, Heck reaction, Suziki 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.

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III B.SC. CHEMISTRY PAPER VIII-C-2
SEMESTER – VI

ORGANIC SPECTROSCOPIC TECHNIQUES

Sl. NO.	Chapter	Essay Question (08 M) knowledge	Short Answer Question (05 M) Under standing	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 -2
ADVANCED ORGANIC REACTIONS
MODEL QUESTIONPAPER

Time: 3 hours **Maximum Marks: 60**

PART- A

4 x 8 = 32 Marks

Answer all questions.

1) a) What is photo reduction? How it is affected by temperature and solvent?

(OR)

b) Explain the following:

i) Singletandtripletstates ii) Jablonski diagram

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

(OR)

b) What do you know about the following:

i) Di-π methane rearrangement ii) Barton reaction

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

(OR)

b) How amine group is protected by acylation and benzoylation.

4) a) Write note on the following:

a.Mannichreaction ii) Wittig reaction

(OR)

b) Write a note on the following:

i) Umpolungii) Phase transfercatalysis

SECTION- B

5x4 = 20 Marks

Answer any five questions.

1. Write notes on inter-system crossing.
2. Describe the photochemistry of benzene.

Give a brief account on the protection of carboxylic acids by ester formation.

3. How does carbonate formation protect diols?
4. Write about Robinson annulation.
5. What is Stork-enamine reaction?

7) Explain the Mukayama aldol reaction.

1) Discuss about Ugi reaction.

PART-C

4 x 2= 8 Marks

Answer **all** the questions..

1) What is meant by Phase Transfer Catalysis
.

2) Explain Heck reaction.

3) Write about protection of Diols.

4) What is meant by photo reduction.

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DEPARTMENT OF CHEMISTRY

CBCS Syllabus for B.Sc. III Year

Effective from 2017 – 2018 onwards

Paper - VIII-C-3 Semester – VI

CHE – 122: PHARMACEUTICAL AND MEDICINAL CHEMISTRY

No. of Hours : 45

UNIT-I **8 h**

Pharmaceutical chemistry Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief treartment) 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 ofthe compounds: **12 h**

a. Chemotheraputic Drugs

l. Sulphadrugs(Sulphamethoxazole) 2. Antibiotics - β-Lactam Antibiotics, Macrolide Antibiotics,

3. Anti malarial Drugs(chloroquine)

b. Psycho therapeutic Drugs:

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

UNIT-IV

Pharmacodynamic Drugs: **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: Indivanir (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

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III B.SC. CHEMISTRY PAPER VIII-C-3
SEMESTER – VI

PHARMACEUTICAL & MEDICINAL 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.	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

MODEL QUESTIONPAPER

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

SIXTH SEMESTER END EXAMINATIONS

III B.Sc., CHEMISTRY - PAPER VIII- C -

3 PHARMACEUTICAL & MEDICINAL CHEMISTRY

Time: 3 hours **Maximum Marks: 60**

PART- A

4 x 8 = 32 Marks

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

1. a) Give a detailed account on pharmacodynamics and pharmacokinetics.

(OR)

b) Explain the following terms with suitable examples.

i) Metabolites ii) Anti-metabolites

2. a) How drugs are classified according to their structure?

(OR)

b) Discuss the classification of drugs based on therapeutic activity.

1) a) Write about the synthesis of Chloroquin.

OR)

b) Write about the synthesis and therapeutic activity of paracetamol.

2) a) Write about the synthesis of salbutamol.

(OR)

b) Describe the synthesis of any one diuretic.

PART - B

5 x 4 = 20 Marks

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

3) Define pharmacy and pharmacology.

4) Define pharmacophore and give two examples.

5) Write the clinical, generic and trade names of paracetamol.

6) Describe the types of administration of drugs.

7) Write about the therapeutic activity of chloroquine.

8) Define hypnotics and tranquilizers.

9) What are known as pharmacodynamic drugs?

10) Write notes on retrovirus.

PART- B

4 x 2 = 8 Marks

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

11) What is meant by group positive and group negative bacteria.

12) Define Generic Name and Chemical name with exam ple.

13) Mention any two sulphadrugs?

16) Mention two measures for the prevention of AIDS.

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III B.Sc. Ag. BBC – SEMESTER VI
CLUSTER ELECTIVE PAPER – VIII D1

SYLLABUS FOR VIII D1: SOILS AND FERTILIZERS

CHE – 123: SOILS AND FERTILIZERS

SOILS UNIT I:

Formation, nature, origin, composition, classification of Soil, Organic and Inorganic constituents. Characteristics, acidity, salinity, alkalinity of soils, pH and its effects on nutrient availability, buffering capacity of soils. Limiting of soil. Absorption of cations and anion*s*

SOILS UNIT II:

Chemistry of weathering of materials soils and clay minerals, availability of soil nutrients to plants,

Macro and Micro-nutrients of Soils - Soil analysis

FERTILIZERS UNIT III:

Nitrogen fertilizers: **N**itrogen fertilizers and there soil reaction. Fate of NO_3 and NH_4 ions in soils, denitrification, nitrogen fixation by legumes.

Phosphate fertilizers: Phosphate in soil, pH, microbes and available phosphorous and its control.

Potassium availability in soil, nutrient availability in soil, soil fertility evaluation, law of minimum and law of diminishing return, diagnostic techniques.

Soil fertility and nutrients, recycling of nutrients, chelation and soil management, Bio - Fertilizers**.**

PESTICIDE FORMULATIONS UNIT IV:

Different types of formulations and their physio-chemical characteristics and important BSI Specification. Wettable powders, Solutions, Emulsifiable concentrates, Aerosols, Dusts and Granules.

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

SOILS & FERTILISERS

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
III B.Sc. Ag. BBC – SEMESTER VI
CLUSTER ELECTIVE PAPER – VIII D1
MODEL QUESTION PAPER

Time: 3 Hours **Marks: 60 M**

Note: Answer all question. All questions carry equal marks. **4x8 = 32 M**

1) pH and its effects on nutrient availability

(or)

Explain soil analysis

2) Explain about soil fertility and nutrients

(or)

Write about Nitrogen Fertilisers and their soil reaction.

3) Write about emulsifiable concentrates and aerosols

(or)

Available phosphorous and its control in phosphate fertilizers

4) Write a note on the following:

a) Bio fertilizers b) Classification of Soils

(or)

Different types of pesticide formulation and their physicochemical characteristics

SECTION - B

Answer any five questions. **5x4 = 20 M**

1) Alkalinity of soils
2) Macro and micro nutrients of soils
3) Nitrogen fixation in Legumes
4) Buffering capacity of soils

5) Soil fertility evaluation
6) Recycling of nutrients
7) Wettable powders
8) Important BSI specifications

SECTION – C

Answer all questions **4x2 = 8 M**

1) Composition of soil
2) Chelation
3) Weathering of materials
4) Clay minerals

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III B.Sc. Ag. BBC – SEMESTER VI
CLUSTER ELECTIVE PAPER – VIII D2
SYLLABUS FOR VIII D2: PEST MANAGEMENT

CHE – 124: PEST MANAGEMENT

No. of Hours: 45

UNIT - I HERBICIDES &FUNGICIDES:

Herbicides: Classification, selectivity and uptake of herbicides, structure- activity relationship (SAR), mode of action and uses of the following classes with special reference to the individual compounds mentioned:

(a) **Aryl Alkanoic Acids:** 2, 4 D, MCPA, dicamba, dichlorobenzil, and dalapon.

(b) **Triazines:** Simazine.

(d) Bipyridiniums, paraquat and glyphosate

(e) **Sulfonylurea:** Chlorosulfron

(f) **Uracils:** Bromacil

UNIT - II FUNGICIDES:

Types of fungicides, Mode of action; Chemistry of the following compounds:

Copper and mercury derivatives

Dithiocarbamates: Thiram, Ziram,

Dinitrophenols: 2, 4-Dinitro o-Cresol (DNOC) Karathane

Quinines: Dichlone

Benzimidazoles: Benomyl.

Triazoles: Propiconazole

Role of Fumigants and fumigation techniques. Nematicides, Mollusicides and Rodenticides.

UNIT - III CONVENTIONAL AND BIOLOGICAL INSECTICIDES:

Conventional Insecticides: Carbamate insecticides, pesticidal properties of following carbamate insecticides: Carbaryl, Methomyl.

Mode of action of carbamate insecticides.

Organophosphorus insecticides Nomenclature and structural diversities of organophosphorus compounds;, Mode of action of organophosphorus insecticides.

Organochlorine Insecticides

properties of organophosphorus insecticides The chlorinated cylodienes and their stereochemistry: Chloridane, heptachlor, aldrin, dialdrin endosulfan.

Mode of action of organochlorine insecticides.

Biological Insecticides:

Pyrethrum Properties of Natural pyrethroids

Synthetic analogs of Pyrethroids: Allethrin, fenvalerate, decamethrin.

Mode of action of pyrethroids. Azadirachtin

Novel insect-control chemicals :

Repellants, chemosterilants, antifeedants

Sex attractants

UNIT – IV INTEGRATED PEST MANAGEMENT:

Pest : Definition and its ecological validity; factors responsible for emergence of pest; pest resurgence; economic injury level; pest load; carrying capacity.

Biological control: Principle; bio-control agents- Parasitoids, predators and pathogens; advantages and drawbacks.

Chemical control: conventional insecticides; control with reference to chlorinated hydro carbons; organophosphates; carbamates; botanical; synthetic pyrethroids; fumigants; IGR compounds & pheromones.

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III B.SC. CHEMISTRY PAPER VIII-D-2
SEMESTER – VI

PEST MANAGEMENT

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
III B.Sc. Ag. BBC – SEMESTER VI
CLUSTER ELECTIVE PAPER – VIII D2
MODEL QUESTION PAPER

Time: 3 Hours **Marks: 60 M**

Note: Answer all question. All questions carry equal marks. **4x8 = 32 M**

1) Classification, selectivity and uptake of herbicides

(or)

Chemistry of di thio carbamates

2) Nomenclature and structured diversity of organo-phosphorous insecticides

(or)

Mode of action of organochlorine insecticides

3) Factors responsible for emergence of pests

(or)

Write about conventional insecticides

4) Advantages and drawbacks of biological control

(or)

Explain the Structure activity relationship (SAR) of herbicides

SECTION - B

Answer any five questions. **5x4 = 20 M**

1) Mode of action of carbamate insecticides
2) Types of fungicides with examples
3) Novel insect-control chemicals
4) Uses of Chlorosulfron and Bromacil

5) Stereochemistry of Aldrin
6) Ecological validity of pests
7) Advantages and drawbacks of biological control
8) Conventional insecticides

SECTION – C

Answer all questions **4x2 = 8 M**

1) What are rodenticides? Give an example
2) Definition of pest management
3) What is meant by pest load?
4) Name any two fumigants

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
III B.Sc. Ag. BBC – SEMESTER VI
CLUSTER ELECTIVE PAPER – VIII D3
SYLLABUS FOR VIII D3: AGRICULTURAL CHEMISTRY

CHE – 125: AGRICULTURAL CHEMISTRY

No. of Hours: 45

UNIT-I AGRO CHEMISTRY:

The Role of Agro chemistry- Safe use of Chemicals – Agricultural Bio – Technology _ Diffuse Pollution Management – Best Land Management Practices – Environmental impacts – The Role of Fertilisers – Agricultural Chemicals – Synthetic fertilisers – Agriculture Pollution – Subsurface Point-source Contamination – Chlorinated Solvents Contamination.

UNIT – II AGRICULTURAL CHEMICALS:

Occurrence and fate of Chemicals used in Agriculture – Pesticide Contamination in various Pesticide-use Settings – Fires in Agriculture Chemicals – Fighting Fires involving Agricultural Chemicals – Ground water contamination by Agricultural Chemicals.

UNIT – III AGROCULTURAL CHEMISTRY & SOIL ECOSYSTEM:

Inorganic Components of the Agricultural Ecosystem - Organic Components of the Agricultural Ecosystem – Soil Chemistry – Soil Microbiology and Biochemistry – Human Manipulation of Agricultural Ecosystems – Rice Ecosystem – Contamination in Lake Ecosystem.

UNIT – IV ROLE OF FERTILISERS IN AGROCHEMISTRY:

Introduction - Nitrogen (N) - Movement of N to Plant Roots - Internal Transformations of N in Soil - Losses of N from Soil - Phosphorus (P) - Gains of P to Soil - Internal Transformations of P in Soil - Losses of P from Soil - Potassium (K) - Gains of K to Soil - Crop Uptake and Removal of K from Soil - Movement of K to Plant Roots - Internal Transformations of K in Soil - Losses of K from Soil - Sulphur (S) - :Gains of S to Soil - Crop Uptake and Removal of S from Soil - Movement of S to Plant Roots - Internal Transformations of S in Soil - Losses of S from Soil – Calcium – Role of Calcium in Agro chemistry.

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III B.SC. CHEMISTRY PAPER VIII-D-3
SEMESTER – VI

AGRICULTURAL 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.	UNIT-I	02	02	01
2.	UNIT-II	02	02	01
3.	UNIT-III	02	02	01
4.	UNIT-IV	02	02	01
Total no of Questions		08	08	04

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
III B.Sc. Ag. BBC – SEMESTER VI
CLUSTER ELECTIVE PAPER – VIII D3 AGRICULTURAL CHEMISTRY
MODEL QUESTION PAPER

Time: 3 Hours **Marks: 60 M**

SECTION - A

Note: Answer all question. All questions carry equal marks. **4x8 = 32 M**

1) Write a note on Agricultural Biotechnology

(or)

Write a note on Role of Fertilisers in Agricultural Chemistry?

2) Pesticide contamination in varied Pesticide use settings.

(or)

Fighting fires involving Agricultural Chemicals

3) Organic Components of the Agricultural Ecosystem

(or)

Write a note on Soil Chemistry

4) The Role of Nitrogen in Agro chemistry

(or)

The Role of Potassium in Agro chemistry

SECTION - B

Answer any five questions. **5x4 = 20 M**

5) Safe use of Chemicals
6) Land Management Practices
7) Chemical Fires
8) Occurrence of Chemicals in Agriculture
9) Contamination in Lake Ecosystem
10) Agricultural Ecosystem
11) Internal Transformation of Phosphorus in soil.
12) Movement of Sulphur in Plant Roots

SECTION – C

Answer all questions **4x2 = 8 M**

13) Agricultural Pollution
14) Give two examples for Agricultural Chemicals.
15) Mention two inorganic components in Agricultural Ecosystem.
16) What is NPK in Fertilisers?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY ELECTIVE – VIII E1
P – VIII E1 - FOOD ADDITIVES AND ANALYTICAL TECHNIQUES
CHE – 126: FOOD ADDITIVES AND ANALYTICAL TECHNIQUES

No. of Hours: 45

MODULE I: FOOD ADDITIVES - I:

- Introduction,
- Need of food additives in food processing and preservation.
- Characteristics and classification of food additives.

Definitions, uses and functions of:

- Acids, Bases, Buffer system, Chelating / sequestering agents,
- Emulsifying and Stabilizing agents, Anticaking agents, Thickeners, Firming agents.
- Flour bleaching agents and Bread improvers. class-I and Class –II preservatives, **(a)**

Chemistry of food flavor:

- Flavour and flavour enhancers; Flavour improvers;
- Humectants and anticaking agents; Leavening agents.
- Functional characteristics of different flavors,
- Philosophy and definitions of flavor,
- Flavourmatics /flavouring compounds,
- Sensory assessment of flavor,
- Technology for flavor retention
- Natural flavour- Types, ,Artificialflavour- Types, ,
- Effect of processing on flavour

MODULE II: FOOD ADDITIVES – II:

Antimicrobial agents. -

- Nitrites, sulphides, sulphur di oxide, sodium chloride, hydrogen peroxide.

Antioxidants -

- Introduction, mechanism of action, natural and synthetic anti-oxidants, Technological aspect of antioxidants.

Non-nutritive and low calorie sweeteners:

- Introduction, importance, classification- natural and artificial, chemistry, technology and toxicology
- consideration for choosing sweetening agents.

pH control agents:

- Preservatives Stabilizer & thickeners, Fat replacers, Texturizers & improvers
- **(d)Regulatory aspects**:
- Natural and synthetic permitted food colors,
- Properties of certified dyes, Use of regulatory dyes,
- Color losses during thermal processing

(e) Chemical, technological and toxicological aspects of Food Additives:

- Risk assessment studies-
- Safety and quality evaluation of additives and contaminants
- Acute and chronic studies, NOEL, ADI, LD50

MODULE III INTRODUCTION TO ANALYTICAL INSTRUMENTATION:

- Introduction to Analytical Instrumentation,
- Classification of Analytical Methods,
- Types of instrumental Methods,
- Selecting an Analytical Method, Calibration of Instrumental methods.
- Beer Lambert Law, Principle, Instrumentation; Single beam, Double beam spectrophotometry.
- Application in the Analysis of food constituents such as Sugars, Amino acids & Minerals such as Iron, Phosphorous and Ascorbic Acid.

MODULE IV CHROMATOGRAPHY:

a) TLC: Principle, Choice of Solvents, Preparation of TLC plates development of TLC plates, Locating Agents, Rf. Values, Application of TL Chromatography to Carbohydrates & Proteins

b) GLC: Principle, Stationary Phase, Application of sample, Separation & dilution of colouring matter, flavor constituents and Aromatic compounds, C) HPLC: Principle of HPLC, stationary phase in HPLC, Normal phase HPLC, Reversed phase HPLC: Applications for food colours.

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

FOOD ADDITIVES & ANALYTICAL TECHNIQUES

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
III B.Sc. FMZC VI SEMESTER ELECTIVE – VIII E1
P – VIII E1 - FOOD ADDITIVES AND ANALYTICAL TECHNIQUES
MODEL QUESTION PAPER

Time: 3 Hours **Marks: 60 M**

SECTION - A

Note: Answer all question. All questions carry equal marks. **4x8 = 32 M**

1) a) Explain food additives.

(or)

a) Write brief account on food additives.

b) Explain chemical, technological, and toxicological aspects of food additives.

2) a) Analysis of sugars, amino acids and minerals.

(or)

b) Analysis of Thiamine and Riboflavin.

3) Beer Lambert Law, Principle & Instrumentation of Double beam spectrophotometer.

(or)

How can you determine the food constituents such as Sugars, Amino acids by Spectrophotometer?

3) a) Detection of carbohydrates and proteins by TLC

(or)

b) Separation & dilution of colouring matter, flavor constituents and Aromatic compounds by GLC.

SECTION - B

Answer any five questions. **5x4 = 20 M**

1) Write about class-I and class-II preservatives.
2) What are the technological aspects of antioxidants?
3) What are preservatives, stabilizers and thickeners? Give one example for each.

4) Classification of food additives.
5) Development of TLC
6) Types of Instrumental Methods
7) Reverse phase HPLC
8) Write about sources in Spectro photometers.

SECTION - C

Answer all questions. **4x2 =8 M**

1) Need of food additives
2) Types of natural flavours
3) Write about Rf value
4) What is Beer Lambert's law?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

III B.Sc. FMZC VI SEMESTER ELECTIVE – VIII E2

SYLLABUS FOR PAPER VIII E2

CHE – 127: CHEMICAL ASPECTS IN FOOD QUALITY AND PACKAGING

MODULE I QUALITY CONTROL**:**

Food Quality Assurance: Design of company quality assurance program, Microbiological concerns.

Managing quality in supply chain and marketing of food products.

Government Regulations In Quality Control: FAO/WHO codex Alimentarious commission, PFA, AGMARK, BIS, FPO, fair average quality (FAQ) specification for food grains, ISO 9000 series.

HACCP: Background, current status, structured approach, principles, benefits and limitation.

Consumer Protection Act (CPA)

Food Standards of different items like :

Cereals and products - bread, biscuits, **Fruits**

Products: Jam, juices, sauce.

Oils and Fats: Coconut oil, groundnut oil, palm oil, sunflower oil, vanaspati.

Milk and Products: Skimmed milk powder, partly skimmed milk powder, condensed sweetened milk. Other products - coffee, tea, sugar, honey, toffees.

MODULE II: FOOD SAFETY:

Meaning of food safety, Importance of Food Quality and safety for developing countries.

Patent: Definition, requirements, patent law in India, administrator, need for patent system, advantages, precautions to be taken by applicants, patent procedures, nonpatentable.

Food Hazards: Physical, Chemical, hazards associated with food types. Effect of processing and storage

. **MODULE III FOOD PACKAGING I**: Definition, functions of packaging materials for different foods, characteristics of packaging material. Food packages – bags, pouches, wrappers, tetra packs. flexible packaging, Mechanical strength of different packaging materials.

Labeling: Standards, purpose, description types of labels, Printing of packages . Barcodes & other packing ,marking regulation , nutrition labeling, health claims, mandatory labeling provision.

Type of packaging materials properties of the following packaging materials-low density polyethylene, high density polyethylene, polypropylene ,polyvinyl chloride, poly vinylidene chloride, ethylene vinyl alcohol, polystyrene, polyethylene terephthalate, nylon, ethylene vinyl acetate, ethylene acrylic acid, ethylene meth acrylic acid, ionomers.

Modern Packaging Materials and Forms: Glass containers, metal cans, composite containers, aerosol containers, rigid plastic packages, semi rigid packaging, flexible packaging.

MODULE III FOOD PACKAGING II:

Packaging regulations: Interactions between packaging material and foods; Environmental and cost consideration in selecting packaging materials. Manufacture of packaging materials; Potential of bio composite materials for food packaging; Packaging and food preservation; Disposal of packaging materials.

Biodegradable packaging material - biopolymer based edible firm.

Type of packaging materials; Selection of packaging material for different foods; Selective properties of packaging film; Methods of packaging and packaging equipment.

Packages of Radiation Stabilized Foods: Introduction, rigid containers, flexible containers, general methods for establishing radiation stabilization. Radiation measurement of radiations.

Packages of dehydrated products. Orientation, metallization, co-extrusion of multilayer films, stretch, package forms and techniques. modified and controlled atmosphere packaging, skin, strink and cling film packaging, micro-ovenable containers, other package forms and components of plastics.

Packaging of Finished Goods: Weighing, filling, scaling, wrapping, cartooning, labeling, marking and trapping.

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III B.SC. CHEMISTRY PAPER VIII-E-2
SEMESTER – VI

CHEMICAL ASPECTS IN FOOD QUALITY & MANAGEMENT

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
III B.Sc. VI SEMESTERCHEMISTRY ELECTIVE – VIII E2
VIII E2: CHEMICAL ASPECTS IN FOOD QUALITY AND PACKAGING
MODEL QUESTION PAPER

Time: 3 Hours **Marks: 60 M**

SECTION - A

Note: Answer all question. All questions carry equal marks. **4x8 = 32 M**

1) Explain stages of quality control in food industry

(or)

Write an account on ISO 9000 series

2) Explain the importance of food quality and safety

(or)

Need, requirements and advantages of patent system

3) Write about methods of packaging and packaging equipment

(or)

Explain the characteristics and functions of packaging material

4) What isv the labelling of Packaging Material.

(or)

What are the regulations while packaging materials?

SECTION – B

Note: Answer any five questions. **5x4 = 20 M**

1) Marketing of food products
2) Write about consumer protection act
3) Effect of processing and storage
4) Write about packing marking regulation
5) Functions of packaging materials for different foods
6) Manufacture of packing materials
7) Food standards of fruit products
8) Write about Biodegradable packaging material

SECTION – C

Note: Answer all questions. **4x2 = 8 M**

1) What is quality control
2) Patent law in India
3) Composite containers
4) Flexible containers

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY ELECTIVE – VIII E3
CHE – 128: FOOD ADULTERATION & FOOD ANALYSIS

MODULE – I FOOD ADULTERATION:

1) Food adulteration
2) Common food adulterants of main food stuffs
3) Detection or microscopic examination adulterants in some common food stuffs
   a) Cereals b) Pulses c) Beverages d)Milk e) Vegetable oils and fats, pure ghee, Sweets g) Spices and Condiments
4) Food Additives
5) Contamination of food stuffs
6) Sampling of can contents
7) Direct microscopic examination
8) Interpretation of Results

MODULE – II QUALITATIVE FOOD ANALYSIS:

Introduction – Qualitative analysis – Qualitative analysis of Carbon, Hydrogen, Halogens and Oxygen - Test for proteins, Colour test for proteins, Test for carbohydrates.

MODULE – III QUANTITATIVE FOOD ANALYSIS –I:

Determination of Moisture, Ash, Crude fat or ether-extract, Soluble extractor, Crude protein, True protein, Crude fiber, Starch, Analysis of Sugars (Carbohydrates), Estimation of Sucrose in a given sample of cane sugar, Estimation of Glucose and Sucrose in Cane Sugar- Estimation of Glucose and Sucrose in a given sample of Gur (iodometric method)Determination of Phosphorous in plant or food material, Destruction of organic matter, Important points,

MODULE – IV QUANTITATIVE FOOD ANALYSIS –II:

Flame Photometry: Determination of food materials by flame photometry- Pressure Regulators and flow meters-Flame source-Atomizers and Burners-Optical and Electronic system- photosensitive detectors-Flame photometers-Determination of calcium, Sodium, Potassium in foods.

Atomic absorption spectrometer: Principle, Instrumentation with Illustrations of Hallow cathode lamp, nebulizer, photo multiplier tube, interferences; Chemical & Ionization, Quantitative applications to minerals in Food Material such as High calcium foods, Iron rich foods etc.,

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III B.SC. CHEMISTRY PAPER VIII-E-3
SEMESTER – VI

FOOD ADULTERATION & FOOD 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.	UNIT-I	02	02	01
2.	UNIT-II	02	02	01
3.	UNIT-III	02	02	01
4.	UNIT-IV	02	02	01
Total no of Questions		08	08	04

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY ELECTIVE – VIII E3
P – VIII E3 FOOD ADULTERATION & FOOD ANALYSIS

Time: 3 Hours **Marks: 60 M**

SECTION - A

Answer all questions. 4x8 = 32 M

1) Explain the common detection methods of Food Adulterants

(or)

Explain direct microscopic examination

2) Explain the qualitative determination of Carbon and halogens.

(or)

Explain the following:

a) Test for Proteins b) Test for |Carbohydrates

3) Determination of Sodium and Potassium 8in Food Materials by flame photometry.

(or)

Explain the following: Flame Sources b) Flame Photometers

4) Principle & Instrumentation of Atomic Absorption Spectrometer

Determination of Calcium and Magnesium in Food Materials.

SECTION – B

Answer any five questions **5x4 = 20 M**

5) **Food Adulteration**
6) **Food Additives**
7) **Colour Test for Proteins**
8) **Test for Hydrogen**
9) **Estimation of Crude Fiber**
10) **Estimation of Sucrose**
11) **Gratings**
12) **Photocells**

SECTION – C

Answer all questions **4x2 = 8 M**

13) **Adulteration of Milk.**

14) **Differentiate Crude Protein & True Protein.**

15) **Nebulisers**

16) **Principle of Flame Photometry**

SYLLABUS FOR VI SEMESTER

CHEMISTRY LABORATORY COURSE – VIII-A-1/ VIII-B-1/ VIII-C-1/ VIII-D-1/ VIII-E-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

10. Preparation of Phenyl azoβ-naphthol

CHEMISTRYLABORATORY COURSE - **VIII-A-1/ VIII-B-1/ VIII-C-1/ VIII-D-1/ VIII-E-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)	Reportofyield	: 5 Marks

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

No. of h/w : 2

50 Marks

1. Electrochemistry:

   Determination of redox potential of Fe^{2+}/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 $KMnO_4$ and determination of concentration of the given solution.

   ii) Verification of Beer-Lambert law for $K_2Cr_2O_7$ and determination of concentration of the given solution.

   iii) Verification of Beer-Lambert law for $CuSO_4$ and determination of concentration of the given solution.

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

CHEMISTRY LABORATORY COURSE-**VIII-A-2/ VIII-B-2/ VIII-C-2/ VIII-D-2/ VIII-E-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/ VIII-D-3/ VIII-E-3

50 Marks

PROJECT WORK

FOR I YEAR BA/B.COM/B.Sc. STUDENTS

Environmental Studies II Semester Syllabus

Module-I : Natural Resources: The Multidisciplinary nature of Environmental Studies-Definition, scope and importance-Need for public awareness-Renewable and Non-Renewable Resources-

Natural Resources and associated problems-**Forest Recourses**: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people-

Water Resources: use and over - utilization of surface and ground water, floods, drought, conflicts over water, darns- benefits and problems-

Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies-

Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer- pesticide problems, water logging, salinity, case studies-

Energy Resources Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies-

Land Resources: Land as resources, land degradation- man induced landslides, soil erosion and desertification-Role of an individual in conservation of natural resources-Equitable use of resources for sustainable lifestyles

Module-II : Ecosystems, Biodiversity and its Conservation: Concept of an ecosystem-Structure and function of an ecosystem-Producers, consumers and decomposers-Energy flow in the ecosystem-Ecological succession-Food chains, food webs and ecological pyramids-Introduction, types, characteristic features, structure and function of the following ecosystem:-

Forest Ecosystem, Grassland Ecosystem, Desert Ecoosystem, Aquatic Ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Introduction-Definition genetic, species and ecosystem diversity-Biogeographically classification of India-Value of biodiversity-Consumptive use, productive use, social, ethical aesthetic and option values-Biodiversity at global, National and local levels-India as a mega diversity nation-Hot spots of biodiversity-Threats to biodiversity habits loss, poaching of wildlife, man wildlife conflicts-Endangered and endemic species of India-Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module-III: Environmental Pollution: Definition, Causes, effects and control measures of:-Air pollution, Water pollution Soil pollution, Marine pollution, Noise pollution, Thermalpollution and Nuclear pollution-Solid waste management: Causes, effects and controlmeasures of urban and industrial wastes-Role of individual in prevention of pollution-Disaster management: floods, earthquake, cyclone and landslides

Module-IV: Social Issues and the Environment: From Unsustainable to Sustainable development-Urban problems related to energy-Water conservation, rain water harvesting, watershed management-Resettlement and rehabilitation of people; its problems and concerns Case studies-Climate change, global warming, acid rain, ozone layer depletion,nuclear accidents and holocaust, case studies-Wasteland reclamation, Consumerism and waste products-Environment protection Act-Air (Prevention and control of Pollution) Act- Water (Prevention and control of Pollution) Act-Wildlife Protection Act, Forest Conservation Act-Issues involved in enforcement of environmental legislation-Public awareness

ModuleV-: Human Population and the Environment: Population growth, variation among nations-Population explosion- Family welfare Programme-Environment and human health-Human Rights-Value Education-HIV/AIDS-Women and Child Welfare-Role of information Technology in Environment and human health.

GOVT.COLLEGE (AUTONOMOUS)-) RAJAHMUNDRY

Environmental Studies Model Question Paper

II Semester(I B.Sc/BA/B.com)

Time: 2 hrs **Max Marks: 50M**

Section – A

Answer anyTwo Questions **2x10=20**M

1. Explain the definition, scope and Importance of Environmental Studies?
2. What is Bio-diversity? What are the threats to it and how it is conserved?
3. Write an essay on the causes, ill effects and preventive measures of Air pollution.
4. What is an Eco system? Describe Forest Ecosystem.

Section -B

Write notes on any Four questions **4x5=20** M

5. Human Rights.
6. Ecological Pyramids.
7. Global Warming.
8. Population Growth.
9. Conflicts over Water.
10. Disaster Management.

Section-C

Answer all Questions. 5x2 **=10 M**

11. Food Chain
12. Noise Pollution.
13. HIV & AIDS.
14. Rain Water Harvesting.
15. Soil Erosion.

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Recommended Text Books:

1. Advance Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
2. Concise Inorganic Chemistry by J.D.Lee
3. Inorganic Chemistry by J.E. Huheey
4. Basic Inorganic chemistry by Cotton and Wilkinson
5. Stereochemistry by P.S. Kalsi
6. Stereochemistry of organic compounds by D Nasipuri
7. Organic Chemistry by Bruise
8. Organic Chemistry by Morrison and Boyd
9. A text of Qualitative inorganic analysis by A.I.Vogel
10. Advance Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
11. Concise Inorganic Chemistry by J.D.Lee
12. Inorganic Chemistry by J.E. Huheey

13. Basic Inorganic chemistry by Cotton and Wilkinson
14. Principles of physical chemistry by prutton and Marron
15. Advanced physical chemistry by Bahl and Tuli
16. Text book of physical chemistry by K L Kapoor
17. Text book of physical chemistry by S Glasstone
18. Text Book of Organic chemistry by Vol I by I.L. Finar Vol I
19. Organic chemistry by Bruice
20. Spectroscopy by William Kemp
21. Spectroscopy by Pavia
22. Organic Spectroscopy by J. R. Dyer
23. Inorganic Chemistry J E Huheey, E A Keiter and R L Keiter
24. Basic Inorganic Chemistry by Cotton and Wilkinson
25. Concise Inorganic Chemistry by J.D.Lee
26. Advanced Physical Chemistry by Atkins
27. Introduction to Electrochemistry by S. Glasstone

GOVERNMENT COLLEGE (A)
RAJAMAHENDRAVARAM

(Accredited by NAAC "A+" Grade)

UG BOARD OF STUDIES - 2020-21

DEPARTMENT OF CHEMISTRY
For the Academic Year 2020-21

B.Sc (MCAc)

Curriculum for the Academic Year 2020-21

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

CBCS Syllabus for B.Sc. I Year

Effective from 2018 – 2019 onwards

Semester – I Paper I - ANALYTICAL CHEMISTRY-1

SEMESTER – I

BASIC PRINCIPLES & LABORATORY OPERATIONS

60hrs (4h/w)

UNIT – I

I. BASIC CONCEPTS: **12hrs**

A. SI Units

i) Definitions of the Seven Base Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity), Derived units, Conversion between units, Significant figures.

B. Chemical concentrations

i) Mole, molar mass ii) Calculations in grams and moles iii) Solutions and their concentrations:

a) Molar concentration b) Analytical molarity c) Equilibrium molarity of a particular species d) Percent concentration e) Parts per million/billion (ppm, ppb) f) Volume ratios for dilution procedures g) p-functions.

C. Preparation of solutions: standard solutions, primary standards, secondary standards.

UNIT – II **12hrs**

INTRODUCTION TO ANALYTICAL CHEMISTRY AND ANALYTICAL METHODS -I

i) General steps in chemical analysis Introduction to methods of detecting analytes Physical, Electromagnetic radiations and Electric charge

ii) Single pan analytical balance: (operation and theory of the balance, construction details, errors in weighing, care of an analytical balance).

UNIT III

12hrs

INTRODUCTION TO ANALYTICAL CHEMISTRY AND ANALYTICAL METHODS-II

Description and use of common laboratory apparatus: Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, different types of funnels chromatographic columns,

chromatographic jars, desiccators, drying ovens, filter crucibles, rubber policeman. Calibration and use of volumetric glass ware.

pH meter: components of pH meter, use of pH Meter, maintenance of pH meter, application of data. Laboratory notebook

UNIT – IV **12hrs**

ERRORS IN CHEMICAL ANALYSIS

Types of errors

Accuracy and Precision, Absolute and relative uncertainty, propagation of uncertainty. The Gaussian distribution, mean and standard deviation, confidence intervals. Statistical tests of data (the F test, the t test, Q test for bad data, the method of least squares). Calibration curve. Laboratory notebook. Safety with chemicals and waste.

UNIT – V

PRINCIPLES OF THERMOGRAVIMETRY: 12hrs

Thermometric methods – Principles of TGA, DTA and Thermometric titrations – application of $CaC_2O.H_2O$, $(CH_3COO)_2$ Ca. H_2O and HCl Vs. NaOH Thermometric titrations.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. FIRST YEAR CHEMISTRY SEMESTER -I

MODEL QUESTION PAPER FROM 2019-20

PAPER-I, ANALYTICAL CHEMISTRY

BASIC PRINCIPLES & LABORATORY OPERATIONS

TIME: 21/2hr. MARKS: 50 M

PART -A

Answer **ALL** the Questions **4X7 = 28 M**

1. What are Chemical Concentrations? Explain.

(OR)

Write the seven basic units. Explain with examples.

2. Write the General Steps in Chemical Analysis? Explain.

(OR)

What are thermometric titrations? Write the principle of TGA, DTA and Thermometric titrations and their applications.

3. Explain components of pH meter and its maintainance with applications.

(OR)

What are common laboratory apparatus. Explain?

4. Explain different types of Errors

(OR)

Explain statistical tests of data (F- Test, t-Test, Q-test of bad data), method of least squares?

PART – B

Answer any **FOUR** Questions **4x4 = 16 M**

4. What are the conversions between the units?
5. What are General steps in chemical Analysis?
6. What are the components of pH meters and write their uses?

7. Write about safety with chemical and waste.
8. Write about Accuracy and Precession.
9. What are thermometric titrations?
10. What are primary standards? Give four examples.
11. Write about calibration of apparatus.

PART-C

Answer **ALL** Questions **3x2 = 6M**

12. What are the uses of common laboratory apparatus.
13. What is Gaussian distribution?
14. Write about chromatographic column?

LABORATORY COURSE -I

45 hrs (3 h / w)

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

1. Use and calibration of volumetric equipment (volumetric flasks, pipette's and burette's).
2. Preparation of standard solutions of acids and bases.
3. Estimation of sodium carbonate by titrating with hydrochloric acid.
4. Preparation of standard solution of EDTA.
5. Estimation of magnesium using EDTA.
6. Use of pH meter: determination of pH of given dilute solutions of shampoos and soaps
7. Titration of acid-base using pH meter.
8. Preparation of buffers.

SUGGESTED BOOKS

1. Seamus P.J. Higson: Analytical Chemistry.
2. Douglas A. Skoog and Donald M.West: Fundamentals of Analytical Chemistry.
3. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
4. Gary D. Christian : Analytical Chemistry .
5. Freifelder and Kealy: Analytical Chemistry.
6. Daniel C Harris: Exploring Chemical Analysis.
7. Daniel C Harris: Quantitative Chemical Analysis.

LABORATORY COURSE -I

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)

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

SYLLABUS FOR I B.SC., ANALYTICAL CHEMISTRY, II SEMESTER

FROM 2019 – 2020 ONWARDS

QUANTITATIVE METHODS OF ANALYSIS

Total Hours: 60

UNIT – I - GRAVIMETRIC ANALYSIS – I 15 Hours

A. Precipitation methods: Precipitation, Mechanism of Precipitation – Nucleation & Crystal Growth- Induction Period – Steps involved in formation of Pure and Complete Precipitation (only steps) – Purity of Precipitates- Co-Precipitation and Post Precipitation (only concepts) – Re-Precipitation.
B. Volatilization methods: Volatilization of analyte or its decomposition products at a suitable temperature. Collection and Weighing of the volatile product or, alternatively, the mass of the product is determined indirectly from the loss in mass of the sample. Example: Determination of the Sodium Hydrogen Carbonates content of antacid tablets.

UNIT – II - GRAVIMETRIC ANALYSIS – II 15 Hours

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 - Introduction
Sedimentation and relative centrifugal force.

UNIT – III - VOLUMETRIC ANALYSIS 15 Hours

Definitions: Titrimetry, Volumetric Titrimetry, Gravimetric Titrimetry, Coulometric Titrimetry.
The equivalence point and 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.

Sigmoidal Titration Curves for Neutralization Titrations.

UNIT – IV

INTRODUCTION TO ENVIRONMENTAL ANALYSIS 15 Hours

A. Sampling: Methods of Gaseous, Liquid and Solid Samplings – Cone and Quarter Method Solid Samples
B. Environmental pollution from industrial effluents and radiochemical waste.
C. Environmental Management System.
D. Introduction to water and waste analysis.

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GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

DEPARTMENT OF CHEMISTRY

I B.SC. ANALYTICAL CHEMISTRY II SEMESTER

BLUE PRINT FROM 2019-20 ONWARDS

PAPER-II: QUANTITATIVE METHODS OF ANALYSIS

Sl. NO.	Chapter	Essay Question (07 M) knowledge	Short Answer Question (04 M) Under standing	Very Short Answer Question (02 M) Skill / Application
1.	Gravimetric Analysis-I	01	01	--
2.	Gravimetric Analysis-II	03	02	01
3.	Volumetric Analysis	02	02	01
4.	Introduction to Environmental Analysis	02	02	01
Total no of Questions		08	08	03

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

I B.Sc. MCAC, II SEMESTER

MODEL QUESTION PAPER FROM 2019-20 ONWARDS

QUANTITATIVE METHODS OF ANALYSIS

Time: $2^1/_2$ Hours **Total Marks: 50**

PART - A

Note: Answer **ALL** the Questions **4 x7 =28 M**

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

(OR)

(B) Explain the Titration Curves for Neutralization Titrations.

9. (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

Note: Answer any **Four** Questions **4x4 = 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

Note: Answer **ALL** Questions **3x2 = 6M**

13. Differentiate Equivalence point and end point.

14. Define Sedimentation and Give one example.

15. What is Radio Chemical Waste?

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GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

I B.Sc. MCAC, II SEMESTER

PRACTICAL COURSE FROM 2019-20 ONWARDS

LABORATORY COURSE – II

QUANTITATIVE (VOLUMETRIC) ANALYSIS

45

Hours

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.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

I B.Sc. CHEMISTRY, II SEMESTER

PRACTICAL COURSE FROM 2019-20 ONWARDS

LABORATORY COURSE – II

QUANTITATIVE (VOLUMETRIC) ANALYSIS

(At the end of Semester II)

Max. Marks: 50 Marks **Time: 3 Hours.**

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)

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

CBCS Syllabus for B.Sc. II Year

Effective from 2018 – 2019 onwards

Semester – III ANALYTICAL CHEMISTRY- Paper III

SEPARATION METHODS

UNIT – I: 15hrs

Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application - Determination of Iron (III)

Chromatography: Classification of chromatographic methods: Principle of differential migration, description of the chromatographic process, distribution coefficients, modes of chromatography, performing column chromatography.

Chromatography - theory and practice: Introduction, the chromatograph (elution time and volume), capacity factor, column efficiency and resolution, sample preparation

UNIT - II 15hrs

A. Techniques of Paper Chromatography: Principle, experimental modifications, various modes of development, nature of the paper, detection of spots, retardation factors, factors that affect the reproducibility of Rf values (due to paper, solvent system, sample, development procedure), selection of solvent, quantitative analysis. applications

B. Thin layer chromatography: Principle, stationary phase, adsorbents, liquid phase supports, plate preparation, mobile phase, sample application, development, saturation of chamber, detection of spot, Rf values (effect of adsorbent, solvent, solute, development process), quantitative analysis, applications.

UNIT – III: 15hrs

A. Adsorption Chromatography: Principle, adsorbents, solvents, nature of solute, operating parameters, retention volumes and times, applications.

Column Chromatography: Principle, columns, matrix materials, stationary phase, column packing, application of sample, column development and sample elution, detectors and fraction collectors, applications.

B. High Performance Liquid Chromatography: Principle, column, matrices and stationary phases, column packing, mobile phase and pumps, application of sample, detectors, applications.

UNIT – IV **15hrs**

A. Liquid-Liquid Partition, Chromatography: Principle, normal phase chromatography, reversed- phase liquid chromatography, reversed phase liquid chromatography, applications.

B. Ion Exchange: Introduction, principle, action of ion exchange resins, separation of inorganic mixtures, applications, Solvent extraction: Principle and process,

Ion- Exchange Chromatography: Principle, ion exchangers, ion- exchange equilibria, ion-exchange resin selectivity, column operations (column development, detection of solute bands), factors affecting retention volumes, applications.

Suggested Readings:

1. F.W. Fifield and D. Kealy: Analytical Chemistry.
2. Daniel C Harris: Exploring chemical analysis.
3. Daniel C Harris: Quantitative chemical analysis.
4. R.V. Dilts Analytical Chemistry- Methods of Separation.
5. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.

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GOVERNMENT COLLEGE (A), RAJAHMUNDRY.
B.Sc. SECOND YEAR CHEMISTRY SEMESTER -III
MODEL QUESTION PAPER
(With effect from 2018-2019 admitted Batch)
ANALYTICAL CHEMISTRY PAPER - III
SEPARATION METHODS

TIME: $2^{1}/_{2}$hr. **MARKS: 50 M**

PART-A

Answer *ALL* Questions. All questions carry equal marks. **4x7= 28 Marks**

1. a) Mention the principle of solvent extraction. Write a note on any two Solvent extraction methods.

(OR)

b) Write a short note on the following.
1) Different Chromatographic methods of development.
2) Stationary & Mobile Phases

2. a) Write the principle and any three development techniques of Paper Chromatography.

(OR)

b) Explain the process of Thin Layer Chromatography.

3. a) Explain the principle, column packing and column development in Column Chromatography.

(OR)

b) Write about the principle, instrumentation and applications of High performance liquid Chromatography.

4. a) Write the principle and separation of Inorganic mixtures by Ion Exchange Technique.

(OR)

b) Give the principle and applications of Ion Exchange Chromatography.

SECTION-B

Answer Any Four Quetions **4 x 4 = 16 Marks**

5. Write about Synergism.
6. Principle of Differential Migration.
7. What are Stationary & Mobile Phases in Paper Chromatography?

8. Advantages of Thin Layer Chromatography over Paper Chromatography.
9. Write a note on adsorbents in Column chromatography.
10. What is $\mathbf{R_f}$ value? Explain the factors affecting $\mathbf{R_f}$ value.
11. What is reversed phase liquid Chromatography?
12. Any four properties of Ion-Exchange Resins.

SECTION-C

Answer All Quetions **3 x 2 = 6 Marks**

13. Differentiate between solvent extraction and chromatography.
14. Mention any two applications of Paper chromatography & TLC.
15. What is meant by matrix materials?

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II B.Sc. Chemistry Paper – III

Semester – III

SEPARATION METHODS

Sl. No.	Chapter	Essay Question (8 M)	Short Answer Question (4 M)	Very Short Answer Questions (2 M)
1.	Solvent Extraction & Chromatography	2	2	1
2.	Techniques of Paper Chromatography & Thin Layer Chromatography	2	2	1
3.	Adsorption/Column Chromatography & HPLC	2	2	1
4.	Liquid-Liquid Partition & Ion Exchange Chromatography	1	2	-
	Total Questions	**08**	**08**	**03**

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GOVERNMENT COLLEGE (A), RAJAHMUNDRY

B.Sc. SECOND YEAR CHEMISTRY SEMESTER -III

PRACTICALS SYLLABUS

(With effect from 2018-2019 admitted Batch)

Practical-III : SEPARATION METHODS

(At the end of Semester-III)

1. Determination of Rf value of amino acids using paper chromatography.
2. Separation and identification of monosaccharide present in a given mixture by paper Chromatography.
3. Determination of equivalent conductance of a weak electrolyte (acetic acid) at Different concentrations.
4. Determination of adulterant in some common food items:
    i) Chicory in coffee powder,
    ii) Foreign resin in asafetida
    iii) Chilli powder
    iv) Turmeric Powder
    v) Pulses

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. SECOND YEAR CHEMISTRY SEMESTER -III

PRACTICALS SCHEME OF VALUATION

(With effect from 2018-2019 admitted Batch)

Practical-III : SEPARATION METHODS

(At the end of Semester-III)

Total No. of Marks: 50 Marks

Record : 10 Marks
Practical : 40 Marks
Principle - 5M
Procedure - 5M
Tabulation - 5
Practical - 25M
(For Material / Calculation) Total: 50 Marks

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

II B.SC (MCAC), IV SEMESTER

ANALYTICAL CHEMISTRY,

FROM 2019 – 2020 ONWARDS

PAPER – IV: SEPARATION METHODS - II

Unit-I: GEL, AFFINITY AND GAS CHROMATOGRAPHY

A. Gel chromatography: Principle, types of gels, separation by gel chromatography, applications
B. Affinity chromatography: Principle, materials, selection and attachment of ligand, practical procedure, applications
C. Gas chromatography: Apparatus and materials, preparation and application of samples, separation conditions, detectors, applications

Unit-II: ELECTROPHORESIS

A. Electrophoresis-I: Theory and classification, factors affecting mobility, macromolecular size and charge, interactions with supporting electrolyte, P^H and concentration discontinuities, factors affecting electrophoresis phenomena
B. Electrophoresis-II: electrolysis, electro-osmosis, temperature and supporting media, instrumentation, methodology, preparation of gel-staining and de-staining, preparative zone electrophoresis, continuous electrophoresis, applications

Unit-III: DIALYSIS AND MEMBRANE FILTRATION AND GENERAL LABORATORY METHODS

A. Dialysis and membrane Filtration: Dialysis, classification of dialysis: Electrodialysis (ED) and Reverse Electrodialysis (RED), types of filtrations: Micro Filtration (MF), Ultra Filtration (UF), Nano Filtration (NF), and Reverse Osmosis (RO), Filters-nitrocellulose, fiberglass, polycarbonate
B. General laboratory methods: Distillation, drying solvents, fractional crystallization, re-crystallization, acid-base, complexation and precipitation titrations, vacuum filtration.

Unit-IV: CENTRIFUGATION METHODS

Introduction, Basic principles of sedimentation and relative centrifugal force, preparative centrifugation and ultra centrifugation, different types of rotors, density gradients, types of centrifugation techniques:

References

1. R. V. Dilts: Analytical Chemistry- Methods of Separation.
2. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.
3. F.W. Fifield and D. Kealy: Principles and practice of analytical chemistry.
4. Vogel's textbook of quantitative chemical analysis, 6th edition.
5. Vogel's textbook of quantitative chemical analysis, 7th edition.
6. Keith Wilson and John Walker: Practical Biochemistry.
7. David J. Holme and Hazel Peck: Analytical Biochemistry. 8. David Freifelder: Physical Biochemistry.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

SYLLABUS FOR II B.SC., ANALYTICAL CHEMISTRY,

IV SEMESTER MODEL PAPER

(From 2019 – 2020 onwards)

Time: $2^1/_2$ Hours **Marks: 50M**

PART-A

Answer all questions (4x7=28 Marks)

1. (a) Write the principle of Gel Chromatography and write different types of gels used in chromatography

   OR

   Write the principle of gas chromatography and write briefly about apparatus and materials used in gas-liquid chromatography.
2. Write the principles of electrophoresis and write the factors affecting the electrophoresis

   OR

   Write a note on preparative zone and continuous electrophoresis
3. Write briefly about nitrocellulose and fiber glass filters

   OR

   Write briefly about general laboratory methods
4. Write briefly about the centrifugal methods

   OR

   Write a note on different types of rotors

PART-B

Answer any four questions (4x4=16 Marks)

5. Write a note on detectors of gas chromatography
6. Write a note on practical procedure of affinity chromatography
7. Write a note on the effect of charge and macromolecular size in electrophoresis
8. Write the applications of electrophoresis
9. Briefly write about polycarbonate
10. Write about dialysis and membrane filtration
11. Write the different types of centrifugation techniques
12. Write about sedimentation process

PART-C

Answer all questions (3x2=6 Marks)

13. Write the principle of affinity chromatogram
14. Write a note about supporting media used in electrophoresis
15. Define crystallization?

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GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

II B.SC., ANALYTICAL CHEMISTRY, IV SEMESTER

BLUE PRINT FROM 2019-20 ONWARDS

PAPER-IV: SEPARATION METHODS-II

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 : GEL, AFFINITY AND GAS CHROMATOGRAPHY	02	02	01
2.	UNIT-II: ELECTROPHORESIS	02	02	01
3.	UNIT : III DIALYSIS AND MEMBRANE FILTRATION AND GENERAL LABORATORY METHODS	02	02	01
4.	UNIT:IV CENTRIFUGATION METHODS	02	02	
Total no of Questions		08	08	03

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

B.Sc. FIRST YEAR CHEMISTRY, IV SEMESTER

PRACTICAL COURSE FROM 2019-20 ONWARDS

PRACTICAL PAPER-II: SEPARATION TECHNIQUES

SYLLABUS FOR SEPARATION TECHNIQUES

Time: 45 Hours (3 Hrs/Wk)

1. Determination of the strength of the given HCl solution by titrating it against NaOH solution conductometrically
2. Seperation of a mixture of Ni^{2+} and Cu^{2+} by TLC and identify the ions.
3. Determination residual chlorine in city water supply using colorimetry
4. Determination of adsorption isotherm and adsorption constant (k) of acetic acid on activated charcoal.
5. Determination of nicotine content in cigarette tobacco

References

1. R. V. Dilts: Analytical Chemistry- Methods of Separation.
2. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.
3. F.W. Fifield and D.Kealy: Principles and practice of analytical chemistry.
4. Vogel's textbook of quantitative chemical analysis, 6th edition.
5. Vogel's textbook of quantitative chemical analysis, 7th edition.
6. Keith Wilson and John Walker: Practical Biochemistry.
7. David J.Holme and Hazel Peck: Analytical Biochemistry. 8. David Freifelder: Physical Biochemistry.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
B.Sc. FIRST YEAR CHEMISTRY, IV SEMESTER
PRACTICAL COURSE FROM 2019-20 ONWARDS
PRACTICAL PAPER-II: SEPARATION TECHNIQUES
SCHEME OF VALUATION

Time: 3 Hours **Total: 50 marks**

Scheme for External Examination

1) Record: 10 Marks

2) Practical: 40 Marks

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)

TOTAL MARKS: 50 M

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-V

SYLLABUS FOR SEMESTER V 2020-21

ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

45hrs (3h/w)

UNIT-I: BASIC UNDERSTANDING OF THE STRUCTURES, PROPERTIES AND FUNCTIONS OF CARBOHYDRATES, LIPIDS, AND PROTEINS: (12 Hours)

1. Proteins- structure, classification and functions.
2. Carbohydrates – Polysaccharides – Definition, Classification, Isolation (from mushrooms) and characterization of polysaccharides.
3. Classification and properties of lipids, functions of steroid hormones.

4. Enzymes- nomenclature, classification, effect of pH and temperature on enzyme activity, enzyme inhibition.
5. Introduction to Lipoproteins.

UNIT – II: CLINICAL CHEMISTRY - A DIAGNOSTIC APPROACH BY BLOOD/URINE ANALYSIS: (10 Hours)

1. Blood: Composition and functions of blood, blood coagulation.
2. Blood collection and preservation of samples.
3. Anemia
4. Estimation of glucose, urea, creatinine, cholesterol and bilirubin in blood.
5. Urine: Collection and preservation of samples.
6. Formation of urine.
7. Composition of normal and pathological urine.

UNIT-III: **MICROBIOLOGICAL ANALYSIS:** **(8 Hours)**

Microbiologial Analysis: Defintion, functions - Different culture media used for microbiological analysis - Microbiological assay of antibiotics (cylinder or cup plate method) - microbiological analysis of water by membrane filtration method.

UNIT-IV: DRUG **FORMULATIONS AND DRUG ANALYSIS:** **(8 Hours)**

Brief introduction to different types of formulations - Additives used in tablet manufacture - Analysis, uses and formulations of following drugs: Aspirin, Sulphadiazine, Phenobarbitone, Methyl Dopa, Vitamine – C, Salicylic acid.

UNIT-V: ENVIRONMENTAL CHEMISTRY**:** **(7 Hours)**

Concept and scope of environmental chemistry -nomenclature -environmental segments - The natural cycles of the environment -the hydrological cycle -the oxygen cycle -the nitrogen cycle.

Classification of water pollutants - Dissolved Oxygen-BOD-COD- Waste water treatment (General). Disposal of radioactive wastes.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-V

SEMESTER V 2020-21

ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY
BLUE PRINT

S.No	**NAME OF THE UNIT**	**ESSAY QUESTIONS** (08 M) Knowledge	**SHORT ANSWER QUESTION** (04 M) Under standing	**VERY SHORT ANSWER QUESTION** (02 M) Skill / Application
UNIT-I	Basic understanding of the structures, properties and functions of carbohydrates, lipids, and proteins	02	02	01
UNIT-II	Clinical chemistry: A diagnostic approach by blood/urine analysis	02	02	-
UNIT-III	Microbiological analysis	01	01	-
UNIT-IV	Drug formulations and Drug analysis	02	02	01
UNIT-V	Environmental chemistry	01	01	01
	TOTAL	08	08	04

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-V

SEMESTER - V 2020-21

ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

MODEL QUESTION PAPER

Time: 3hrs **Max. Marks: 60M**

SECTION – A

Answer all the questions 4x8=32M

1. a) What are Polysaccharides? How they are classified and explain the Isolation of Polysaccharides.

OR.

b) Define Protein. Write a detailed account on structure of Proteins.

2. a) Write about the procedure for the Estimation of glucose and Cholesterol in Blood.

OR

b) Write detailed note on Composition of Blood.

3. a) Explain the Microbiological analysis of water by membrane filtration method.

OR

b) Write a detailed account on different Formulations of drug manufacturing.

4. a) Write about the Estimation, formulations and uses of Aspirin.

OR

b) Write about the general procedure for the treatment of Waste water.

SECTION – B

Answer any FIVE of following **5x4=20M**

5. Write about the functions of Steroid hormones.

6. Write a short note on effect of temperature on enzyme activity.
7. Write a brief note on composition of normal and pathological urine.
8. Give the process of collection and preservation of blood samples.
9. What are the different Culture media that are used for the microbiological analysis?
10. Write about procedure for the analysis of Methyl Dopa.
11. Write about the Additives that are used in the manufacture of Tablets.
12. Give a brief account of Hydrological cycle of Environment.

SECTION – C

Answer all the questions **4x2=8M**

13. What are Lipoproteins and give two examples.
14. Define Anemia and write the normal range of Haemoglobin in blood.
15. What are Aerosols and Give two examples.
16. Define BOD and COD.

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GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL -V

SEMESTER - V 2020-21

ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

Practical-V Analysis of Bio Products and Environmental analysis

45 hrs (3 h / w)

Identification and estimation of the following:

1. Qualitative analysis of Carbohydrates.
2. Quantitative analysis of Carbohydrates.
3. Qualitative analysis of Lipids.
4. Qualitative analysis of Proteins.
5. Determination of the Saponification number of oil.
6. Estimation of Alkalinity of water.
7. Estimation of Acidity of Water.

Suggested Readings:

1. T. G. Cooper: Tool of Biochemistry.
2. Keith Wilson and John Walker: Practical Biochemistry.
3. Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
4. Thomas M. Devlin: Textbook of Biochemistry.
5. Jeremy M. Berg, John L Tymoczko, LubertStryer: Biochemistry.
6. G. P. Talwar and M Srivastava: Textbook of Biochemistry and
7. Human Biology.
8. A.L.Lehninger: Biochemistry.
9. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.
10. Environmental chemistry by A.K.De
11. A text book of Engineering chemistry by S.S.Dara
12. A text book of Industrial chemistry by B.K.Sharma

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DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-V

SEMESTER - V 2020-21

PRACTICAL-V ANALYSIS OF BIO PRODUCTS AND ENVIRONMENTAL ANALYSIS SCHEME OF VALUATION

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

iv) Procedure in first 10 min. : 5 Marks

v) Formula with units : 5 Marks

vi) Neat tabulation & correct calculation : 5 Marks

Error < 10% : 20 Marks

Error 10-15 % : 15 Marks

Error > 15 % : 10 Marks (Minimum Marks)

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DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-VI

SEMESTER - V 2020-21

SYLLABUS FOR INSTRUMENTAL METHODS OF ANALYSIS

45 Hours

UNIT: UV AND VISIBLE SPECTROPHOTOMETRY 9 Hours

Lambert-Beer's law: Principles - Instrumentation, Single/double beam instrument and its applications
IR SPECTROSCOPY:

Principle - Instrumentation and applications

UNIT-II: ATOMIC EMISSION SPECTROSCOPY **(FLAME PHOTOMETRY)**9 Hours

Principle - Instrumentation - Interferences - Analytical techniques for Flame photometry - Calibration plots (Working curves). Determination of Alkali and Alkaline earth metals in natural water (any two metal ions)

UNIT-III: ATOMIC ABSORPTION SPECTROSCOPY 9 Hours

Principle - Instrumentation - Radiation sourcs (line sources) - Hollow cathode lamps and Discharge lamps. Interferences - Analytical techniques for AAS - Calibration plots. Applications - Determinations of Calcium and Magnesium in tap water.

UNIT-IV: POLOROGRAPHY AND COULOMETRY 9 Hours

(a) Polarography: Basic Principles - DME - Advantages and Disadvantages Diffusion Current - The llkovic equation (derivation not required). Half - Wave potential - Experimental set up - Applications. Determination of Copper and Zinc in Brass.
(b) Coulometry: Types of coulometric methods: Potentiostatic and amperostatic; principles, instrumentation and applications, applications.

UNIT-V: BASIC ELECTRO-ANALYTICAL CHEMISTRY 9 Hours

Electrochemical cells, cell potentials, electrode potentials, calculation of cell potentials and currents in electrochemical cells, types of polarization, types of electroanalytical methods, problems.
Ion-selective Electrodes:

Types of ion-selective electrodes: Glass, liquid ion exchange membrane, neutral carrier membrane, coated wire, gas sensing, air gap and biomembrane electrodes; theory of ion selective electrode and ion-selectivity coefficient; problems.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-VI

SEMESTER - V 2020-21

MODEL QUESTION PAPER

INSTRUMENTAL METHODS OF ANALYSIS

Time: 3hrs **Max. Marks: 60M**

SECTION – A

Answer all questions **4x8=32M**

UNIT – 1

1. a) Write the principle of lamberts - beer's law.
   Instrumentation of double beam spectrometer

   OR.

   b) Instrumentation of I.R spectroscopy? Write one application.

2. a) write the principal and instrumentation of flame photometry.

   OR

   b) Determination of Alkali and Alkaline earth metals in natural water.
3. a) write the analytical techniques for AAS and write it's applications.

   OR

   b) Write about electro-chemical cells and write types of polarization.
4. a) Explain half wave- potential - experimental set up and applications.

   OR

   b) Write the principle and instrumentation of coulometer.

SECTION – B

Answer any FIVE of following **5x4=20 M**

5. Write the applications of lamberts-beers law.
6. Write the single and double beam instrumentation.
7. Write about calibration plots.
8. Write analytical techniques of flame photometry.

9. Write the instrumentation of AAS.
10. Determination of calcium and magnesium in water.
11. Determination of copper and zinc in brass.
12. Write about glass and bio membrane in electrode.

SECTION – C

Answer all the questions **4x2=8 M**

13. Write lamberts-beers law.
14. Write the principle of AAS.
15. Write the advantages and disadvantages of Diffusion current.
16. Write any two advantages of diffusion current.

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GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-VI

SEMESTER - V 2020-21

BLUE PRINT FOR INSTRUMENTAL METHODS OF ANALYSIS

Unit	Chapter	Essay Question Essay Question (08 M) Knowledge	Short Answer Question (04 M) Under standing	Very short Answer Question (02 M) Skill Application
Unit-1	Introduction to spectroscopic method of analysis	02	02	01
Unit-2	Atomic emission spectroscopy	02	02	-
Unit-3	Atomic Absorption spectroscopy	01	02	01
Unit-4	Polarography & coulometry	02	01	01
Unit-5	Basic Electro- Analytical chemistry	01	01	01
	Total No of Questions	08	08	04

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL-VI

SEMESTER - V 2020-21

SYLLABUS FOR PRACTICALS

INSTRUMENTAL METHODS OF ANALYSIS

Practical VI Instrumental methods of analysis 45 **hrs (3 h / w)**

1) Determination of metals in given samples by AAS technique.

2) Preparation of standard calibration graphs of Pb, Cd, Zn and Fe by AAS

3) Determination of Sodium by Flame Photometry.

Suggested Readings:

1. P.W. Atkins: Physical Chemistry.
2. G.W. Castellan: Physical Chemistry.
3. C.N. Banwell: Fundamentals of Molecular Spectroscopy.
4. Brian Smith: Infra red Spectral Interpretations: A Systematic Approach.
5. W.J. Moore: Physical Chemistry.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL-VI

SEMESTER - V 2020-21

SCHEME OF VALUATION FOR PRACTICALS

INSTRUMENTAL METHODS OF ANALYSIS

Max. Marks: 50 **Time:** 3 hrs.

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

Splitting of Practical Marks

vii) Procedure in first 10 min. **:** 5 Marks

viii) Formula with units **:** 5 Marks

ix) Neat tabulation & correct calculation **:** 5 Marks

Error < 10% **:** 20 Marks

Error 10-15 % **:** 15 Marks

Error > 15 % **:** 10 Marks (Minimum Marks)

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL-VII

SEMESTER - VI 2020-21

SYLLABUS FOR PRACTICAL

ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS

UNIT-I: ANALYSIS OF SOAPS, DETERGENTS AND PAINTS

9 Hours

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

UNIT- II: ANALYSIS OF FATS & OILS AND INDUSTRIAL SOLVENTS

9 Hours

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

UNIT-III: ANALYSIS OF FERTILIZERS, STARCH, SUGARS AND PAPER

9 Hours

Analysis of fertilizers: urea, NPK fertilizer, super phosphate,
Analysis of DDT, BHC, Endrin, Endosulphon, Malathion, parathion.
Analysis of starch, sugars, cellulose and paper,

UNIT –IV: ANALYSIS OF GASES

9 Hours

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

UNIT – V: ANALYSIS OF COMPLEX MATERIALS

9 Hours

Analysis of cement- loss on ignition, insoluble residue, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydride.
Analysis of glasses - Determination of silica, sulphur, barium, arsenic, antimony, total R2O3, calcium, magnesium, total alkalies, aluminium, chloride, fluoride.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-VII

SEMESTER - VI 2020-21

BLUE PRINT FOR ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS

Unit	Chapter	Essay Question Essay Question (08 M) Knowledge	Short Answer Question (04 M) Under standing	Very short Answer Question (02 M) Skill Application
Unit-1	Analysis of Soaps, Detergents and Paints	02	02	01
Unit-2	Analysis of Fats & Oils and Industrial Solvents	02	02	-
Unit-3	Analysis of Fertilizers, Starch, Sugars and Paper	01	02	01
Unit-4	Analysis of Gases	01	01	01
Unit-5	Analysis of Complex Materials	02	01	01
	Total No of Questions	08	08	04

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY, SEMESTER – VI **PAPER-VII**

MODEL QUESTION PAPER FOR ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS

(w.e.f. 2020-2021)

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-VII

SEMESTER – VI - 2020-21

ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS

SYLLABUS FOR PRACTICALS

45 hrs (3 h / w)

Analysis of Heavy & Fine Chemicals:

1. Preparation of soaps and detergents.
   Estimation of EDTA in detergent and shampoo.
1. Assay of soaps and detergent
2. Determination of Na/K/Li/Ca in given sample by flame photometry method.
3. Determination of washing strength of detergents by surface tension method.
4. Determination of CMC of detergents.
5. Preparation and characterization of copper sulphate.
6. Preparation and characterization of methyl orange and methyl red.
7. Estimation of $Na_2CO3.10H_2O$ in washing soda.
8. Determination of Thiosulphate content of a commercial hypo solution.
9. Estimation of available chlorine in the sample of bleaching powder

SUGGESTED BOOKS:

1. F.J.Welcher-Standard methods of analysis,
2. A.I.Vogel-A text book of quantitative Inorganic analysis-ELBS,
3. H.H.Willard and H.Deal- Advanced quantitative analysis- Van Nostrand Co,
4. F.D.Snell & F.M.Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,
5. J.J.Elving and I.M.Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,
6. G.Z.Weig - Analytical methods for pesticides,plant growth regulators and food additives - Vols I to VII,
7. Analytical Agricultural Chemistry by S.L.Chopra & J.S.Kanwar -- Kalyani Publishers
8. F.J.Welcher-Standard methods of analysis,
9. Quantitative analysis of drugs in pharmaceutical formulations by P.D.Sethi, CBS Publishers and Distributors, New Delhi
10. G.Ingram- Methods of organic elemental micro analysis- Chapman and Hall.,
11. H.Wincciam and Bobbles (Henry J)- Instrumental methods of analysis of food additives.,
12. H.Edward-The Chemical analysis of foods;practical treatise on the examination of food stuffs and the detection of adulterants,

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PAPER-VII

SEMESTER – VI - 2020-21

ANALYSIS OF APPLIED INDUSTRIAL PRODUCTS
SCHEME OF VALUATION FOR PRACTICALS

For Record - 10 Marks
Marks for Viva-voce - 5 Marks
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)

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM
DEPARTMENT OF CHEMISTRY
CBCS Syllabus for B.Sc. III Year
Effective from 2018 – 2019 onwards
Paper - VIII-B-1 Semester – VI

CHE – 117: 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

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

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BLUE PRINT
III B.SC. CHEMISTRY CLUSTER – VIII B-I
SEMESTER – VI
FUEL CHEMISTRY AND BATTERIES

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	02	00
2.	UNIT –II	02	01	01
3.	UNIT –III	02	02	00
4.	UNIT –IV	02	01	01
5.	UNIT –V	00	02	02
Total no of Questions		08	08	04

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

Time: 3 hours **Maximum Marks: 60**

SECTION-A

4 x 8 = 32 Marks

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

1. A) Write in detail about renewable and non–renewable energy sources.

(OR)

B) Write about the composition and uses of producer gas and water gas.

2. A) Explain the composition of the crude petroleum.

.

(OR)

B) Describe the refining of petroleum.

.

3. A) Discuss about fractional distillation.

(OR)

B) Write about the non-petroleum fuels.

.

4. A) Explain the classification of lubricants.

(OR)

B) What are the properties of lubricants?

SECTION-B

5 x 4 = 20 Marks

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

.

What are the uses of coal in various industries?

5. Discuss the gasification of coal.
6. Write the applications of different petroleum products.
7. Short note on cracking.
8. Write about synthetic fuels.
9. What are conducting and non-conducting lubricating oils?
10. Fuel cells.
12. Write about the primary and secondary batteries.

SECTION-C

4 x 2 = 8 Marks

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

13. What is carbonisation of coal?
14. What are conducting lubricants?
15. Write about polymer cell.
16. Write about the working of the Li-Battery

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

CHE – 118: 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, Milliken 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 decarbonisation, demagnetization, 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

7. E. Stocchi: Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK.
8. R. M. Felder, R. W. Rousseau: Elementary Principles of Chemical Processes, Wiley Publishers, New Delhi.
9. W. D. Kingery, H. K. Bowen, D. R. Uhlmann: Introduction to Ceramics, Wiley Publishers, New Delhi.
10. J. A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
11. P. C. Jain & M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.
12. 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

Time: 3 hours **Maximum Marks: 60**

SECTION- A

4 x 8 = 32 Marks

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

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

(OR)

B) Describe the anomalous behaviour of lithium and boron.

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

(OR)

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

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

(OR)

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

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

(OR)

B) Write the preparation and explosive properties of RDX.

SECTION- B

5 x 4 = 20 Marks

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

5. Write about diagonal relationship.
6. Discuss the classification of glasses.
7. Write about Carbon nanotubes
8. Describe the manufacturing of urea.
9. What are emulsifying agents? Give examples.
10. Explain about metallic coatings.
11. Write a note on non-ferrous alloys.
12. Explain the properties of steels.

SECTION- C

4 x 2 = 8 Marks

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

13. What are allotropes of carbon?
14. What are NPK fertilizers?
15. What are enamel paints?
16. Write an example for eco-friendly paint.

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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

CHE – 119: ANALYSIS OFAPPLIED INDUSTRIALPRODUCTS

No. of Hours: 45

UNIT-I **9 h**

Analysis of soaps: moisture and volatile matter, combined alkali, total fatty matter, free alkali, total fatty acid, sodium silicate and chlorides.

Analysis of paints: Vehicle and pigments, Barium Sulphate, total lead, lead chromate, iron pigments, zinc chromate.

UNIT-II **8 h**

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

UNIT-III **10 h**

Analysis of Fertilizers: urea, NPK fertilizer, super phosphate. Analysis of DDT, BHC, Endrin, Endosulphon, malathion, parathion. Analysis of starch, sugars, cellulose and paper.

UNIT-IV **9 h**

Gas Analysis: carbon di oxide, 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.

UNIT-V **9 h**

Analysis of Complex Materials:

Analysis of Cement- loss on ignition, insoluble residue, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydride.

Analysis of Glasses- Determination of silica, sulphur, barium, arsenic, antimony, total R2O3, calcium, magnesium, total alkalis, aluminium, chloride, fluoride.

REFERENCEBOOKS

9. F.J. Welcher – Standard methods of analysis.
10. A.I. Vogel -A text book of quantitative Inorganic analysis- ELBS.
11. H.H. Willard and H. Deal- Advanced quantitative analysis-Van Nostrand Co.
12. F.D. Snell &F.M. Biffen-Commercial methods of analysis - D.B. Taraporavala & sons.
13. 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.
14. G.Z. Weig - Analytical methods for pesticides, plant growth regulators and food additives – Vols I to VII.
15. S.L. Chopra & J.S. Kanwar- Analytical Agricultural Chemistry- Kalyani Publishers.
16. R.M. Upadhyay and N.L. Sharma -Manual of soil, plant, water and fertilizer analysis-Kalyani Publishers.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM.

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III B.SC.CHEMISTRY CLUSTER – VIII B-3

SEMESTER – VI

ANALYSIS OFAPPLIED INDUSTRIALPRODUCTS

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	02	00
2.	UNIT–II	02	01	00
3.	UNIT–III	02	01	01
4.	UNIT–IV	02	02	01
5.	UNIT–V	00	02	02
Total no of Questions		08	08	04

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

Time: 3 hours **Max. Marks: 60**

PART-A

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

4 x8 =32 Marks

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

(OR)

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

2. a) Give the procedure for the determination of iodine value and acid value in oil samples.

(OR)

b) Describethe analysisof benzene.

3. a) Discuss the analysis of ureaandDDT.

(OR)

b) Discuss the analysis of starchand paper.

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

(OR)

b) How are water gas and producer gas analyzed?

PART-B

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

5. How do you determine the moisture in soaps?
6. Give the procedure for the determination of total lead in paints.
7. Write a note on saponification value.
8. Explain the analysis of BHC.
9. How carbon monoxide is analysed in gases?
10. Explain the determination process of nitrogen in gases.
11. Describe the determination of lime in cement.
12. Describe the determination of silica in glass.

PART-C

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

4 x2 =8 Marks

13. What is NPK fertilizer?
14. What is kerosene oil gas?
15. What is insoluble residue?
16. What is meant by total silica?

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GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL –VIII A

SEMESTER – VI - 2020-21

SYLLABUS FOR PRACTICAL – VIII A

45 Hours (3hr/wk)

5. Preparation of Aspirin
6. Preparation of Paracetamol
7. Preparation of Acetanilide
8. Preparation of Barbituric Acid
9. Preparation of Phenyl azo β-naphthol

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL –V IIIB

SEMESTER – VI - 2020-21

SCHEME OF VALUATION FOR PRACTICAL - VIIIB

Max. Marks: 50 Marks **Time:** 3 hrs.

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

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL –VIII B

SEMESTER – VI - 2020-21

SYLLABUS FOR PRACTICAL – VIII B

45 Hours (3hr/wk)

4. Electrochemistry:

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

5. 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.

6. Colorimetry:
   i) Verification of Beer-Lambert law for KMnO4 and determination of concentration of the given solution.
   ii) Verification of Beer-Lambert law for $K_2Cr_2O_7$ and determination of concentration of the given solution.
   iii) Verification of Beer-Lambert law for CuSO4 and determination of concentration of the given solution.
   iv) Composition of complex of Cu^{2+}-EDTA disodium salt.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL –VIII B

SEMESTER – VI - 2020-21

SCHEME OF VALUATION FOR PRACTICAL – VIII B

Max. Marks: 50 **Time:** 3 hrs.

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

Splitting of Practical Marks

x) Procedure in first 10 min. **:** 5 Marks

xi) Formula with units **:** 5 Marks

xii) Neat tabulation & correct calculation **:** 5 Marks

Error < 10% **:** 20 Marks

Error 10-15 % **:** 15 Marks

Error > 15 % **:** 10 Marks (Minimum Marks)

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL –VIII C

SEMESTER – VI - 2020-21

SYLLABUS FOR PRACTICAL – VIII C (PROJECT WORK)

INTELLECTUAL PROPERTY RIGHTS:

Concept and fundamentals of IPR, need and economic importance of IPR, description of various IP Properties (Patents, Trademarks, Copyrights, Geographical Indications Industrial Designs and Trade secrets), factors affecting IP protection, trade related aspects of IPR, concepts behind GATT, WTO, TRIPS, TRIMS and GATS. **9 h**

UNIT-II: R & D AND TECHNOLOGY TRANSFER:

Role of R&D, functional structure of R&D, unit research strategies and manufacturing interface, laboratory-industry interface, technology transfer

UNIT-III: QUALITY CONTROL:

Concept of quality and quality control, Design of QC laboratory for chemical, instrumental and microbiological laboratories, schedule L1, standardization of reagents, labeling of reagents, control samples, data generation and storage, QC documentation, sampling techniques, sampling plans, steps to improve quality with reference to ISO and TQM, preparation of control charts,

UNIT-IV: QUALITY ASSURANCE:

Concepts of Quality Assurance, Total Quality Management, concept of GMP and cGMP, Premises: Location, design, plant layout, construction, maintenance of sterilite areas, control of contamination.

UNIT-V: INDUSTRIAL STANDARDS AND CONTROL:

Government standards like Agmark, Hallmark, ISI, MINAS, IP, BP, USP; an introduction of ISO, OSHA, CDSCO, USFDA, ICH, FPO, MHRA, SUPAC

Suggested Books:

- Harold Koontz, H. Weihrich, and A.R. Aryasri, Principles of Management, Tata McGraw-Hill, New Delhi, 2004.
- Dr. B. L. Wadhera-Intellectual Property Law Handbook, Universal Law Publishing Co. Ltd. 2002.
- Handbook of Small Scale Industry by P.M. Bhandari.
- Dr. T Ramakrishna -Ownership and Enforcement of Intellectual Property Rights, CIPRA, NSLIU-2005.
- Intellectual Property Law (Bare Act with short comments) - Universal Law Publishing Co. Ltd. 2007.
- The Trade marks Act 1999 (Bare Act with short comments) - Universal Law Publishing Co. Ltd. 2005.

• The Patents Act, 1970 (Bare Act with short comments) - as amended by Patents (Amendment) Rules
2006 w.e.f. 5-5-2006. Commercial law publishers (India) Pvt. Ltd. 2006.

• Thomas T Gordon and Arthur S Cookfair -Patent Fundamentals for Scientist and Engineers, CRC Press 1995.
• Prabuddha Ganguli -Intellectual Property Rights, TMHPublishing Co. Ltd.2001
• Steinborn L. GMP/ISO Quality Audit Manual for Healthcare Manufacturers and Their Suppliers, Sixth
Edition, (Volume 1 with Checklists and Software Package). Taylor & Francis; 2003.

• Hoyle D. ISO 9000 Quality Systems Handbook -updated for the ISO 9001:2008 standards. Routledge;
2012.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

III B.Sc., ANALYTICAL CHEMISTRY PRACTICAL –VIII C

SEMESTER – VI - 2020-21

SCHEME OF VALUATION – VIII C (PROJECT WORK)

PROCESS OF PROJECT WORK:

- **Four weeks duration for multi-disciplinary training in the institution.**
- **Each candidate has to submit a project report after completion.**
- **One Faculty member has to supervise the above process.**

GOVERNMENT COLLEGE (A)
RAJAMAHENDRAVARAM

(Accredited by NAAC "A" Grade)

UG BOARD OF STUDIES - 2020-21

DEPARTMENT OF CHEMISTRY

For the Academic Year 2020-21

B.Sc CHEMISTRY (HONOURS)

On th April, 2020

Curriculum for the Academic Year 2020-21

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
B.Sc. CHEMISTRY (HONOURS) COURSE
SYLLABUS FROM THE ACADEMIC YEAR 2019-20

SEMESTER I **PAPER-IA**

CHEMISTRY - C I: INORGANIC CHEMISTRY-I **60 Hours**

Atomic Structure **(14 hrs)**

Recapitulation of Bohr's theory, its limitations and atomic spectrum of hydrogen atom, photoelectric effect, Compton Effect. Wave mechanics: Planck's quantum theory, de Broglie equation, Heisenberg's Uncertainty Principle and its significance.

Derivation of Schrödinger's wave equation, significance of ψ and ψ^2, Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Shapes of *s*,*p*, *d* and *f* orbitals.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, aufbau principle and its limitations. Electronic configurations of the elements and some exceptional electronic configurations.

Periodicity of Elements **(16 hrs)**

Brief discussion of the following properties of the elements, with reference to *s* & *p*-block and the trends shown:

(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

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(b) Atomic and ionic radii

(c) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization enthalpy and trends in groups and periods.

(d) Electron gain enthalpy and trends in groups and periods.

(e) Electronegativity, Pauling's/ Allred Rochow's scales. Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity.

Chemical Bonding-I **(14 hrs)**

(i) *I onic bond:* General characteristics, types of ions, size effects, radius ratio rule and its

limitations. Packing of ions in crystals.Lattice energy, Born-Landé equation without derivation and importance of Kapustinskii expression for lattice energy. Born-Haber cycle and its application, Solvation energy.

(ii) *Covalent bond:* Valence shell electron pair repulsion theory (VSEPR), lone pairs and bond pairs of electrons: H2O, NH3, PCl3, PCl5, SF6, ClF_3, $I3^-$, BrF_2^+, PCl_6^-, ICl_2^-, ICl_4^- and SO_4^{2-}, Effect of Multiple bonds. Lewis structure, Formal charge, Resonance and resonance energy, Valence Bond theory (Heitler-London approach), Concept of hybridization with $BeCl_2$, BF_3, CH_4, PCl_5, ClF_3, BrF_5, XeF_2, equivalent and non-equivalent hybrid orbitals.

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Chemical Bonding-II **(16 hrs)**

Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N2, O2, C2, B2, F2, CO, NO, and their ions; HCl (idea of s-p mixing and orbital interaction to be given).

Polarizing power and polarizability. Fajan's rules and consequences of polarization, Ionic character in covalent compounds.

Bond moment and dipole moment. Percentage ionic character from dipole moment and electronegativity difference.

(iii) Metallic Bond: Qualitative idea of valence bond, Free-electron theory and band theories. Semiconductors and insulators, defects in solids.

(iv) Weak Chemical Forces: Van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction. Hydrogen bonding and its applications. Effects of weak chemical forces, melting and boiling points, solubility, energetics of dissolution process.

Reference Books:

• Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010
• Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.
• Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970
• Shriver, D.D. & P. Atkins, *Inorganic Chemistry 2nd Ed.,* Oxford University Press, 1994.
• Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.

I B.Sc. CHEMISTRY (Hons) SEMESTER -I

MODEL QUESTION PAPER FROM 2019-20 ONWARDS

PAPER-IA: INORGANIC CHEMISTRY

TIME: 21/2hr. MARKS: 50 M

PART -A

Answer ALL the Questions 4x7 = 28 M

1. Derive Schrodinger's wave equation.Explain significance of ψ and ψ^2?

(OR)

What are the postulates of Bohr's theory? Discuss the importance of this model to Explain atomic spectrum of hydrogen atom?

2. How do the following properties change in group and period? Explain with example 1.Ionization energy 2. Electron gain enthalpy 3. Atomic radius

OR

Define IE_1 and IE_2. Why is $IE_2 > IE_1$for a given atom? Discuss factors that affect ionisation potential of of an element.

3. What is lattice energy? Write about Born-Haber cycle. Calculate lattice energy of NaCl crystal from the following data by the use of born habit cycle.
   Sublimation energy (S) = 10 8.7 kj mol^-
   Dissociation energy for Cl_2 = 22.59 kj mol^-
   Ionization energy of Na (g) = 489.5 kj mol^-
   Electron affinity for Cl (g) = - 351.4 kj mol^-
   Heat of formation of NaCl (ΔH_f) = - 414.2 kj mol^-

OR

How do you explain the geometry of the molecules CH_4, PCl_5 on the basis of valence bond theory? **242**

4. What is LCAO method? Explain the molecular orbital diagrams of molecules a) O_2 b) N_2.Calculate the respective bond order. Write magnetic nature of N_2 and O_2 molecules?

OR

What is polarising power and polarizability? State Fajan's rules and write applications of Fajan's rules?

PART – B

Answer any **FOUR** Questions **4x4= 16 M**

5. Describe different types of defects in crystals.
6. Write a note about photoelectric effect.
7. Explain Slater rules?
8. Explain structure of NH3 on VSEPR?
9. Write rules for writing Lewis structure?
10. Write Quantum Numbers and their significance.
11. Mention factors affecting Ionization enthalphy.
12. What are semiconductors and insulators? Give one example for each.

PART – B

Answer all Questions 3**x2= 6 M**

13. What is compton affect?
14. What is solvation energy?
15. Differentiate Polarizing power and Polarizability.

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

B.Sc. FIRST YEAR CHEMISTRY SEMESTER -I

MODEL QUESTION PAPER BLUE PRINT

FROM 2019-20 ONWARDS

PAPER-IA: INORGANIC CHEMISTRY

PART -A 4x7 = 28 M

Answer ALL the Questions

1. A (OR) B from Unit- I
2. A (OR) B from Unit- II
3. A (OR) B from Unit -III
4. A (OR) B from Unit- IV

PART – B

4x4 = 16 M

Answer any FOUR Questions

5. **Unit- I**
6. **Unit- I**
7. **Unit- II**
8. **Unit- II**
9. **Unit- III**
10. **Unit- III**
11. **Unit- IV**
12. **Unit- IV**

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PART – C

3x2 = 06 M

Answer all Questions

13. Unit- I
14. Unit- III
15. Unit- IV

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GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

I B.Sc. CHEMISTRY (HONOURS) SEMESTER -I

MODEL QUESTION PAPER BLUE PRINT

FROM 2019-20 ONWARDS

PAPER - IA

(INORGANIC CHEMISTRY)

S.No.	Chapter	Essay questions (07 M) Knowledge/ skill	Short answer questions (04 M) understanding	Very Short Answer Questions (2 M) application
1	Unit-I	01	02	01
2	Unit-II	01	02	-
3	Unit-III	01	02	01
4	Unit-IV	01	02	01
	Total number of questions	04	08	03

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
B.Sc. CHEMISTRY (HONOURS) COURSE
SYLLABUS FOR PRACTICAL
SEMESTER-I **PRACTICAL-IA**

TITRIMETRIC ANALYSIS

Practical C – I Lab: 45 Lectures

(A) Titrimetric Analysis

(i) Calibration and use of apparatus

(ii) Preparation of solutions of titrants of different Molarity/Normality

(B) Acid-Base Titrations

Principles of acid-base titrations to be discussed.

(i) Estimation of sodium carbonate using standardized HCl.

(ii) Estimation of carbonate and hydroxide present together in a mixture.

(iii) Estimation of carbonate and bicarbonate present together in a mixture.

(iv) Estimation of free alkali present in different soaps/detergents

LABORATORY COURSE -IA

PRACTICAL - 1A : 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)

Govt. College (Autonomous), Rajahmundry
Department Of Chemistry
Syllabus for B.Sc. Chemistry (Honours)
SEMESTER I
PAPER – IB: PHYSICAL CHEMISTRY-I

Theory: 60 hrs

UNIT-I **(18 hrs)**

1. Gaseous state: Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities.

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure and temperature for different gases. Causes of deviation from ideal behaviour. van der Waals equation of state, its derivation and application in explaining real gas behaviour, calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states. Liquefaction of gases: Joule-Thomson effect.

UNIT-II **(6 hrs)**

2. Liquid state: Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

UNIT-II **(16 hrs)**

3. Solid state: Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl.

UNIT-IV **(20 hrs)**

4. Ionic equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono and diprotic acids. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations.

Reference Books:

- Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press 13 (2006).
- Poori and Sharma Physical Chemistry
- Ball, D. W. Physical Chemistry Thomson Press, India (2007).
- Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
- Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY

DEPARTMENT OF CHEMISTRY

B.SC. CHEMISTRY (HONOURS) SEMESTER I

MODEL QUESTION PAPER FOR PAPER-IB

(PHYSICAL CHEMISTRY-I)

Part- A

Time: 21/2 hrs **Marks: 50 Marks**

Answer all Questions 4x7=28M

1. Write the postulates and derivation of Kinetic Theory of Gases.

(OR)

Explain the relation between Critical constants and Vanderwaals constants.

2. Explain the determination and Temperature variation of Viscosity of Liquids.

(OR)

What is Surface Tension? Mention any one method for the determination of Surface Tension of Liquids.

3. a) Write about Miller Indices.
   b) Determine the Miller Indices for a Plane when the intercepts along the axes are 2a, 3b and 2c.

(OR) **250**

Write a simple account of Rotating Crystal Method and Powder Pattern Method.

4. What is degree of ionization? Explain the factors affecting the degree of ionization.

(OR)

What are acid-base indicators? Explain any one theory of acid-base indicators.

Part- B

Answer any Four Questions 4x4= 16M

5. Write about Mean Free Path.

6. Derive law of corresponding states.

7. Explain cleansing action of detergents.

8. Write about any two symmetry elements.

9. Derive Bragg's equation.

10. What is common ion effect? Give one example.

11. Mention any two applications of solubility product.

12. Explain types of salt hydrolysis.

Part- C

Answer all Questions 3x2= 6M

13. What is compressibility Factor?

14. What are Bravis lattices?

15. What is Buffer solution? Give one example.

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GOVERNMENT COLLEGE (A), RAJAHMUNDRY.

I B.Sc. CHEMISTRY (HONOURS) SEMESTER -I

MODEL QUESTION PAPER BLUE PRINT

FROM 2019-20 ONWARDS

PAPER - IB

(PHYSICAL CHEMISTRY)

S.No.	Chapter	Essay questions (07 M) Knowledge/ skill	Short answer questions (04 M) understanding	Very Short Answer Questions (2 M) application
1	Unit-I	01	02	01
2	Unit-II	01	02	-
3	Unit-III	01	02	01
4	Unit-IV	01	02	01
	Total number of questions	04	08	03

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
B.Sc. CHEMISTRY (HONOURS) COURSE
SYLLABUS FOR PRACTICALS

SEMESTER-I **PARACTICAL-IB**

PHYSICAL CHEMISTRY PRACTICALS

1. Surface tension measurements using Stalagmometer.
   a) Determine the surface tension by drop number method.
   b) Study the variation of surface tension with different concentration of detergent solutions. Determine CMC.

2) Viscosity measurement using Ostwald's viscometer.
   a) Determination of co-efficient of viscosity of an unknown aqueous solution.
   b. Study the variation of viscosity with different concentration of sugar solutions.

3) Indexing of a given powder diffraction pattern of a cubic crystalline system.

4) Study the effect of addition of HCl/NaOH on pH to the solutions of acetic acid, sodium acetate and their mixtures.

5) Preparation of buffer solutions of different pH values i. Sodium acetate-acetic acid ii. Ammonium chloride-ammonium hydroxide

6) pH metric titration of (i) strong acid with strong base, (ii) weak acid with strong base. Determination of dissociation constant of a weak acid.

Reference Books:

• Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
• Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).
• Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY

B.Sc. CHEMISTRY (HONOURS) COURSE

SCHEME OF VALUATION FOR PRACTICALS

SEMESTER-I **PARACTICAL-IB**

PHYSICAL CHEMISTRY PRACTICALS

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)

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF CHEMISTRY

SYLLABUS FOR I B.SC.(HONOURS) CHEMISTRY, II SEMESTER

FROM 2019 – 2020 ONWARDS

PAPER – IIA : ORGANIC CHEMISTRY - I

Total Hours: 60

UNIT-I: BASICS OF ORGANIC CHEMISTRY & SATURATED HYDROCARBONS

15 Hours

BASICS OF ORGANIC CHEMISTRY: *9 Hours*

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties.

Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyper conjugation and their applications; Dipole moment; Organic acids and bases; their relative strength.

Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and their relative stability of Carbocation's, Carbanions, Free radicals and Carbenes.

Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions.

SATURATED HYDROCARBONS: 6 Hours

A. Carbon-Carbon sigma bonds: Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation -relative reactivity and selectivity.

UNIT-II:CHEMISTRY OF UNSATURATED HYDROCARBONS **15 Hours**

B. Carbon-Carbon pi bonds: Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, Ozonolysis, reduction (catalytic and chemical), Syn and anti-hydroxylation (oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic Bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form

carbonyl compounds, Alkylation of terminal alkynes.

UNIT: III STEREOCHEMISTRY: 15 Hours

Geometrical isomerism: cis-trans and, Syn-anti isomerism E/Z notations with C.I.P rules. *Optical Isomerism:* Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

UNIT:IV CHEMISTRY OF ACYCLIC AND AROMATIC HYDROCARBONS: 15Hours

CYCLOALKANES AND CONFORMATIONAL ANALYSIS: 6 Hours

Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformation analysis of alkanes: Relative stability: Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams.

3. Chemistry of Aromatic Hydrocarbons: 9 Hours

Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocation's/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Reference Books:

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
10. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
11. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.
12. Kalsi, P. S. Stereochemistry Conformation and Mechanism; New Age International, 2005.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

DEPARTMENT OF CHEMISTRY

I B.SC.(HONOURS) CHEMISTRY II SEMESTER

BLUE PRINT FROM 2019-20 ONWARDS

PAPER-IIA: ORGANIC CHEMISTRY

Sl. NO.	Chapter	Essay Question (07 M) knowledge	Short Answer Question (04 M) Under standing	Very Short Answer Question (02 M) Skill / Application
1.	UNIT-I: BASICS OF ORGANIC CHEMISTRY & SATURATED HYDROCARBONS	02	02	--
2.	**UNIT-II: CHEMISTRY OF UNSATURATED HYDROCARBONS**	02	02	01
3.	**UNIT : III STEREO CHEMISTRY**	02	02	01
4.	**UNIT:IV CHEMISTRY OF ACYCLIC AND AROMATIC HYDROCARBONS**	02	02	01
Total no of Questions		08	08	03

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

DEPARTMENT OF CHEMISTRY

I B.SC.(HONOURS) CHEMISTRY II SEMESTER

MODEL QUESTION PAPER FROM 2019-20 ONWARDS

PAPER-IIA: ORGANIC CHEMISTRY-I

SECTION - A

Time: 2 ½ hrs **Marks: 50 M**

Answer all Questions **4 X 7 = 28 M**

1) Describe different types of organic reactions with suitable examples.

(or)

What is Inductive effect? How it explain the acidity of different carboxylic acids and basicity of amines.

2) Describe different types of Elimination reactions (E_1, E_2, E_{1cb}) with mechanism.

(or)

a) Write the classification of Dienes. Write a note on 1,2 and 1,4 addition reaction in conjugated Dienes.

b) Diels – Alder reaction.

3) Explain Geometrical and Optical Isomerism.

(or)

Explain Racemic mixture and Resolution.

4) Write any two methods of preparation of Cycloalkanes and explain Bayer's strain theory.

(or)

Explain the mechanism of th3e following reactions in Benzene ring.

4

a) Nitration b) Friedel-crafts alkylation c) Friedel-crafts acylation

SECTION – B

Answer any four questions. 4x4 = 16 M

5) What if hyper conjugation? Give one application.

6) Write wurtz and wurtz-fittig reactions

7) Write the reactions of alkenes with the following reagents:

a) HBr b) HBr in presence of peroxide.

8) Write about Hydroboration and Ozonolysis.

9) What are Enantiomers and Diastereomers? Give examples.

10) Write relative and absolute configuration.

11) Write about conformational analysis of cycloalkane and draw the energy diagram of cyclohexne

12) What is Aromaticity? Write the aromatic character of Arenes with suitable examples.

SECTION – C

Answer all questions. 3x2 = 6M

13) Define Carbenes. Give one example.

14) Explain acidity of Acetylenic Hydrogen.

15) Define ortho and para directing groups with suitable examples.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
I B.Sc. CHEMISTRY(HONOURS), II SEMESTER
PRACTICAL COURSE SYLLABUS FROM 2019-20 ONWARDS

PRACTICAL PAPER – IIA (ORGANIC CHEMISTRY)

45 Hrs. (3 H / W)

II. Organic Qualitative Analysis :

ii) Identification of an organic compound through the functional group analysis, determination of melting point/ boiling point and preparation of suitable derivatives.

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

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

I B.Sc. CHEMISTRY(HONOURS), II SEMESTER

LABORATORY COURSE – IIA: ORGANIC CHEMISTRY – I

SCHEME OF VALUATION

Total – 50 Marks
Record – 10 Marks **Practical – 40 Marks**

Break up of Practical – I (40 Marks)

Identification of function group of an organic compound (Systematic procedure should be adopted).

- Colour - 1 Marks
- Physical State - 1 Marks
- Odour - 1 Marks
- MP / BP - 2 Marks
- Ignition Test - 2 Marks
- Litmus Test - 2 Marks
- Solubility & Classification basing on solubility data - 5 Marks
- Detection of extra elements - 4 Marks (2 Marks for extract)
- Unsaturation Test (with bromine water and Bayer's Test) - 4 Marks
- Identification of functional group - 5 Marks
- Confirmatory test for function group (1 test)- 5 Marks
- Anyone derivative of the organic compound-4 Marks (1 X 4)

Report - 4 Marks

Total Marks - 40 Marks

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.

DEPARTMENT OF CHEMISTRY

SYLLABUS FOR I B.SC.(HONOURS) CHEMISTRY II SEMESTER

(wef 2019-20 onwards)

PAPER-IIB: PHYSICAL CHEMISTRY-II

COURSE CODE : CHH102 **Total Hours: 60**

Unit – I - PHASE EQUILIBRIA: **(16 Hours)**

Concept of phases, components and degree of freedom, derivation of Gibbs Phase Rule for Non- reactive and reactive systems; Clausius –Clapeyron equation and its applications to solid-liquid , liquid – vapour and solid – vapour equilibria, phase diagram for one component systems with applications.

Phase diagram for systems of solid – liquid equilibria involving eutectic, congruent and incongruent melting points, solid solutions.

UNIT – II - CHEMICAL KINETICS: **(14 Hours)**

Order and molecularity of a reaction, rate law in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions,

Theories of reaction rates – collision theory, Transition state theory, factors affecting reaction rates. Arrhenius equation.

UNIT – III - SURFACE CHEMISTRY: **(16 Hours)**

Adsorption: Physical adsorption, chemisorption, adsorption isotherms, Nature of adsorbed state.

Catalysis: Types of catalyst, specificity and selectivity, mechanisms of catalysed reactions at solid surfaces. Enzyme catalysis .Michaelis – Menten mechanism, acid-base catalysis.

UNIT – IV - VOLUMETRIC ANALYSIS: **(14 Hours)**

Definition: Titrimetry, Volumetric titrimetry, Gravimetric titrimetry. The equivalence point and End point.

Classification of Volumetric methods.

Principles – Acid – base titration – Redox titrations – Complexometric titrations – Precipitation titrations –Non aqueous solutions (Introduction only)

Types of Errors: Accuracy and Precision, Absolute and relative uncertainty, Gaussian distribution, mean and standard deviation, confidence intervals, significant figures.

GOVERNMENT COLLEGE (A) , RAJAMAHENDRAVARAM
DEPATMENT OF CHEMISTRY
MODEL QUESTION PAPER BLUE PRINT
FROM 2019-20 ONWARDS
PAPER-IIB PHYSICAL CHEMISTRY – II SEMESTER-II

S.No.	Chapter	Essay questions (7 M) Knowledge/ skill	Short answer question(4M) Understanding	Very short answer questions(2M) Applications
1	Unit-I	02	02	-
2	Unit-II	02	02	01
3	Unit-III	02	02	01
4	Unit-IV	02	02	01
Total number of questions		08	08	03

GOVERNMENT COLLEGE (A) , RAJAMAHENDRAVARAM
DEPATMENT OF CHEMISTRY
B.Sc., FIRST YEAR CHEMISTRY (HONORS) SEMESTER-II
MODEL QUESTION PAPER FOR PAPER-IIB
(wef 2019-20 onwards)
PAPER-IIB - PHYSICAL CHEMISTRY – II

Part-A

Time: 2 ½ hrs **Marks: 50 M**

Answer all Questions **4 X 7 = 28 M**

1. Derive the Clausius-Clapeyron equation and write the one application of liquid-vapour.

(OR)

What is incongruent melting point? Explain the system of solid-liquid ($NaCl-H_2O$) equilibria along with phase diagram.

2. What is rate of reaction? Derive the equation of second order reaction having same type of reactants.

(OR)

Write about simple collision theory of gaseous reactions.

3. What is adsorption isotherms? And derive the Langmuir adsorption isotherm.

(OR)

Derive the Michaelis-Menten equation.

4. Explain different types of Errors.

(OR)

Define complexometric titration and explain the method of complexometric titration by giving one example.

10

Part-B

Answer any FOUR Questions **4 x 4 =16 M**

5. Define congruent and incongruent melting point.
6. Derivation of Gibb's phase rule for reacting system.
7. Derive the equation of zero order reaction.
8. Derivation of Arrhenius equation.
9. Derive the equation of Freundlich Adsorption isotherm.
10. What is selectivity and specificity catalyst with one example each.
11. Explain Accuracy and Precision
12. Derive the Gaussian distribution law.

Part-C

Answer all Questions **3 X 2 = 6 M**

13. Write the effect of temperature on rate of reaction.
14. What is adsorption, adsorbate and adsorbent?
15. What is Redox titration and give one example.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. CHEMISTRY (HONORS) II SEMESTER LABORATORY COURSE

PRACTICAL PAPER –IIB FROM 2019-20 ONWARDS

LABORATORY COURSE –IIB

SYLLABUS FOR PRACTICAL -IIB: QUANTITATIVE ANALYSIS

2) Estimation of Acetic acid in Vinegar sample using standard HCl solution

3) Estimation of Fe(II) using $KMno_4$ with Oxalic acid As primary standard.

4) Estimation of Fe(II) using $K_2Cr_2O_7$.

5) Estimation of Ca using EDTA.

6) Estimation of Mg using EDTA.

7) Determination of hardness of water.

8) Nickel dimethyl glyoxime – Gravimetric Analysis.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

I B.Sc. CHEMISTRY (HONORS) II SEMESTER LABORATORY COURSE

PRACTICAL PAPER –IIB FROM 2019-20 ONWARDS

PRACTICAL -IIB: QUANTITATIVE ANALYSIS

SCHEME OF VALUATION

Max.Marks: 50 Marks **Time: 3 Hrs**

14) For Record 10 Marks
15) For Practical 40 Marks

Splitting of Practical Marks:

i)	Procedure in 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)

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
SYLLABUS FOR PAPER – IIIA INORGANIC CHEMISTRY
(with effect from 2020-21)

60 Hours

UNIT-I: GENERAL PRINCIPLES OF METALLURGY & s BLOCK ELEMENTS:

Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent.
Electrolytic Reduction, Hydrometallurgy with reference to cyanide process for silver and gold.
Methods of purification of metals: Electrolytic process, van Arkel-de Boer process and Mond's process, Zone refining.

Chemistry of s Block Elements:

i) General characteristics: melting point, flame colour, reducing nature, diagonal relationships and anomalous behaviour of first member of each group.

ii) Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water

(15 Hours)

UNIT-II: REACTIONS OF ALKALI AND ALKALINE EARTH METALS

(i) Common features such as ease of formation, thermal stability and solubility of the following alkali and alkaline earth metal compounds: hydrides, oxides, peroxides, superoxides, carbonates, nitrates, sulphates.
ii) Complex formation tendency of s-block elements; structure of the following complexes: crown ethers and cryptates of Group I; basic beryllium acetate, beryllium nitrate, EDTA complexes of calcium and magnesium.
iii) Solutions of alkali metals in liquid ammonia and their properties.

(15 Hours)

UNIT-III: CHEMISTRY OF P BLOCK ELEMENTS

14

Electronic configuration, atomic and ionic size, metallic/non-metallic character, melting point, ionization enthalpy, electron gain enthalpy, electronegativity, Allotropy of C, P, S; inert pair effect, diagonal relationship between B and Si and anomalous behaviour of first member of each group.

Acidic/Basic Nature, Stability, Ionic/Covalent Nature, Oxidation/Reduction, Hydrolysis, Action of Heat of the following:

- **Hydrides**: hydrides of Group 13 (only diborane), Group 14, Group 15 (EH_3 where E = N, P, As, Sb, Bi), Group 16 and Group 17.
- **Oxides**: oxides of phosphorus, sulphur and chlorine
- **Oxoacids**: oxoacids of phosphorus and chlorine; peroxoacids of sulphur
- **Halides**: halides of silicon and phosphorus

UNIT-IV: PREPARATION, PROPERTIES, STRUCTURE AND USES OF THE FOLLOWING COMPOUNDS:

- Borazine
- Silicates, silicones,
- Phosphonitrilic halides $\{(PNCl_2)_n$ where n = 3 and 4$\}$
- Interhalogen and pseudohalogen compounds
- Clathrate compounds of noble gases, xenon fluorides (MO treatment of XeF_2).

(15 Hours)

Reference Books:

1. Lee, J.D. Concise Inorganic Chemistry, Pearson Education 2010
2. Douglas, B.E., Mc. Daniel, D.H. & Alexander, J.J: Concepts & Models of Inorganic Chemistry 3rd Ed., John Wiley Sons, N.Y. 1994.
3. Greenwood, N.N. & Earnshaw: Chemistry of the Elements, Butterworth- Heinemann. 1997
4. Cotton, F.A. & Wilkinson, G: Advanced Inorganic Chemistry, Wiley, VCH, 1999.
5. Miessler, G. L. & Donald, A. Tarr: Inorganic Chemistry 3rd Ed.(adapted), Pearson, 2009
6. Shriver, D.F., Atkins P.W and Langford, C.H: Inorganic Chemistry 2nd Ed., Oxford University Press, 1994

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
MODEL PAPER FOR PAPER – IIIA INORGANIC CHEMISTRY
(with effect from 2020-21)

PART-A

Answer the following questions

1) (a) What are the methods for purification of metals and explain ?

(or)

(b) Write the reaction of alkali and alkali earth metals with Oxygen, Hydrogen, Nitrogen and Water?

2) (a) Write the thermal stability and solubility of the following alkali and alkali earth metal compounds in (a) oxides (b) peroxides (c) carbonates (d) sulphates

(or)

(b) Solutions of alkali metals in liquid ammonia and their properties?

3) (a) Explain following terms:

1. Atomic Size or Ionic Size
2. Ionization Enthalpy
3. Electron Gain Enthalpy
4. Electro Negativtivity

(or)

(b) Explain in detail about Diborane?

4) (a) Write the preparation, properties, structure and use of Borazine?

(or)

(b) Write about Inter halogen and Pseudohalogen compounds?

PART-B

Answer any four questions 4x4 = 16 Marks

5) What is hydrometallurgy with reference to cyanide process for silver and gold?
6) Write about general characteristics of s-block elements?
7) Explain EDTA complex formation tendency of s-block elements?
8) What is diagonal relationship between B and Si and explain anomalous behaviour of first member of each group ?
9) Explain the allotropy of carbon?
10) Write the oxidation and reduction properties of Phosphorous?

11) Writethepreparationandpropertiesof Silicones

12) DrawthestructureofXenonFluoride(XeF2)andwriteitsuses?

PART-C

Answer all the questions **3x2=6 Marks**

13) Define metallurgy?

14) What is inert pair effect?

15) What are Nobel gases? And in which group they are present in the periodic table?

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GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
BLUE PRINT FOR PAPER – IIIA INORGANIC CHEMISTRY
(with effect from 2020-21)

Sl. NO	Chapter	Essay Questions (07 Marks) Knowledge	Short Answer Question (04 Marks) understanding	Very Short Answer Question (02 Marks) Skill/Application
1	General Principles of Metallurgy & s Block Elements	02	02	01
2	Reactions of Alkali And Alkaline Earth Metals	02	02	01
3	Chemistry o P Block Elements	02	02	01
4	Preparation, Properties, Structure and Uses	02	02	-
Total no of questions		08	08	03

18

60 Hours

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
SYLLABUS FOR INORGANIC PRACTICALS LAB-IIIA
(with effect from 2020-21)

(A) Iodo / Iodimetric Titrations

(i) Estimation of Cu(II) and $K_2Cr_2O_7$ using sodium thiosulphate solution (Iodometrically).

(ii) Estimation of antimony in tartar-emetic iodimetrically

(B) Complexometric titrations using disodium salt of EDTA

(i) Estimation of Mg^{2+}, Zn^{2+}
(ii) Estimation of Ca^{2+} by substitution method

(C) Inorganic preparations

(i) Cuprous Chloride, Cu_2Cl_2

(ii) Manganese(III) phosphate, $MnPO_4.H_2O$

(iii)Aluminium potassium sulphate $KAl(SO_4)_2.12H_2O$ (Potash alum) or Chrome alum.

Reference Books:

Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS. 1978
Marr, G. and Rockett, R.W. Practical Inorganic Chemistry, Van Nostrand Reinhold. 1972.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
SCHEME OF VALUATION FOR INORGANIC PRACTICALS LAB-IIIA
(with effect from 2020-21)

Max Marks: 50 **Time: 3 Hours**

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: 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 (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
SYLLABUS FOR ORGANIC CHEMISTRY PAPER-IIIB
(with effect from 2020-21)

60 Hours

UNIT-I: CHEMISTRY OF HALOGENATED HYDROCARBONS 16 Hours

Alkyl Halides: Methods of preparation and properties, nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereo chemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination.

Aryl Halides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; SNAr, Benzyne mechanism.

Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Organometallic compounds of Mg (Grignard reagent) – Use in synthesis of organic compounds.

UNIT-II: ALCOHOLS, PHENOLS, ETHERS AND EPOXIDES 16 Hours

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouvaelt-BlancReduction; Oxidation of diols by periodic acid and lead tetra acetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$

UNIT-III: CARBONYL COMPOUNDS 16 Hours

21

Structure, Reactivity, Preparation and Properties;

Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann and Benzil Benzilic acid rearrangements, Haloform reaction and Baeyer Villiger oxidation, α - substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner,$LiAlH_4$, $NaBH_4$, MPV, PDC)
Addition reactions of α, β- unsaturated carbonyl compounds: Michael addition.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.

UNIT-IV: CARBOXYLIC ACIDS AND THEIR DERIVATIVES 12 Hours

General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituents on acidic strength. Typical reactions of dicarboxylic acids , hydroxy acids and unsaturated acids.

Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dickmann and Reformatsky reactions, Hofmann- bromamide degradation and Curtius rearrangement.

Reference Books:

•Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
•Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education). •Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
BLUE PRINT FOR ORGANIC CHEMISTRY PAPER-IIIB
(with effect from 2020-21)

Sl. NO	Chapter	Essay Questions (07 Marks) Knowledge	Short Answer Question (04 Marks) understanding	Very Short Answer Question (02 Marks) Skill/Application
1	Chemistry of halogenated hydrocarbons	02	02	02
2	Alcohols, phenols, ethers & epoxides	02	02	02
3	Carbonyl compounds	02	02	-
4	Carboxylic acids and their relatives	02	02	02
Total no of questions		08	08	06

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM B.Sc.
CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
MODEL QUESTION PAPER FOR ORGANIC CHEMISTRY PAPER-IIIB
(with effect from 2020-21)

SECTION-A

(4X7 = 28 Marks)

Answer ALL questions

1. (a) Discuss the mechanism and stereo chemistry of SN^1 &SN^2 reactions taking with suitable examples

   OR

   (i) How are alkyl halides prepared?
   (ii) Write any four chemical properties of alkyl halides with suitable examples
2. (a) How will you distinguish among primary, secondary and tertiary alcohols

   OR

   (b) Write two methods of preparation of phenol. How phenol can be converted into
   (i) Phenyl ethyl ether (ii) Salicylaldehyde (iii) Phenyl acetate (iv) Picric Acid
3. (a) (i) Explain Cannizzaro reaction and aldol condensation
   (ii) How do you differentiate aldehydes and ketones?

   OR

   (b) Write short notes on (i) Benzoin condensation (ii) Give mechanism of nucleophilic addition reaction with one example
4. (a) (i) Give any three methods of preparation of carboxylic acid
   (ii) What happens when (1) acetic acid reacts with PCl_5 and (2) benzoic acid is treated with conc H_2SO_4 and conc HNO_3?

   OR

   (b) What happens when (i) formic acid reacts with Tollen's reagent (ii) ammonium acetate is heated with P_2O_5.

24

SECTION-B

(4X4 = 16 Marks)

Answer any four questions

5. Discuss the relative reactivity of alkyl halides and aryl halides
6. The order of reactivity towards hydrolysis is ally bromide>ethyl bromide>vinyl bromide discuss
7. How is glycerol prepared? Mention its uses?
8. Write about the industrial significance of ethanol and phenol?
9. What is Perkin reaction and give mechanism
10. What is Clemmensen reduction and Wolf-Kishner reduction
11. What is Hell-Volhard-Zelinsky (HVZ) reaction explain with example
12. How do you prepare urea and give its properties and uses

SECTION-C

(3X2 = 6 Marks)

Answer any three questions

13. How will you distinguish p-chlorotoulene and benzyl chloride?
14. What is organic metallic compound?
15. Why phenol is acidic and alcohols are neutral
16. What is esterfication and give suitable examples
17. What is HVZ reaction?
18. What is the strong acid formic or propionic?

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
SYLLABUS FOR ORGANIC CHEMISTRY PRACTICAL-IIIB
(with effect from 2020-21)

: 60 Hours

1. Functional group tests for alcohols, phenols, carbonyl and carboxylic acid group.
2. Organic preparations:

Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any one method:

Using conventional method.
Using green approach

Benzolyation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m, p-anisidine) and one of the following phenols (β -naphthol, resorcinol, p- cresol) by Schotten-Baumann reaction.

Oxidation of ethanol/ isopropanol (Iodoform reaction). iv. Selective reduction of meta dinitrobenzene to m-nitroaniline. v. Hydrolysis of amides and esters.

Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.

S-Benzylisothiouronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid).

Aldol condensation using either conventional or green method.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization and melting point.

Reference Books:

•Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
•Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
•Ahluwalia, V.K. &Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
•Ahluwalia, V.K. &Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
B.Sc. CHEMISTRY (HONOURS) SECOND YEAR III SEMESTER,
ORGANIC CHEMISTRY PRACTICAL-IIIB
(with effect from 2020-21)
SCHEME OF VALUATION

Total – 50 Marks
Record – 10 Marks **Practical – 40 Marks**

Break up of Practical – I (40 Marks)

Identification of function group of an organic compound (Systematic procedure should be adopted).

- Colour - 1 Marks
- Physical State - 1 Marks
- Odour - 1 Marks
- MP / BP - 2 Marks
- Ignition Test - 2 Marks
- Litmus Test - 2 Marks
- Solubility & Classification basing on solubility data - 5 Marks
- Detection of extra elements - 4 Marks (2 Marks for extract)
- Unsaturation Test (with bromine water and Bayer's Test) - 4 Marks

Identification of functional group - 5 Marks

- Confirmatory test for function group (1 test)- 5 Marks
- Anyone derivative of the organic compound- 4 Marks (1 x 4)

Report - 4 Marks

Total Marks - 40 Marks

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
II B.Sc CHEMISTRY (HONOURS)– SEMESTER-III
SYLLABUS FOR PHYSICAL CHEMISTRY IIIC

60 Lectures

Conductance: Quantitative aspects of Faraday's laws of electrolysis Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at 29 infinite dilution. Kohlrausch law of independent migration of ions. Debye-Hückel-Onsager equation, Wien effect,

Debye-Falkenhagen effect, Walden's rules. Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods. Applications of conductance measurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii) solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v)

hydrolysis constants of salts. **(18 Lectures) Chemical Kinetics:** Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws, kinetics of complex reactions (integrated rate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions and (iii) consecutive reactions and their differential rate equations (steady-state approximation in reaction mechanisms) (iv) chain reactions.
Temperature dependence of reaction rates; Arrhenius equation; activation energy. Collision theory of reaction rates, Lindemann mechanism, qualitative treatment of the theory of absolute reaction rates. **(22 Lectures)**

Catalysis: Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces. Enzyme catalysis, Michaelis-Menten mechanism, acid-base catalysis.

(8 Lectures)

Photochemistry: Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws, of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitised reactions, quenching. Role of photochemical 34 reactions in biochemical processes, photostationary states,

chemiluminescence. **(12 Lectures)**

Reference Books:

- Atkins, P.W & Paula, J.D. Physical Chemistry, 9th Ed., Oxford University Press (2011).
- Castellan, G. W. Physical Chemistry 4th Ed., Narosa (2004).
- Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier: NOIDA, UP (2009).
- Barrow, G. M., Physical Chemistry 5th Ed., Tata McGraw Hill: New Delhi (2006).
- Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall (2012). • Rogers, D. W. Concise Physical Chemistry Wiley (2010).
- Silbey, R. J.; Alberty, R. A. & Bawendi, M. G. Physical Chemistry 4th Ed., John Wiley & Sons, Inc. (2005).

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
II B.Sc CHEMISTRY (HONOURS)– SEMESTER-III
CHEMISTRY-C X: PHYSICAL CHEMISTRY IIIC
MODEL QUESTION PAPER

Section-A

(4X8 = 32 Marks)

Answer ALL questions

19. (a) Define the equivalent and molar conductivity and write the effect of dilution of weak and strong electrolytes on conductance

OR

(b) Determine the transference number by Hittorf method

20. (a) Explain briefly about second order kinetics

OR

(b) Write the collision theory of reaction rates

21. (a) Explain the enzyme catalysis by Michael-Menten mechanism

OR

(b) Explain the kinetics of acid-base catalysis

22. (a) Write about beer's-lambart law and its limitations

OR

(b) Define the quantum yield and explain about various types of quantum yields with examples

Section-B

(5X4 = 20Marks)

Answer any Five questions

23. Write about kohl-rausch law
24. Wxplain about conductometric titrations of weak acid vs strong Base
25. Write about kinetics of opposing reactions
26. Write about Lindemann theory
27. Explain abut specificity and selectivity in terms of catalysts
28. Explain the steady-state approximation with examples
29. Write the role of photo chemical reactions in biochemical process
30. Write about chemiluminescence

Section-C

(4X2 = 8 Marks)

Answer all the questions

31. Define the ionic mobility and transport number of electrolytes
32. Define the order and molecularity of the reactions
33. Write about half life times of first order and second order kinetics
34. Write about zeroth law of photo chemistry

Practical C – X Lab : 60 Lectures **Conductometry:**

I. Determination of cell constant

II. Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant of a weak acid.

III. Perform the following conductometric titrations: i. Strong acid vs. strong base ii. Weak acid vs. strong base iii. Mixture of strong acid and weak acid vs. strong base iv. Strong acid vs. weak base

Chemical Kinetics:

IV. Study the kinetics of the following reactions.

1. Iodide-persulphate reaction (i) Initial rate method; (ii)Integrated rate method
2. Acid hydrolysis of methyl acetate with hydrochloric acid.
3. Saponification of ethyl acetate.
4. Comparison of the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate.

Reference Books:

- Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

- Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).

- Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

CHEMISTRY - C VIII: INORGANIC CHEMISTRY IVA

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures Coordination

Chemistry:

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, Polynuclear complexes, Labile and inert complexes.

(26 Lectures)

Transition Elements:

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series.

Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the following compounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassium ferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

(14 Lectures)

Lanthanoids and Actinoids:

Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

(6 Lectures)

Inorganic Reaction Mechanism

Introduction to inorganic reaction mechanisms. Substitution reactions in square planar complexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

CHEMISTRY - C VIII: INORGANIC CHEMISTRY III

I. Write the answers of the following essay questions.

1. Explain the crystal field theory. Explain the splitting of d-orbitals in tetrahedral complex compounds.
2. Explain outer orbital complexes on the basis of valence bond theory.
3. Define stereo isomerism. Explain the stereo isomerism in coordination number with six complex compounds.
4. Explain Jahn-Teller theorem.
5. Write the similarities and differences between the first, second and third transition series.
6. What are transition elements? Explain the magnetic and catalytic properties of transition elements.
7. What are lanthanides? Write short note on electronic configuration, oxidation states and colour properties of lanthanides.
8. Explain the reaction mechanism of substitution reactions in square planar complexes.

II. Write the answers of the following short questions.

9. Give postulates of Werner's theory.
10. Write short note on ligand field theory.
11. What is chelate effect? Give example.
12. Calculate the oxidation and coordination number of the following complexes.

    I). Ni (CO) 4 II). $[Fe (CN) 6]^{+3}$

13. Short note on peroxo compounds of chromium. **32**

14. Write the separation of lanthanides by ion-exchange method.
15. Write the structure and oxidation number in sodium nitroprusside and sodium Cobaltinitrite.
16. Explain Trans- effect with example.

III. Write the answers of the following very short questions.

17. Define labile and inert complexes.
18. Write the different oxidation states of manganese.
19. Lanthanide contraction.
20. Short notes on kinetic stability in inorganic reaction mechanism.

Practical C – VIII Lab:

60 Lectures

Gravimetric Analysis:

i. Estimation of nickel (II) using Dimethylglyoxime (DMG).
ii. Estimation of copper as CuSCN iii. Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$.
iv. Estimation of Al(III) by precipitating with oxine and weighing as $Al(oxine)_3$ (aluminium oxinate).

Inorganic Preparations:

i. Tetraamminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$ ii. Acetylacetonate complexes of Cu^{2+}/Fe^{3+} iii. Tetraamminecarbonatocobalt (III) nitrate iv. Potassium tri(oxalato)ferrate(III)

Properties of Complexes

i. Measurement of 10 Dq by spectrophotometric method ii. Verification of spectrochemical series. iii. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g. bidentate ligands like acetylacetone, DMG, glycine) by substitution method.

Reference Book:

- Vogel, A.I. A text book of Quantitative Analysis, ELBS 1986.
- G. Marr and B.W. Rockett, Practical Inorganic Chemistry, Van Nostrand Reinhold. 1972

Theory: 60 Lectures

Nitrogen Containing Functional Groups

Preparation and important reactions of nitro compounds, nitriles and isonitriles.

Amines: Preparation and properties: Effect of substituent and solvent on basicity; Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction; Distinction between 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.

Diazonium Salts: Preparation and their synthetic applications.

(18 Lectures) Polynuclear Hydrocarbons

Aromaticity of polynuclear hydrocarbons, structure elucidation of naphthalene; Preparation and properties of naphthalene, phenanthrene and anthracene.

(8 Lectures) Heterocyclic Compounds

Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Indole(Fischer indole synthesis and Madelung synthesis),

Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis, Bischler-Napieralski reaction, Pictet-

Spengler reaction, Pomeranz-Fritsch reaction)

(22 Lectures)

Alkaloids

Natural occurrence, General structural features, Isolation and their physiological action,Hoffmann's exhaustive methylation, Emde's modification; Structure elucidation and synthesis of Nicotine. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine.

(6 Lectures)

Terpenes

Occurrence, classification, isoprene rule; Elucidation of stucture and synthesis of Citral.

(6 Lectures)

Reference Books:

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

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

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

•Acheson, R.M. Introduction to the Chemistry of Heterocyclic compounds, John Welly& Sons (1976).

•Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.

•Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.

•Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.

•Singh, J.; Ali, S.M. & Singh, J. Natural Product Chemistry, PrajatiParakashan (2010).

GOVERNMENT COLLEGE (A),RAJAMAHENDRAVARAM
DEPARTMENT OF CHEMISTRY
II B.Sc.(HONOURS) CHEMISTRY IV-SEMESTER
MODEL QUESTION PAPER FROM 2020 -21 ONWARDS
CHEMISTRY –C IX : ORGANIC CHEMISTRY – III

Time : $2^{1}/_{2}$ hrs

SECTION – A

Marks :50 M

Answer ALL questions 4 X 7 = 28 M

1) How do you distingwish 1^{o},2^{o} and 3^{o} amines with Hinsberg reagent and nitrous acid?

(OR)

Explain the following :

a) Gabriel phthalimide synthesis b) Carbylamine reaction

2) What are polynuclear hydrocarbons ? Explain structure elucidation of naphthalene ?

(OR)

Write the preparation and properties of anthracene ?

3) What is aromaticity ? Explain the aromaticity of Furan, Pyrrole and Thiophene ?

(OR)

Explain the following :

a) Skraup synthesis b) Friedlander's synthesis

4) Describe about structure elucidation and synthesis of Nicotine ?

(OR)

Give the classification of terpenes ? Write the synthesis of Citral ?

SECTION – B

Answer any FOUR questions 4 X 4 = 16 M

35

5) Explain the basicity of amines ?

6) How diazonium salts are prepared ? Give any two applications of it .

7)Write any four properties of phenanthrene .

8)How do you prepare 5- membered hetero cyclic compounds by Paul- Knorr synthesis?

9)Write the following reactions :

a) Bischler –Napieralski reaction b)Pomeranz –Fritsch reaction

10)Explain Hoffmann's exhaustive methylation.

11)ExplainIsolation and physiological action of alkaloids ?

12)What is Isoprene ? Explain Isoprene rule in terpenes ?

SECTION – C

Answer ALL questions 2 X 3 = 6 M

13)Give any two differences between nitriles and isonitiles .

14)Write any two preparations of pyridine ?

15)What is morphine ? Give medicinal importance of morphine.

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BLUE PRINT FROM 2020 -21 ONWARDS

CHEMISTRY – C IX : ORGANIC CHEMISTRY III

S.No.	UNIT & CHAPTER	Essay Question (7 M) Knowledge	Short Answer Question (4 M) Under standing	Very Short Answer Question (2 M) Skill / Application
1.	UNIT- I : NITROGEN CONTAINING FUNCTIONAL GROUPS	02	02	01
2.	UNIT –II : POLY NUCLEAR HYDROCARBONS	02	01	--------
3.	UNIT –III : HETERO CYCLIC COMPOUNDS	02	02	01
4.	UNIT –IV : ALKALOIDS & TERPENES	02	03	01

Practical C – IX Lab: 60 Lectures

1. Functional group test for nitro, amine and amide groups.

2. Qualitative analysis of unknown organic compounds containing simple functional groups (alcohols, carboxylic acids, phenols , carbonyl compounds and esters)

Reference Books:

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

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

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

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

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DEPARTMENT OF CHEMISTRY

II B.Sc.(HONOURS) CHEMISTRY IV-SEMESTER

LABORATORY COURSE – C IX : ORGANIC CHEMISTRY – III

SCHEME OF VALUATION

Total – 50 Marks

Record – 10 Marks Practical – 40 Marks

Break up of practical – III (40 Marks)

Identification of functional group of an organic compound (Systamatic Procedure should be adopted)

♦ Colour	-	1 Mark
♦ Physical State	-	1 Mark
♦ Odour	-	1 Mark
♦ MP / BP	-	2 Marks
♦ Ignition test	-	2 Marks
♦ Litmus test	-	2 Marks
♦ Solubility & Classification basing		
♦ on solubility data	-	5 Marks
♦ Detection of extra elements	-	4 Marks (extract -2 M)
♦ Unsaturation test (with bromine water & Bayer's reagent)	-	4 Marks
♦ Identification test for functional group	-	5 Marks
♦ Conformatory test for functional group	-	5 Marks
♦ One derivative of the organic compound	-	4 Marks
♦ Report	-	4 Marks
		38

Total Marks - 40 Marks

** ** **

Theory: 60 Lectures

Quantum Chemistry: Postulates of quantum mechanics, quantum mechanical operators and commutation rules, Schrödinger equation and its application to free particle and ―particle-in-abox‖ (rigorous treatment), quantization of energy levels, zero-point energy and Heisenberg Uncertainty principle; wave functions, probability distribution functions, nodal properties, Extension to two and three dimensional boxes, separation of variables, degeneracy.

Qualitative treatment of simple harmonic oscillator model of vibrational motion: Setting up of Schrödinger equation and discussion of solution and wave functions. Vibrational energy of diatomic molecules and zero-point energy.

Angular momentum. Rigid rotator model of rotation of diatomic molecule. Schrödinger equation in Cartesian and spherical polar (Derivation not required). Separation of variables. Spherical harmonics. Discussion of solution (Qualitative).

Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression). Average and most probable distances of electron from nucleus. Setting up of Schrödinger equation for many-electron atoms (He, Li). Need for approximation methods. Statement of variation theorem and application to simple systems (particle-in-a-box, harmonic oscillator, hydrogen atom).

Chemical bonding: Covalent bonding, valence bond and molecular orbital approaches, LCAOMO treatment of H_2^+. Bonding and antibonding orbitals. Qualitative extension to H_2. Comparison of LCAO-MO and VB treatments of H_2 (only wave functions, detailed solution not required) and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH).

(30 Lectures)

Molecular Spectroscopy: Interaction of electromagnetic radiation with molecules and various types of spectra; Born Oppenheimer approximation.

Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution.

Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, concept of group frequencies.

Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches.

Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion.

Electronic spectroscopy: Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation, calculation of electronic transitions of polyenes using free electron model.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of NMR spectroscopy, Larmor precession, chemical shift and low resolution spectra, different scales (δ and T), spin-spin coupling and high resolution spectra, interpretation of PMR spectra of organic molecules.

Electron Spin Resonance (ESR) spectroscopy: Its principle, hyperfine structure, ESR of simple radicals.
(30 Lectures)

Reference Books:

- Banwell, C. N. & McCash, E. M. Fundamentals of Molecular Spectroscopy 4th Ed. Tata McGraw-Hill: New Delhi (2006).
- Chandra, A. K. Introductory Quantum Chemistry Tata McGraw-Hill (2001). • House, J. E. Fundamentals of Quantum Chemistry 2nd Ed. Elsevier: USA (2004).
- Lowe, J. P. & Peterson, K. Quantum Chemistry, Academic Press (2005).
- Kakkar, R. Atomic & Molecular Spectroscopy, Cambridge University Press (2015).

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
I B.SC CHEMISTRY (HONS) SEMESTER –IV
MODEL QUESTION PAPER FROM 2019-20
PAPER- IV C PHYSICAL CHEMISTRY

TIME: 2 ½ hrs **MARKS : 50M**

PART – A

Answer **ALL** questions **7 x 4 = 28**

1. Discuss the postulates of quantum mechanics.

   (OR)

   Derive the Schrodinger wave equation for one dimensional box
2. What is LCAO method? Explain the molecular orbital diagrams of molecules a) O_2 b) CO

   (OR)

   Give a detail account of setting up of operators for different observables.
3. Give a short note on the factors that influence the stretching and bending vibrations.

   (OR)

   Write the principle NMR spectroscopy. What is chemical shift equivalence? How many different NMR signals you will see in the following molecules? Ethanol, acetate and Acetophenone.
4. Derive the equation of Lamber-Beer's law and it's applications.

   (OR)

   What is quantum yield? Calculation of Quantum yield by any one method using actinometry.

PART-B

Answer any **FOUR** Questions **4 x4 = 16 M**

5. Write a brief note on Heisenberg's uncertainty principle.
6. Write vibrational energy diatomic molecules and zero point energy.
7. Define wave function. Write the acceptable wave function for Ψ.
8. Explain the structure of NH_3 on VSEPR theory.
9. Write various types of electronic transitions.
10. What is the finger print region in IR and discuss it's structural elucidation
11. Write the laws of photochemistry.
12. Write the role of photochemical reactions in biochemical processes.

PART-C

Answer **ALL** questions **3 x 2 = 6M**

13. What is bonding and anti-bonding molecular orbital?
14. What is coupling constant (J)?
15. What is photosensitization? Give one example.

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MODEL QUESTION PAPER BLUE PRINT
FROM 2019-20 ONWARDS
PAPER-IVB PHYSICAL CHEMISTRY – II SEMESTER-IV

S.No.	Chapter	Essay questions (7 M) Knowledge/ skill	Short answer question(4M) Understanding	Very short answer questions(2M) Applications
1	Quantum Chemistry	02	02	-
2	Chemical Bonding	02	02	01
3	Molecular Spectroscopy	02	02	01
4	Photochemistry	02	02	01
Total number of questions		08	08	03

Practical C – XII Lab: 60 Lectures Colorimetry :

I. Verify Lambert-Beer's law and determine the concentration of $CuSO_4/KMnO_4/K_2Cr_2O_7$ in a solution of unknown concentration

II. Determine the concentrations of $KMnO_4$ and $K_2Cr_2O_7$ in a mixture.

III. Study the kinetics of iodination of propanone in acidic medium.

IV. Determine the amount of iron present in a sample using 1, 10-phenathroline. V. Determine the dissociation constant of an indicator (phenolphthalein).

VI. Study the kinetics of interaction of crystal violet/ phenolphthalein with sodium hydroxide.

VII. Analysis of the given vibration-rotation spectrum of HCl(g)

Adsorption

VIII. Verify the Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.

UV/Visible spectroscopy:

I. Study the 200-500 nm absorbance spectra of $KMnO_4$ and $K_2Cr_2O_7$ (in 0.1 M H_2SO_4) and determine the λ_{max} values. Calculate the energies of the two transitions in different units (J molecule^{-1}, kJ mol^{-1}, cm^{-1} , eV).

II. Study the pH-dependence of the UV-Vis spectrum (200-500 nm) of $K_2Cr_2O_7$.

III. Record the 200-350 nm UV spectra of the given compounds (acetone, acetaldehyde, 2propanol, acetic acid) in water. Comment on the effect of structure on the UV spectra of organic compounds.

Reference Books:

- Khosla, B. D.; Garg, V. C. & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

- Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).

- Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

GOVERNMENT COLLEGE(A),RAJAHMUNDRY
DEPARTMENT OF CHEMISTRY
III B.Sc., SEMESTER-V
SYLLABUS FOR ORGANIC CHEMISTRY VA

Theory: 60 Lectures

Nucleic Acids

Components of nucleic acids, Nucleosides and nucleotides;

Structure, synthesis and reactions of: Adenine, Guanine, Cytosine, Uracil and Thymine; Structure of polynucleotides (DNA and RNA).

(9 Lectures) Amino Acids, Peptides and Proteins

Amino acids, Peptides and their classification.

α-Amino Acids - Synthesis, ionic properties and reactions. Zwitterions, pK_a values, isoelectric point and electrophoresis;

Study of peptides: determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting, C-protecting and C-activating groups, Solid-phase synthesis; primary, secondary and tertiary structures of proteins, Denaturation

(18 Lectures)

Enzymes

Introduction, classification and characteristics of enzymes. Salient features of active site of enzymes.

Mechanism of enzyme action (taking trypsin as example), factors affecting enzyme action, coenzymes and cofactors, specificity of enzyme action (including stereospecificity), enzyme inhibitors and their importance.

(6 Lectures)

Lipids

Introduction to oils and fats; common fatty acids present in oils and fats, Hydrogenation of fats and oils, Saponification value, acid value, iodine number. Reversion and rancidity.

(8 Lectures)

Concept of Energy in Biosystems

Cells obtain energy by the oxidation of foodstuff (organic molecules). Introduction to metabolism (catabolism, anabolism).

ATP: The universal currency of cellular energy, ATP hydrolysis and free energy change. Agents for transfer of electrons in biological redox systems: NAD+, FAD.

Conversion of food to energy: Outline of catabolic pathways of carbohydrate- glycolysis, fermentation, Krebs cycle.

Caloric value of food, standard caloric content of food types.

(7 Lectures) Pharmaceutical Compounds: Structure and Importance

Classification, structure and therapeutic uses of antipyretics: Paracetamol (with synthesis), Analgesics: Ibuprofen (with synthesis), Antimalarials: Chloroquine (with synthesis). An elementary treatment of Antibiotics and detailed study of chloramphenicol, Medicinal values of curcumin (haldi), azadirachtin (neem), vitamin C and antacid (ranitidine).

(12 Lectures) *Reference Books:*

• Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006) Biochemistry. VIth Edition. W.H. Freeman and Co.

•Nelson, D.L., Cox, M.M. and Lehninger, A.L. (2009) Principles of Biochemistry. IV Edition.

W.H. Freeman and Co.

•Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009) Harper's Illustrated Biochemistry. XXVIII edition.Lange Medical Books/ McGraw-Hill.

GOVERNMENT COLLEGE(A),RAJAHMUNDRY
DEPARTMENT OF CHEMISTRY
III B.Sc., SEMESTER-V
ORGANIC CHEMISTRY VB

Time; 3Hrs **Max Marks;50M**

SECTION-A

I. Answer all the questions. **4×7=28M**

1. What are nucleic acids? Explain the double helical structure of DNA.
   (OR)
   Explain the structure, synthesis and reactions of Thymine.
2. What are Amino acids write about the classification of aminoacids based on the structure.
   (OR)
   Define protein explain the primary, secondary and tertiary structure of proteins.
3. Explain in detail about the mechanism of action of Trypsin.
   (OR)
   What are the common fatty acids present in oil and explain about the hydrogenation of fats and oils.
4. Define metabolism and write the glycol sis cycle along with the yield of ATP.
   (OR)
   What are antipyretics write about the structure, synthesis and therapeutic uses of paracetamol.

SECTION-B

II. Answer any four questions.
4×4=16M

5. Write brief note on single standard structure of DNA.
6. Write the structure of four nitrogen bases that are present in DNA.
7. Write about the synthesis of peptides using C-activating groups.
8. What are the ionic properties of α-Amino acids?
9. What are the different factors that effect the enzyme action?
10. Write about rancidity of oils.
11. Write abrief note on hydrolysis of ATP.
12. Give the synthesis of chloroquine.

SECTION-C

III Answer All questions.
3×2=6M

13. What are Zwitter ions?
14. Define saponification value.
15. Write any four medicinal uses of azadirachtin.

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FROM 2020-2021
ORGANIC CHEMISTRY

	7Marks	4Marks	2Marks
UNIT-1 Nucleic acids	2	2	-
UNIT-II Amino acids peptides& proteins	2	2	1
UNIT-III Enzymes& lipids	2	2	1
UNIT-IV Biosystems & pharmaceutical compounds	2	2	1
	8	8	3

Practical C – XI Lab: 60 Lectures

1. Estimation of glycine by Sorenson's formalin method.

2. Study of the titration curve of glycine. 3. Estimation of proteins by Lowry's method.

4. Study of the action of salivary amylase on starch at optimum conditions.

5. Effect of temperature on the action of salivary amylase.

6. Saponification value of an oil or a fat.

7. Determination of Iodine number of an oil/ fat.

8. Isolation and characterization of DNA from onion/ cauliflower/peas.

Reference Books:

- Manual of Biochemistry Workshop, 2012, Department of Chemistry, University of Delhi.
- Arthur, I. V. Quantitative Organic Analysis, Pearson.

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II B.Sc – SEMESTER-V

SYLLABUS FOR PHYSICAL CHEMISTRY VB

60 Lectures

Chemical Thermodynamics: Intensive and extensive variables; state and path functions; isolated, closed and open systems.

First law: Concept of heat, Q, work, W, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of Q, W, ΔU and ΔH for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions. Thermochemistry: Heats of reactions: standard states; enthalpy of formation and enthalpy of combustion and its applications; effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions.

Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics. Calculation of entropy change for reversible and irreversible processes.

Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and

other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state.

(36 Lectures)

Systems of Variable Composition: Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases. **(8 Lectures)**

Chemical Equilibrium: Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration (Le Chatelier Principle, Quantitatively)). Free energy of mixing and spontaneity. equilibrium between ideal gases and a pure condensed phase.

(8 Lectures)

Solutions and Colligative Properties: Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

(8 Lectures)

Reference Books:

- Peter, A. & Paula, J. de. Physical Chemistry 9th Ed., Oxford University Press (2011).
- Castellan, G. W. Physical Chemistry 4th Ed., Narosa (2004).
- Engel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall (2012).

- McQuarrie, D. A. & Simon, J. D. Molecular Thermodynamics Viva Books Pvt. Ltd.: New Delhi (2004).
- Assael, M. J.; Goodwin, A. R. H.; Stamatoudis, M.; Wakeham, W. A. & Will, S. Commonly Asked Questions in Thermodynamics. CRC Press: NY (2011).
- Levine, I .N. Physical Chemistry 6th Ed., Tata Mc Graw Hill (2010). • Metz, C.R. 2000 solved problems in chemistry, Schaum Series (2006)

GOVERNMENT COLLEGE (A), RAJAHMUNDRY

II B.Sc – SEMESTER-IV

CHEMISTRY-C IV: PHYSICAL CHEMISTRY II

MODEL QUESTION PAPER

Section-A

(4X8 = 32 Marks)

Answer ALL questions

1(a) Define the internal energy and enthalpy and derive the changes of Q, W, ΔU , ΔH for irreversible and reversible process.

OR

(b) Give the different statements of second law of thermodynamics and derive the entropy changes for reversible and irreversible process.

2(a) Define the third law of thermodyanamics and derive the Maxwell relations.

OR

(b) Define the partial molar quantity and derive the Gibbs- Duhem equation.

3(a) Derive the thermodynamic relation between Gibbs free energy of the reaction and reaction coefficient

OR

(b) write about the free energy mixing of ideal gases and pure condensed gas phase

4(a) Define the raoults law and henrys law and write their applications

OR

(b) Define the colligative property and write briefly about (a) depression in freezing point (b) osmotic pressure.

Section-B

(5X4 = 20 Marks)

51

Answer any Five questions

5 Explain about kirchhoff's law

6 Define the state and path functions and explain by giving examples

7 Calculate the entropy of mixing 10 moles of helium and 10 moles of oxygen at constant temperature and pressure, assuming both to be ideal gases is?

8 Write about Gibbs and Helm-Holtz free energies

9 Explain the effect of temperature and pressure on equilibrium constant

10 Explain chemical potentials of ideal mixtures

11 Explain the relative lowering of vapor pressure

12 Calculate the molar mass of dissociated and associated solutes in solution

Section-C

(4X2 = 8 Marks)

Answer all the questions

13 Write about intensive and extensive properties

14 Define the enthalpy of formation

15 Define the residual entropy

16 Write about osmosis

Practical C – IV Lab: 60 Lectures Thermochemistry:

(a) Determination of heat capacity of a calorimeter for different volumes using (i) change of enthalpy data of a known system (method of back calculation of heat capacity of calorimeter from known enthalpy of solution of sulphuric acid or enthalpy of neutralization), and (ii) heat gained equal to heat lost by cold water and hot water respectively

(b) Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

(c) Determination of the enthalpy of ionization of ethanoic acid.

(d) Determination of integral enthalpy (endothermic and exothermic) solution of salts.

(e) Determination of basicity of a diprotic acid by the thermochemical method in terms of the changes of temperatures observed in the graph of temperature versus time for different additions of a base. Also calculate the enthalpy of neutralization of the first step.

(f) Determination of enthalpy of hydration of salt.

(g) Study of the solubility of benzoic acid in water and determination of ΔH.

Any other experiment carried out in the class.

Reference Books:

- Khosla, B. D.; Garg, V. C. & Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).
- Athawale, V. D. & Mathur, P. Experimental Physical Chemistry New Age International: New Delhi (2001).

GOVERNMENT COLLEGE (A), RAJAHMUNDRY
III B.Sc CHEMISTRY(HONOURS) – SEMESTER-VI
SYLLABUS FOR PHYSICAL CHEMISTRY-VIA

Theory: 60 Lectures

Theoretical Principles in Qualitative Analysis (H_2S Scheme)

Basic principles involved in analysis of cations and anions. Solubility products, common ion effect. Principles involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after Group II.

(12 Lectures)

Organometallic Compounds

Definition and classification of organometallic compounds on the basis of bond type. Concept of hapticity of organic ligands.

Metal carbonyls: 18 electron rule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series. Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π-acceptor behaviour of CO (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.

Zeise's salt: Preparation and structure, evidences of synergic effect and comparison of synergic effect with that in carbonyls.

Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds.

Ferrocene: Preparation and reactions (acetylation, alkylation, metallation, Mannich Condensation). Structure and aromaticity. Comparison of aromaticity and reactivity with that of benzene.

(26 Lectures)

Bioinorganic Chemistry:

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals. Sodium / K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug.

Iron and its application in bio-systems, Haemoglobin, Myoglobin; Storage and transfer of iron.

(14 Lectures)

Catalysis by Organometallic Compounds

Study of the following industrial processes and their mechanism:

1. Alkene hydrogenation (Wilkinson's Catalyst)
2. Synthetic gasoline (Fischer Tropsch reaction)
3. Polymerisation of ethene using Ziegler-Natta catalyst

(8 Lectures)

Reference Books:

- Vogel, A.I. *Qualitative Inorganic Analysis,* Longman, 1972
- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, 7th Edition, Prentice Hall, 1996-03-07.
- Lippard, S.J. & Berg, J.M., *Principles of Bioinorganic Chemistry* Panima Publishing Company 1994.
- Cotton, F.A., Wilkinson, G., & Gaus, P.L. *Basic Inorganic Chemistry 3rd Ed.;* Wiley India,
- Huheey, J. E.; Keiter, E.A. & Keiter, R.L. *Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed.,* Harper Collins 1993, Pearson,2006.
- Sharpe, A.G. *Inorganic Chemistry*, 4th Indian Reprint (Pearson Education) 2005
- Douglas, B. E.; McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry3rd Ed.,* John Wiley and Sons, NY, 1994.
- Greenwood, N.N. & Earnshaw, A. *Chemistry of the Elements 2nd Ed,* Elsevier, 1997 (Ziegler Natta Catalyst and Equilibria in Grignard Solution).
- Lee, J.D. *Concise Inorganic Chemistry 5th Ed.,* John Wiley and sons 2008.
- Powell, P. *Principles of Organometallic Chemistry*, Chapman and Hall, 1988.
- Shriver, D.D., Atkins, P. and Langford, C.H., *Inorganic Chemistry 2nd Ed.,* Oxford University Press, 1994.
- Purcell, K.F. & Kotz, J.C., *Inorganic Chemistry*, W.B. Saunders Co. 1977
- Miessler, G. L. & Tarr, Donald A., *Inorganic Chemistry 4th Ed.,* Pearson, 2010.
- Collman, James P. et al. *Principles and Applications of Organotransition Metal Chemistry.* Mill Valley, CA: University Science Books, 1987.
- Crabtree, Robert H. *The Organometallic Chemistry of the Transition Metals*. John Wiley New York, NY, 2000.
- Spessard, Gary O., & Miessler, Gary L., *Organometallic Chemistry*. Upper Saddle River, NJ: Prentice-Hall, 1996.

Final B.Sc., Semester VI

Chemistry – C XIII: Inorganic chemistry

Blue print

Unit No.	Unit name	8 marks questions	4 marks questions	2 marks questions	Total questions	Total marks
1	Theoretical principles in qualitative analysis	01	02	01	04	18
2	Organometallic compounds	03	03	02	08	40
3	Bioinorganic chemistry	02	02	01	05	26
4	Catalysis by Organometallic compounds	02	01	-	03	20
	Total marks	**64**	**32**	**08**	**-**	**104**

Chemistry – C XIII: Inorganic chemistry
Model question paper
Section – A

Time: 3hours Marks: 60

I. Answer the following questions. 4x8= 32Marks

1. A) Explain solubility product and common ion effect.

Or

B) Write the preparation methods of mono and binuclear carbonyls.

2. A) Discuss the structures of $Mn_2(CO)_{10}$ and $Fe_2(CO)_9$.

Or

B) Write one preparation method and discuss the structure of ferrocene.

3. A) Explain the action of any four metal ions present in biological system.

Or

B) Explain the action and applications of myoglobin in bio system.

4. A) Write the industrial processes and mechanism of ethane using Ziegler – Natta Catalyst.

Or

B) Write the industrial processes and mechanism of Wilkinson's catalyst.

Section – B

II. Answer any five of the following questions. 5x4= 20Marks

5. How the borate and phosphate interfering anions remove in qualitative analysis.

6. Explain choice of group reagents involved in separation of cations into groups.

7. Write the classification of organometallic compounds on the basis of nature of bond.

8. Write the preparation and structure of Zeise's salt.

9. Explain the tetramer structure of methyl lithium.

10. Write the toxic nature of mercury and lead.

11. Write the structure and applications of cisplatin drug.

12. Fischer Tropsch reaction.

Section – C

III. Answer the following questions. 4x2= 8 Marks

13. Give flame colors of barium and calcium.
14. 18 electron rule.
15. Hapticity.
16. Write the use of chelating agents in medicine.

Practical C – XIII Lab: 60 Lectures

Qualitative semimicro analysis of mixtures containing 3 anions and 3 cations. Emphasis should be given to the understanding of the chemistry of different reactions. The following radicals are suggested:

CO_{3}^{2-}, NO_{2}^{-}, S^{2-}, SO_{3}^{2-},$S_2O_{3}^{2-}$, CH_3COO^-, F^-,Cl^-, Br^-, I^-, NO_{3}^{-}, BO_{3}^{3-}, $C_2O_{4}^{2-}$, PO_{4}^{3-}, NH_{4}^{+}, K^+, Pb^{2+}, Cu^{2+}, Cd^{2+}, Bi^{3+}, Sn^{2+}, Sb^{3+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}

Mixtures should preferably contain one interfering anion, **or** insoluble component ($BaSO_4$, $SrSO_4$, $PbSO_4$, CaF_2 or Al_2O_3) **or** combination of anions e.g. $CO_3^{2-}$and SO_3^{2-}, NO_2^- and NO_3^-, Cl^- and Br^-, Cl^- and I^-, $Br^-$and I^-, NO_3^- and Br^-, NO_3^- and I^-. Spot tests should be done whenever possible.

Principles involved in chromatographic separations. Paper chromatographic separation of following metal ions:

i. Ni (II) and Co (II)
ii. Cu(II) and Cd(II)

Reference Books:

- *Vogel's Qualitative Inorganic Analysis*, Revised by G. Svehla.
- Vogel, A.I. *A Textbook of Quantitative Analysi*s, ELBS. 1986

Practical –C- XIII Lab

Qualitative semi micro analysis

Marks: 50 **Time: 3 hours**

Scheme of valuation

Sl.No.	Test	Marks
1	State, odor, color & solubility	2
2	Action of heat	1
3	Flame test	2
4	First anion preliminary tests- any two tests	2x2=4
5	Second anion preliminary tests- any two tests	2x2=4
6	Third anion preliminary tests- any two tests	2x2=4
7	Preparation of sodium carbonate extract	2
8	Confirm test for three anions	3x1=3
9	Elimination of interfering anion	1
10	Test for ammonium ion with NaOH solution	**1**
11	Confirm test for ammonium ion	**2** **58**
12	Identification of cation group separation table (Each cation)	3x1=3
13	Confirm test for each cation separation table	3x2=6
14	Report	6x1/2=3
15	**Viva - voice**	**5**
16	**Record**	**10**
Total		**50**

Final B.Sc., Semester VI

Paper-VII; Analysis of applied industrial products

Blue print

Unit No.	Unit name	8 marks questions	4 marks questions	2 marks questions	Total questions	Total marks
1	Unit-I: Analysis of soaps, detergents & paints Unit-II: Analysis of fats, oils & industrial solvents.	02	03	01	06	30
2	Unit-III: Analysis of fertilizers, starch sugars & paper.	02	02	01	05	26
3	Unit-IV: Analysis of gases	02	02	01	05	26
4	Unit-IV: Analysis of complex materials	02	01	01	04	22
	Total marks	**64**	**32**	**08**	**-**	**104**

Final B.Sc., Semester VI
Paper-VII; Analysis of applied industrial products
Model question paper
Section – A

Time: 3hours Marks: 60

I. Answer the following questions. 4x8= 32Marks

1. A) Explain the analysis of free alkali and total fatty acid in soaps.

Or

B) How can you calculate saponification value and iodine value in oils?

2. A) Define fertilizers? Discuss the analysis of urea and superphosphate.

Or

B) Discuss the analysis of cellulose and paper.

3. A) Write the composition and discuss the analysis of water gas and producer gas.

Or

B) Write the ultimate analysis of nitrogen and sulfur.

4. A) Explain the analysis of total silica and ferric oxide in cement.

Or

B) Determination of total alkalies, calcium and magnesium in analysis of glasses.

Section – B

II. Answer any five of the following questions. 5x4= 20Marks

5. Write the analysis of vehicle and pigments in paints.

6. Explain the analysis of industrial solvent benzene.

7. Explain the analysis of sodium silicate in soaps. **60**

8. Explain the analysis of BHC.

9. Explain the analysis of malathion.

10. Short note on octane number and cetane number.

11. Write the analysis of unsaturated hydrocarbons in gas analysis.

12. Write the composition of cement and glasses.

Section – C

III. Answer the following questions. 4x2= 8 Marks

13. Determination of methoxyl group.
14. NPK fertilizer.
15. Kerosene gas analysis.
16. Determination of silica in gas analysis.

Practical – VII

Analysis of applied industrial products

Marks: 50 **Time: 3 hours**

Scheme of valuation

Sl.No.	Practical system	Marks
1	Procedure for first 10 min.	5
2	Formula with units	5
3	Tabulation and correct calculation	5
4	Error: < 10%	20
5	Error: < 10-15 %	15
6	Error: >15 %	10
7	**Viva - voice**	**5**
8	**Record**	**10**
Total		**50**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

B.SC. CHEMISTRY HONOURS VI SEMESTER PAPER – V

SYLLABUS FOR ORGANIC CHEMISTRY-V

45 Hours

Organic Spectroscopy

General principles Introduction to absorption and emission spectroscopy.

UV Spectroscopy: Types of electronic transitions, λ_{max}, Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption; Application of Woodward Rules for calculation of λmax for the following systems: α,β-unsaturated aldehydes, ketones, carboxylic acids and esters; Conjugated dienes: alicyclic, homoannular and heteroannular; Extended conjugated systems (aldehydes, ketones and dienes); distinction between cis and trans isomers.

IR Spectroscopy: Fundamental and non-fundamental molecular vibrations; IR absorption positions of O, N and S containing functional groups; Effect of H-bonding, conjugation, resonance and ring size on IR absorptions; Fingerprint region and its significance; application in functional group analysis.

NMR Spectroscopy: Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it; Spin – Spin coupling and coupling constant; Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation\ of NMR spectra of simple compounds.

Applications of IR, UV and NMR for identification of simple organic molecules.

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18 Hours

Carbohydrates

Occurrence, classification and their biological importance.

Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani- Fischer synthesis and Ruff degradation;

Disaccharides – Structure elucidation of maltose, lactose and sucrose.

Polysaccharides – Elementary treatment of starch, cellulose and glycogen.

(18 Hours)

Dyes

Classification, Colour and constitution; Mordant and Vat Dyes; Chemistry of dyeing;

Synthesis and applications of: Azo dyes – Methyl orange; Triphenyl methane dyes Malachite green and Rosaniline ; Phthalein Dyes – Phenolphthalein; Natural dyes – structure elucidation and synthesis of Alizarin and Indigotin; Edible Dyes with examples.

(9 Hours)

Reference Books:

•Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.

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

•Billmeyer, F. W. Textbook of Polymer Science, John Wiley & Sons, Inc.

•Gowariker, V. R.; Viswanathan, N. V. &Sreedhar, J. Polymer Science, New Age International (P) Ltd. Pub.

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

•Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.

•Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.

•Singh, J.; Ali, S.M. & Singh, J. Natural Product Chemistry, PrajatiPrakashan (2010).

•Kemp, W. Organic Spectroscopy, Palgrave

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

B.SC. CHEMISTRY HONOURS VI SEMESTER PAPER – V

BLUE PRINT FOR ORGANIC CHEMISTRY-V

S.No.	Name of the Unit	Essay Answer Questions (07 Marks)	Short Answer Questions (07 Marks)	Very Short Answer QuestionQuestions (07 Marks)
1	ORGANIC SPECTROSCOPY	4	3	1
2	CARBOHYDRATES	2	3	1
3	DYES	2	2	1
TOTAL		8	8	3

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

B.SC. CHEMISTRY HONOURS VI SEMESTER PAPER – V

MODEL PAPER ORGANIC CHEMISTRY-V

1) Applications of Woodward rules for calculation of λmax for the α,β unsaturated aldehydes and ketones.

(or)

Explain Fundamental and Non-Fundamental molecular vibrations.

2) With an example explain the interpretation of NMR spectra.

(or)

Define Chemical shift (δ). Explain the factors affecting Chemical shift.

3) Constitution and Absolute configuration of Glucose and Fructose. Write about epimers and anomers.

(or)

Explain the Structure elucidation of Maltose and Sucrose.

4) Synthesis and applications of Azo dyes Methyl Orange and Triphenyl Methane dyes.

(or)

Structure elucidation and synthesis of Alizarin and Indigo.

II) Write any four questions.

5) Define the Chromophores and Auxochromes.
6) Explain Fingerprint region.
7) What is effect of H-Bonding in IR spectroscopy?
8) Explain Ruff degradation.
9) Determine the ring size of Glucose and Fructose.
10) Explain Killiani Fischer Synthesis.
11) Synthesis of Rosaniline and Malachite Green.
12) Write about Edible oils.

III) Write any four questions.

13) What are Bathochromic and Hypsochromic effects?
14) Give two examples of Edible Dyes?
15) What is Glycogen?

*****

Practical C – XIV Lab: 60 Lectures

1.Extraction of caffeine from tea leaves.

2.Preparation of urea formaldehyde resin.

3. Qualitative analysis of unknown organic compounds containing monofunctional groups (carbohydrates, aryl halides, aromatic hydrocarbons, nitro compounds, amines and amides) and simple bifunctional groups, e.g. salicylic acid, cinnamic acid, nitrophenols etc.

4. Identification of simple organic compounds by IR spectroscopy and NMR spectroscopy (Spectra to be provided).

5. Preparation of methyl orange.

Reference Books:

• Vogel, A.I. Quantitative Organic Analysis, Part 3, Pearson (2012).

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

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

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

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

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

CHE – 118: 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, polyph$_6$o$_7$sphate, 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

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

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM.
BLUE PRINT
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 69	04

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

Time: 3 hours **Maximum Marks: 60**

SECTION- A

4 x 8 = 32 Marks

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

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

(OR)

B) Describe the anomalous behaviour of lithium and boron.

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

.

(OR)

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

.

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

(OR)

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

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

(OR)

B) Write the preparation and explosive properties of RDX.

SECTION- B

70 **5 x 4 = 20 Marks**

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

5. Write about diagonal relationship.
6. Discuss the classification of glasses.
7. Write about Carbon nanotubes
8. Describe the manufacturing of urea.
9. What are emulsifying agents? Give examples.
10. Explain about metallic coatings.
11. Write a note on non-ferrous alloys.
12. Explain the properties of steels.

.

SECTION- C

4 x 2 = 8 Marks

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

13. What are allotropes of carbon?
14. What are NPK fertilizers?
15. What are enamel paints?
16. Write an example for eco-friendly paint.

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY
DEPARTMENT OF CHEMISTRY
SYLLABUS FOR III B.Sc., VI SEMESTER
FROM 2019 -20 ONWARDS
CHE – 111: VII A - ANALYTICAL METHODS IN CHEMISTRY

TOTAL HOURS: 45

UNIT-I

Quantitative analysis: **10 Hours**

c) 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.

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

UNIT-II **7 Hours**

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 Hours**

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. **71**

UNIT-IV **10 Hours**

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

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

UNIT –V **10 Hours**

Thin layer Chromatography (TLC): Advantages - Principles, factors effecting R_f values - Experimental procedures - Adsorbents and solvents - Preparation of plates - Development of the chromatogram - Detection of the spots – Applications - Column Chromatography: Principles - experimental procedures - Stationary and mobile Phases - Separation technique – Applications. HPLC: Basic principles and applications.

ADDITIONAL INFORMATION @ INTELLECTUAL PROPERTY RIGHTS

UNIT I

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.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works – Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor Chip Protection Act.

UNIT III

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.

UNIT IV

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

6. Analytical Chemistry by Skoog and Miller
7. A textbook of qualitative inorganic analysis by A.I. Vogel **72**
8. Nanochemistry by Geoffrey Ozin and Andre Arsenault
9. 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.

GOVERNMENT COLLEGE (AUTONOMOUS), RAJAMAHENDRAVARAM.

BLUE PRINT

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) Under standing	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
Total no of Questions		45	08	08	04

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

Time: 3Hrs **Max. Marks: 60 M**

PART-A

4X 8 =32Marks

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

2. A) Describe the choice of indicators for acid-base titrations.

.OR

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

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

ii) Define standard deviation and confidence limit.

OR

B) Discuss various types of errors.

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

OR

B) Explain any two methods for solvent extraction.

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

74

OR

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

PART-B

5 X 4 = 20 Marks

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

5. Discuss the complex metric titrations with examples.

6. Explain about precipitation and coagulation.

7. Write about standard deviation.

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

9. Describe the development of chromatogram in paper chromatography.

10. What are the factors affecting R_f value.
11. What type of adsorbents and solvents used in thin layer chromatography.
12. Write the applications of High Performance Liquid Chromatography.

PART – C

4 X 2 = 8 Marks

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

13. What is co-precipitation and post-precipitations?
14. Define accuracy and precision.
15. What is R_f value. Write the formula of R_f value.
16. Define Stationary Phase and Mobile Phase.

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GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM.
SYLLABUS FOR VI SEMESTER
III B.Sc. CHEMISTRY VI SEMESTER - SYLLABUS FOR VIIC

CHE – 113: GREEN CHEMISTRY

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

ii) Rearrangements (100% atom economic), ii) Addition reactions (100% atom economic). Organic reactions by Sonication method: apparatus required examples of sonochemical reactions (Heck, Hunds-Diecker 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_2: 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 anthroquinones, Leukart 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/surfacta**7**n**6**t)

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 INFORMATION @ INTELLECTUAL PROPERTY RIGHTS

UNIT I

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.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works – Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor Chip Protection Act.

UNIT III

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.

UNIT IV

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:

6. Green Chemistry Theory and Practice. P.T.Anatas and J.C. Warner
7. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
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III B.SC. CHEMISTRY ELECTIVE PAPER – VIIC

SEMESTER – VI

GREEN CHEMISTRY

Sl. NO.	Chapter	Essay Question (08 M) knowledge	Short Answer Question (04 M) Under standing	Very Short Answer Question (02 M) Skill / Application
1.	Green Chemistry	01	01	01
2.	Selection of solvent	01	02	01
3.	Microwave and Ultrasound assisted green synthesis	01	01	01
4.	Green catalysis	01	02	--
5.	Green Synthesis	01	02 78	01
Total no of Questions		05	08	04

MODEL QUESTION PAPER

GOVERNMENT COLLEGE (AUTONOMOUS) RAJAMAHENDRAVARAM

THREE YEAR B.Sc., DEGREE EXAMINATIONS

SEMESTER-VI

PAPER VII- C: ELECTIVE – C

GREEN CHEMISTRY

Time: 3Hrs **Max. Marks: 60 M**

PART-A

4 X 8 =32 Marks

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

17. A) Explain the basic principles of green chemistry.

(OR)

B) Illustrate the sonication method with any two reactions.

A) Write about the reactions in ionic liquids.

(OR)

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

18. A) Explain the synthesis of fused Anthroquinines by microwave assisted organic synthesis.

(OR)

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

19. A) What is Phase transfer catalyst? How do they function?

(OR)

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

PART-B

5 X 4 = 20 Marks

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

20. What is the need of green chemistry?
21. Write a note on atom economy reactions.
22. Heck reaction.
23. Write about solid supported synthesis.
24. What are the advantages of microwaves assisted organic synthesis.
    Bio catalysis.

25. How do you perform Stricker synthesis by green synthesis method?
26. Ultra sound assisted reactions.

PART – C

4X 2 = 8 Marks

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

27. Write the sono chemical Wittig reaction.
28. Write Suziki reaction.
29. What is Heterogeneous catalysis? Write any two uses of Zeolities.
30. Write the sono chemical Simmons – Smidth reaction.

CHE – 111P: CHEMISTRY LABORATORY COURSE – VII-A

(at the end of semester VI)

30 hrs (2 h / w)

50 Marks

4. Identification of amino acids by paper chromatography.
5. Determination of Zn using EDTA
6. Determination of Mg using EDTA

CHEMISTRY LABORATORY COURSE – VII-A

(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

iv) Procedure in first 10 min. **:** 5 Marks

v) Formula with units **:** 5 Marks

vi) Neat tabulation & correct calculation **:** 5 Marks

Error < 10% **:** 20 Marks

Error 10-15 % **:** 15 Marks

Error > 15 % **:** 10 Marks (Minimum Marks)

CHE – 112P: CHEMISTRY LABORATORY COURSE – VII-B

(at the end of semester VI)

45 hrs (3 h / w)

50 Marks

6. Determination of carbonate and bicarbonate in water samples (acidity and alkalinity)

7. Determination of hardness of water using EDTA
   a) Permanent hardness b) Temporary hardness

8. Determination of Acidity

9. Determination of Alkalinity

10. Determination of chlorides in water samples

CHEMISTRY LABORATORY COURSE – VII-B

(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

iv) Procedure in first 10 min. : 5 Marks

v) Formula with units : 5 Marks

vi) Neat tabulation & correct calculation : 5 Marks

Error < 10% : 20 Marks

Error 10-15 % : 15 Marks

Error > 15 % : 10 Marks (Minimum Marks)

CHE – 113P: CHEMISTRY LABORATORY COURSE – VII-C

(at the end of semester VI)

30 hrs (2 h / w)

50 Marks

8. Green procedure for organic qualitative analysis: Detection of N, S and halogens

9. Acetylation of 1^0 amine by green method: Preparation of acetanilide

10. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement

11. Electrophilic aromatic substitution reaction: Nitration of phenol

12. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol

13. Green oxidation reaction: Synthesis of adipic acid

14. 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 M

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 : 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

CHE – 114P: POLYMER CHEMISTRY

TOTAL HOURS: 45

UNIT-I **12 h**

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 (Tg) and Determination of Tg: Free volume theory, WLF equation, factors affecting glass transition temperature (Tg).

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 **87** **8 h**

Polymers and their applications:

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

REFERENCE BOOKS

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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 po l y m e r s	01	02	01
4.	Polymer additives	02	88 01	01
5.	Polymers and their applications	01	01	01
Total no of Questions		08	08	04

MODELQUESTION 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.

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

(OR)

b) Write the mechanism of free radical polymerization**.**

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

(OR)

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

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

.

(OR)

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

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

(OR)

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

PART- B **89** **5 x 4 = 20 Marks**

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

5. What are thermo plastics and thermo setting plastics?
6. Write about condensation polymerization.
7. Define number average and weight average molecular weights.
8. Write a note on emulsion polymerization.
9. Give the Williams-Landel-Ferry equation.
10. Illustrate the colourants and photosensitizers.
11. What are the factors affecting Tg?
12. Write any two applications of PVC and PAN

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

Answer ALL the questions Each carries Two marks

1. What is co polymer give example
2. What is glass transition temperature?
3. What is nucleating agent? Give example.
4. Write the preparation and give one application of nylon-6,6