

**PITHAPUR RAJAH'S GOVERNMENT
COLLEGE(AUTONOMOUS)
KAKINADA - 533 001, EAST GODAVARI,
A.P.**

Affiliated to Adikavi Nannaya University

NAAC Accredited with "A" Grade (3.17 CGPA)

BOARD OF STUDIES OF CHEMISTRY

B.Sc. Chemistry Under CBCS

Meeting Minutes/Resolutions



Convened on 03 November 2022

**DEPARTMENT OF CHEMISTRY
P. R. GOVT. COLLEGE (Autonomous)
Opp. Mc Laurin High School, Raja Ram Mohan Roy Road,
Kakinada**

www.prgc.ac.in; e-mail: chemistry_dept@prgc.ac.in

**PROCEEDINGS OF THE PRINCIPAL, P.R.GOVERNMENT COLLEGE(A),
KAKINADA-A.P**

Present: Dr. B. V. Tirupanyam, M.Sc; Ph.D.

R.C.No.12A/A.C./BOS/2022-23,Dated:24.09.2022

SUB:P.R.Government College(A), Kakinada-UG Board of Studies (BOS)- Program/Course-
B.Sc./Chemistry, Nomination of Members-Orders issued.

REF: 1. UGC Guidelines of for Autonomous Colleges-2018.

ORDERS:

The Principal, P.R. Government College(A), Kakinada is pleased to constitute UG Boards of Studies in Chemistry for framing the syllabi in Chemistry Subject for all Semesters duly following the norms of the UGC Autonomous guidelines.

S.No	Name of the Nominee	Designation
1	Dr. D. Chenna Rao	Chairman, Lecturer Incharge.
2	Dr. K. Jhansi Lakshmi	University Nominee Lecturer in Chemistry ASD Govt. Degree College for Women(Autonomous),Kakinada.
3	Sri. V. Mallikarjuna Sarma	Subject Expert Lecturer in Chemistry ASD Govt. Degree College for Women (Autonomous), Kakinada.
4	Dr. B. Ramesh Babu	Representative from Industry Founder & M.D., BogaR laboratories, Peddapuram. Ph: 9701712028.
5	V. Sanjeeva Kumar	Member
6	T.V.V.Satya Narayana	Member
7	P. Vijay Kumar	Member
8	V. Rambabu	Member
9	G. Pavani	Member
10	Dr. N. Bujji Babu	Member
11	Dr. Ch. Praveen	Member
12	V. Venkateswara Rao	Member
13	G. Sandhya	Member
14	K.N.S.Swami	Member
15	T.Pavan Kumar	Member
16	P. Devi Sunanda	Member
17	B. Asha	Member
18	S. Vara Prasad	Student Alumni Member
19	Y. Vijay Sekhar II MPC(EM)	Student Member
20	K. Uma Maheshwari II MCCS	Student Member
21	S. Swamy II MPC (TM)	Student Member

The above members are requested to attend the BoS meeting on 03-10-2022 and share their valuable reviews, and suggestions on the following functionaries.

- Prepare syllabi for the subject keeping in view the objectives of the college, interest of the stakeholders and National requirement for consideration and approval of the IQAC and Academic Council.
- Suggested methodologies for innovative teaching and evaluation techniques.
- Suggest the panel of Names to the academic council for appointment of Examiners.
- Coordinate research, teaching, extension and other activities in the Department of the college.

B.V.S. Prasad
PRINCIPAL
P. R. Government College (A) Kakinada
KAKINADA. E.G.DL, - 533 001. A.P.

1. One expert in the subject from outside the college to be nominated by the Academic Council

Sri. V. MallikarjunaSarma, Lecturer in Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada.

2. One expert to be nominated by the Vice-Chancellor from a panel of six recommended by the CollegePrincipal

Dr. K. Jhansi Lakshmi, Lecturer in Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada.

3. One representative from industry/ Corporate Sector/ allied area relatingto Placement.

Dr. B. Ramesh Babu, Founder &M.D., BogaR laboratories, Peddapuram.
Ph:9701712028.

4. One postgraduate meritorious alumnus to be nominated by thePrincipal.The chairman, Board of Studies, may with the approval of the Principal of the College, Co-opt.

K.N.S. Swamy, M.Sc., APSET (Student Alumni Member)

II. Term

The term of the nominated members shall be two years.

III. Meeting

The Principal of the College shall draw the schedule for meeting of the Board

of Studies for different Departments. The meeting may be scheduled as and when necessary but at least once in a year.

IV. Functions

The Board of Studies of a Department in the College shall:

- a) Prepare syllabus and various courses keeping in view the objectives of the College interest of the stakeholders and national requirement for consideration and approval of the Academic Council.
- b) Suggest methodologies for innovative teaching and evaluation techniques.
- c) Suggest panel of names to the Academic Council for appointment of examiners.
- d) Coordinate research, Teaching, Extension and other academic activities in the Department/College.

P.R. GOVT.COLLEGE (A)KAKINADA
DEPARTMENT OF CHEMISTRY

Meeting of Board of Studies in Chemistry is convened on 03 November 2022 through offline at P.R. Govt. College (A), Kakinada, at 10.00 AM.

Venue: Conference Hall, Dt: 03-11-2022, Thursday - 11.00 A.M.

The Principal Dr. B.V. Tirupanyam; Chairman Dr. D. Chenna Rao; University Nominee Dr. K. Jhansi Lakshmi, Lecturer in Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada; Industrialist Dr. B. Ramesh Babu, Founder & M.D., BogaR laboratories, Peddapuram; Subject Expert Sri.V. Mallikarjuna Sarma, HOD-Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada; all the faculty members of Chemistry Department and student alumni attended the meeting.

Agenda:

1. To discuss the Semester System and Choice Based Credit System (CBCS) being implemented for the past 07 years, i.e., w.e.f. 2015-16.
2. To discuss and approve the Continuation/Modifications of the syllabus for the Odd & Even Semesters of I, II & III Years for 2022-23.
3. Grant of Extra credits for Online SWAYAM MOOCs etc.
4. Syllabus, Model Question Papers and Model Blue Prints, POs, PSOs & COs mapping for I, II, III, IV and V Semesters.
5. Teaching learning methodology by 60:40(External: Internal) ratio for the present III-Year Students and 50:50 (External: Internal) ratio I & II Year Students commenced w.e.f. 2021-22.
6. Minimum attendance of 75% for both I mid-term examination, and II mid-term examination under CIA component shall be the benchmark for attendance and it shall be approved in the BOS.
7. Minimum of 60% integration of ICT into transaction of curriculum.
8. Remedial coaching for slow learners and project works, research, Conferences, etc., for advanced learners.
9. Panel of paper setters and examiners.
10. Implementation of compulsory Community Service Project (CSP)/ Internships/ Apprenticeship and Extension activities for the benefit of the society

11. Department action plan for 2022-23.
12. To discuss and resolve the minor modifications/refinement if any, in the V Semester (6A & 7A) as majority of the students opting this set as their choice.
13. Any Other Proposal with the Permission of the Chairman.

Resolutions:

The Board of Studies meeting was convened by the Chemistry Department on 02.12.2021 at 3.00pm under the chairmanship of Dr. D. Rama Rao, In-charge of the department. Dr. K. Jhansi Lakshmi, University Nominee., Sri.V. MallikarjunaSarma, Lecturer in Chemistry, ASD Degree College for Women's, Kakinada and all members of the faculty of Chemistry and student representatives attended the meeting. The following agenda items are discussed and resolutions are made.

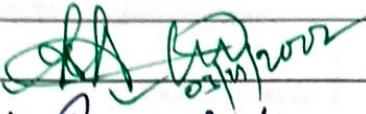
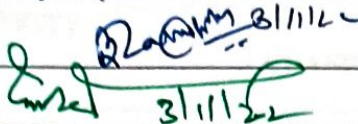
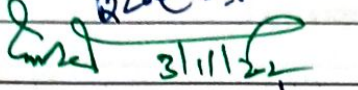

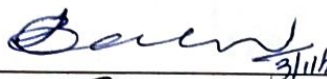
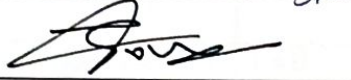
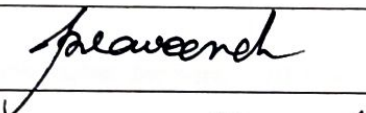
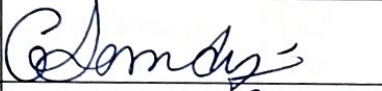
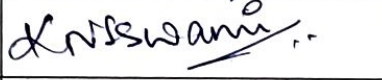
1. It is resolved to continue choice-based credit system in the chemistry combination programmes as per the directions of the CCE, Vijayawada to the first year, second year and final year students for the academic year 2021-22.
2. Resolved to follow 50%-50% external and internal pattern of evaluation w. e. f. 2021-2022 admitted batch and it will be continued in second and third year consecutively.
3. Resolved to follow 60%-40% external and internal for 2018-2019 and 2019-2020 admitted batch and the same is continued in second and third year.
4. It is resolved to allocate 50 marks for project work for final year students of chemistry in cluster paper C - 3 practicals, w.e.f 2021-22 in accordance with APSICHE.
5. It is resolved to conduct Departmental activities such as OZONE DAY, CHEM FEST, CHEMISTRY DAY, SCIENCEDAY etc.
6. It is resolved to offer Subject Electives and clusters A, B and C in the VI Semester as per the guidelines of AKNU
7. It is resolved to implement the recommended pedagogy for the first semester 2021-22
8. Resolved to conduct practical examinations semester wise.
9. It is resolved to organize guest lectures by eminent professors.
10. Resolved to implement no pass minimum for internal assessment for CBSE pattern students as the pattern is learner oriented.
11. It is resolved to maintain status quo for question paper pattern in I, II, III years.
12. It is resolved to encourage students enroll in MOOCS Online Programmes and give extra credits for students after successful completion of the courses.
13. Resolved to submit proposals to conduct a faculty development program in instrumentation techniques/ advanced topics with the assistance of the industry representatives and university representatives.
14. Resolved to assist the orphan children of below two years age being taken by department of women and child welfare as an extension activity with the funds

contributed by the faculty members of the Department.

15. Resolved that the syllabus/workload distribution to the individual lecturers is either as Paper wise or as Track wise.

**Signatures of the members who attended the
Board of studies in Chemistry on 03.11.2022 at 11.00am**

Mode of Conduct of meeting: Offline/ Online

NAME	SIGNATURE	CONTACT NO.
Dr. D. Chenna Rao		9560740108
Dr. K. Jhansi Lakshmi	K. Jhansi Lakshmi	9441256409
Dr. B. Ramesh Babu		
Sri. V. Mallikarjuna Sarma		8341546804
V. Sanjeeva Kumar	V. S. Kumar	9849329966
T. V. V. Satyanarayana		9490876913
P. Vijay Kumar	P. Vijay Kumar	9652023082
V. Ram babu		99115485537
G. Pavani		9912526493
Dr. N. Bujji Babu		
Dr. Ch. Praveen		9491185518
V. Venkateswara Rao	V. Venkateswara Rao	9885165588
G. Sandhya		7207424837
K.N.S. Swamy		9908900962
T. Pawan Kumar		
P. Devi Sunanda	P. Devi Sunanda	6300449647
B. Asha		
S. Vara Prasad		
Y. Vijay Sekhar		
K. Uma Maheshwari		
S. Swamy		

ACTION PLAN BOS MEETING -CHEMISTRY HELD ON 03.11.2022.

1. Department activities for 2022-23 academic year.

Annexure- I

S.No.	MONTH	WEEK	ACTIVITY	CLASS	LECURER
1.	JUN	I week	Sem I and Sem III Examinations	I &II B.Sc	DCR/TVV/VSK/NBB/PVK/VRB/GP/CHP
2.		II week	*Commencement of CSP for Sem I and Sem II Class work to Sem VI	I ,II&III B.Sc I B.Sc	DCR/TVV/VSK/NBB/PVK/VRB/GP/CHP/ VVR GP/TVV/KNS/VRB
3.		III week	Practical Examinations for Sem III and Sem I	I &II B.Sc	TVV/VSK/NBB/PVK/VRB/GP/CHP/ VVR/GSS/
4.		IV week	Sem End Examintions for Sem VI Students	III B.Sc	TVV/NBB/PVK/VRB/GP /VVR/GSS/KNS/PVK
5.	JUL	I week	CSP Reports and submission	I &II B.Sc	TVV/VSK/NBB/PVK/VRB/GP/ VVR
6.		II week	*Assignments *MOU with 1.BOGA LABORATORY LTD, Peddapuram 2. ASD (W) college, kakinada Certificate course on basic laboratory techniques	II &III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/CHP/ VVR/GSS/
7.		III week	*MOU with PRAGATHI ENGINEERING COLLEGE, surampalem	II & III B.Sc	DCR/TVV/VSK/VRB/GP/VVR

			*Student Seminar		
8.		IV week	1st Year Admissions	I B.Sc	
9.	AUG	I week	*Bridge course *Add on course on chem draw	I B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/CHP/ VVR/KNS/GSS/GS
10.		II week	Invited talk	III B.Sc	DCR/TVV/VSK
11.		III week	I st Internal Examinations * Internship for IV Sem at 1.1. BOGA LABORATORY LTD, Peddapuram 2. National Institute of Hydrology, Kakinada	I,II&III B.Sc	TVV/NBB/PVK/VRB/GP /VVR/GSS/KNS/PVK
12.		IV week	*Student seminar/quiz curricular activity	II & III BSC	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/
13.	SEP	I week	*Student Seminar *Student study project	II & III B.Sc	DCR/TVV/VSK/VRB/GP/V VR
14.		II week	quiz	III B.Sc	DCR/TVV/VSK/PVK/ VRB/GP/VVR
15.		III week	Assignments	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/CHP/ VVR/GSS/
16.		IV week	II nd Internal Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/
17.	OCT	I week	Student Seminar	II & III B.Sc	DCR/TVV/VSK/VRB/GP/V VR

18.		II week	*Assignments	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/
19.		III week	Sem End Examinations	I&III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/
20.		IV week	Sem End Examinations	I & III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/
21.	NOV	I week	Commencement for Class work to Sem II, IV & VI	I,II&III B.Sc	
22.		II week	Assignments	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/
23		III week	Student Seminar	II & III B.Sc	DCR/TVV/VSK/VRB/GP/V VR
24.		IV week	Quiz Programme	I,IIB.Sc	KNS/PVK/GSS/GS
25.	DEC	I week	Awareness programme on World Aids Day	I,II&III B.Sc	DCR/TVV/VSK/NBB/PVK/ VRB/GP/ VVR/GSS/
26.		II week	National Chemistry Day Celebrations I st Internal Examinations	I,II&III B.Sc	DCR/TVV/VSK/NBB/PVK/ VRB/GP/ VVR
27.		III week	Student Seminar Invited talk	II & III B.Sc	DCR/TVV/VSK/VRB/GP/V VR
28.		IV week	Field trip	III B.Sc	DCR/TVV/VSK/VRB/GP/C HP/
29.	JAN	I week	Assignments	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/ GP/ VVR/GSS/

30.		II week	Pongal holidays		
31.		III week	Student Seminar	II & III B.Sc	DCR/TVV/VSK/VRB/GP/VR
32.		IV week	II nd Internal Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GSS/
33.	FEB	I week	Assignments	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GSS/
34.		II week	Invited talk	III B.Sc	DCR/TVV/VSK/VRB/GP/CHP/
35.		III week	Student Seminar	II & III B.Sc	DCR/TVV/VSK/VRB/GP/VR
36.		IV week	Assignments/Remedial class	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GSS/
37.	MAR	I week	Assignments/Remedial class	II & III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GSS/
38.		II week	Student Seminar	II & III B.Sc	DCR/TVV/VSK/VRB/GP/CHP/VVR
39.		III week	debate/group. discussion	III B.Sc	TVV/KNS/GSS/GS/GS/GSS
40.		IV week	Sem End practical Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/KNS/GSS/GS
41.	APR	I week	Sem End Practical Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GS/KNS/GSS/PVK
42.		II week	Sem End Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GS/KNS/GSS/PVK
43.		III week	Sem End Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GS/KNS/GSS/PVK
44		IV week	Sem End Examinations	I,II&III B.Sc	TVV/VSK/NBB/PVK/VRB/GP/VVR/GS/KNS/GSS/PVK

2. Organizing National/ State level seminars/Workshops/ Conferences/ Training programs etc., with topics and other details.

(Mandatory for each Department)

- i) Faculty Development Program
- ii) Student Training Programme in TLC/Column Chromatography
- iii) Awareness on OZONE protection
- iv) National Chemistry day
- v) National Science day 2021
- vi) Guest Lectures
- vii) National seminar in chemistry
- viii) Training in Soil analysis
- ix) Training in water analysis

3. Change of modules in the syllabus content.

Syllabus changed for first, second and final years as per university regulations and CBCS pattern.

4. Plan for utilization of funds for Autonomous/CPE/other grants available for arranging guest lectures, faculty improvement programs, study tours, equipping laboratories, reference books & other necessary teaching-learning material with ICT enabled teaching.

I. Study visits to: Rs, 50,000

1. Visakha Steel Plant, Visakhapatnam
2. Hetero Laboratories, Nakkapally
3. Dr. Reddy's Laboratories, Yanam.
4. National Institute of Hydrology, Kakinada.
5. SAR Chandra Environ Solutions, Kakinada.
6. ONGC mini refinery, Tatipaka.
7. Soil analysis laboratory, Samalkot.
8. IICT, HYD
9. Venky parenterals, Yanam

II. Purchase of Equipment

1. Sophisticated version UV-Visible spectrophotometer- 5.0 lakhs
2. Rota vapour 4.0 lakhs
3. Other equipment 1.0 lakh

5. Plan for organizing subject oriented community outreach programs & allocation of necessary funds. (Mandatory for each Department)

- | | | |
|--------------------------------|-----|--------|
| i) Adoption of village | Rs. | 20,000 |
| ii) Medical Awareness programs | Rs. | 10,000 |

6. Instituting of new medals/incentives/prizes etc., from alumni, philanthropists, parents, faculty etc., - Strategies to be recommended

7. Introduction of new programs -PG/UG/Diploma and certificate courses.

8. Any other program that enhances the learning capacity of students and their employable & knowledge skills.

Training in the use of instruments like AAS, UV-Vis, HPLC, flame photometer, uranium analyzer, soil and water analysis projects, air quality projects.

9. Proposed panel of examiners/paper setters & other experts/nominees for BOS deliberations.

Chemistry:


1. Sri.V. Mallikarjuna Sarma, Lecturer in Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada.
2. Dr. V. Narayana Rao, Lecturer in Chemistry, GDC, Perumallapuram.
3. Dr. T. Narasimha Murthy, Lecturer in Chemistry, Govt. Arts College, Rajamahendravaram.
4. Dr. P. Siva Kumar, Lecturer in Chemistry, Govt. Arts College, Rajamahendravaram.
5. Sri. U. Sai Krishna, Lecturer in Chemistry, Govt. Arts College, Rajamahendravaram
6. Sri. K. Anand, Lecturer in Chemistry, GDC, Pithapuram.

Structure of Chemistry Syllabus under CBCSw.e.f. 2020-21

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
I	I	I	Inorganic and Physical Chemistry	100 (50:50)	04
			Practical - I	50	01
	II	II	Organic and General Chemistry	100 (50:50)	04
			Practical - II	50	01
	Summer Internship-I		Community Service Project (CSP)	100	04
II	III	III	Spectroscopy and Physical Chemistry	100 (50:50)	04
			Practical - III	50	01
	IV	IV	Inorganic, Organic and Physical Chemistry	100 (50:50)	04
			Practical - IV	50	01
		V	Inorganic and Physical Chemistry	100 (50:50)	04
	Practical - V		50	01	
	Summer Internship-II		On the Job Training	100	04
III	V (Any one of the five pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A&7A or 6B&7B or 6C&7C or 6D&7D or 6E&7E)	VI (6A)	Synthetic Organic Chemistry	100 (60:40)	04
			Practical - 6A	50	01
		VII (7A)	Analysis of Organic Compounds	100 (60:40)	04
			Practical - 7A	50	01
		VI	Industry Apprenticeship		400

Allotment of Extra credits guidelines

Sl.No.	Activity	Details of achievement	Credits
1	MOOC Course	<i>SWAYAM/NPTEL/CEC etc., (Course Completion certificate with credits should be produced for the claim of extra credits)</i>	<i>Total credits achieved will be considered</i>
2	NCC	B CERTIFICATE	2
		<i>Participation in National Camp after 'B' certificate</i>	3
		C CERTIFICATE	4
		<i>Adventure camp/RD parade along with 'B'</i>	5
		<i>Failed in B certificate Examination</i>	1
3	Sports	<i>Intercollegiate selection</i>	2
		<i>South zone selection</i>	3
		<i>All India participation</i>	4
		<i>Winning medals in all India competitions</i>	5
4	NSS	<i>40% attendance in regular NSS activities</i>	1
		<i>50% attendance with Community Service</i>	2
		<i>Conduct of survey/Youth exchange/RD</i>	3
5	JKC	<i>Enrollment and training</i>	1
		<i>Campus recruitment local level</i>	2
		<i>MNCs/reputed companies</i>	3
6	Community service	<i>Participation in community service by departments (outreach programmes)</i>	2
7	Cultural activity	<i>Winning medals at state level-2,</i>	2
		<i>District level-1</i>	1
8	COP/Add on Course	<i>Pass in Certificate Exam-1,</i>	1
		<i>Diploma-2</i>	2
9	Support services	<i>Lead India, Health club, RRC and Eco Club etc., participation in various programmes</i>	1

	P. R. College (Autonomous), Kakinada		Program & Semester I B.Sc. Chemistry (I Semester)				
Course Code	TITLE OF THE COURSE Inorganic & Physical chemistry						
Teaching	Hours Allocated: 60 (Theory)			L	T	P	C
Pre-requisites	III A Group Elements, Modern periodic table, Chemical bonding			60	10	30	4+1

Course Objectives:

1. To explain the basic concepts of p-block elements
2. To analyze modern periodic table.
3. To synthesize inorganic molecules
4. To understand physical and chemical properties of elements
5. To understand the various types of structures of molecules.

Course Outcomes:

Course on Completion of the course, the students will be able to	
CO1	Understand the basic concepts of p-block elements.
CO2	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
CO3	Apply the concepts of gas equations, electrolytes while studying other Chemistry courses.
CO4	Explain the concepts of azeotropic mixtures and miscible liquids and steam distillation

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	
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SYLLABUS FOR SEMESTER -I
CHEMISTRY PAPER- I
(Inorganic & Physical Chemistry)

60hrs. (4h/w)

INORGANIC CHEMISTRY **24 h**

UNIT-I

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

Group13: Preparation & structure of Diborane, Borazine

Group14: Preparation, classification and uses of silicones

Group 15: Preparation & structures of Phosphonitrilic halides $\{(PNCl_2)_n\}$ where $n=3,4$

Group 16: Oxides of Sulphur, (structures only)

Group 17: Pseudo halogens, Structures of Interhalogen compounds.

Additional Input: Oxoacids of Sulphur (structures only)

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: **4h**

Chemistry of lanthanides; electronic structure, oxidation states, Lanthanide contraction, consequences of lanthanide contraction , magnetic properties.

Theories of bonding in metals: **6h**

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.

Additional Input: Chemistry of actinides-electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

PHYSICAL CHEMISTRY **36h**

UNIT-III

Solid state **10h**

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

Additional Input: Defects in crystals. Stoichiometric and non-stoichiometric defects.

UNIT-IV

1. Gaseous state **6h**

Van der Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and van der Waal's constants. Joule-Thomson effect. Inversion temperature.

2. Liquid state **4h**

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.

Additional Input: Law of corresponding states.

UNIT-V

1. Solutions **6h**

Azeotropes-HCl-H₂O system and ethanol-water system. Partially miscible liquids-phenol-water system. Critical solution temperature(CST), 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 boiling point and depression in freezing point. Experimental method for the determination of molar mass of a non-volatile solute using osmotic pressure, abnormal colligative properties. Van't Hoff factor.

Additional Input: Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Experimental methods for the determination of Elevation in boiling point and depression in freezing point.

Co-curricular activities and Assessment Methods

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

1. **Textbooks :**

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

CO-PO Mapping:

Course on Completion of the course, the students will be able to	
CO1	Understand the basic concepts of p-block elements.
CO2	Explain the difference between solid, liquid and gases in terms of intermolecular interactions.
CO3	Apply the concepts of gas equations, electrolytes while studying other Chemistry courses.
CO4	Explain the concepts of azeotropic mixtures and miscible liquids and steam distillation

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], 4: No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	2	-	-	1	3	3	1	2
CO2	3	2	3	3	2	3	3	1	-	3	2	3	2	3
CO3	2	3	3	2	3	2	3	3	1	2	2	2	3	2
CO4	3	3	2	2	2	2	3	-	1	1	3	3	2	3
Avg.	3	2.5	2.5	2.5	2.5	2.5	2	1	.5	1.75	2.5	2.75	2	2.5

PROGRAMME SPECIFIC OUTCOMES:

PSO1: Understand the theoretical concepts of physical and chemical properties of materials and the role of mathematics in dealing with them in a Quantitative way.

PSO2: Mathematical, numerical techniques required to model them.

PSO3: To Build firm foundation on various basic concepts in Mathematics, Physics and Chemistry.

PSO4: Analyze the concepts of mathematics, physics and chemistry and understand the relation among them like physical chemistry, Mathematical modeling of physics and chemistry Problem.

PSO5: To understand inter-relationship among the three subjects, Mathematics, Physics and Chemistry.

PSO6: To facilitate the students to pursue higher Studies interdisciplinary areas such as Biochemistry, Bioinorganic Chemistry Bioinformatics etc.,

PSO7: To understand the laboratory protocols with regard to safe handling Chemicals, glassware and Equipment

P. R. GOVERNMENT COLLEGE, KAKINADA
SYLLABUS FOR SEMESTER -I (CHEMISTRY)
Paper I (Inorganic & Physical Chemistry)
Weightage to content

S. No.	Course Content	Essay Questions(10M)	Short Answer Questions(5M)	Total No. Of Questions From each Unit	Total No. of Marks allotted to each Unit	As per Blooms Taxonomy
	Inorganic Chemistry					
1	Unit-I	1	1	2	15	Understanding and Application
2	Unit-II	2	1	3	25	Knowledge and Understanding
	Physical Chemistry					
3	Unit-III	1	1	2	15	Analysis and Creation
4	Unit-IV	1	1	2	15	Understanding
5	Unit-V	1	2	3	20	Knowledge and Application
	TOTAL	6	6	12	90	

P. R. GOVERNMENT COLLEGE, KAKINADA

SEMESTER-I

MODEL PAPER (CHEMISTRY)

Paper-I (Inorganic & Physical Chemistry)

Duration:2hrs.Max.

Marks:50

PART-I

Answer any **THREE** questions by attempting at least one question from each section.

SECTION-A

3X10= 30 Marks

1. Question from Unit-I
2. Question from Unit-II
3. Question from Unit-III

SECTION-B

4. Question from Unit-IV
5. Question from Unit-V
6. Question from Unit- II

PART-II

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

4x5=20 Marks

7. Question from Unit- I
8. Question from Unit-II
9. Question from Unit-III
10. Question from Unit-IV
11. Question from Unit-V
12. Question from Unit-V

Topics Included / Deleted under Autonomous setup

Program : I B.Sc.

Semester : I

Course : Chemistry-I

Title of the course : Inorganic and Physical chemistry.

S. No.	Name of the Module	Topics Deleted	Justification
1	Unit I	Chemistry of actinides	➤ It is appropriate to delete this topic in view of to much difficulty to understand at this level for this semester
2	Unit V	Immiscible liquids and steam distillation	➤ It is appropriate to continuation this topic in additional input

Total Percentage of deletion: 15 %

P.R. GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER-I
CHEMISTRY COURSE-I (INORGANIC & PHYSICAL CHEMISTRY)

Question bank

Unit-I

ESSAY QUESTIONS

1. Explain Classification, Preparations & uses of Silicones
2. Explain Preparation and Structure of Diborane.
3. What are Pseudo halogens? Explain the Structures of AX₃ & AX₅ types of interhalogen compounds.

SHORTANSWERQUESTIONS

1. Explain the preparation and structure of Borazine
2. Explain the structures of Phosphonitrilic compounds.
3. Write any three structures of sulphuroxyacids.

Unit-II

ESSAYQUESTIONS

1. Explain magnetic and catalytic properties of d-block elements.
2. What is Lanthanide Contraction? Explain the Consequences of Lanthanide Contraction?
3. Explain Band theory of Conductors, Semi-conductors and Insulators.

SHORTANSWERQUESTIONS

1. Why do d-block elements show variable oxidation states? Explain with examples.
2. Explain free electron theory of metals.
3. Explain Valence bond theory of metals.

Unit-III

ESSAYQUESTIONS

1. Derive Bragg's Law. Explain the determination of structure of a crystal by powder method?
2. Explain symmetry elements in crystals.

SHORTANSWERQUESTIONS

1. Write a short note on Law of constancy of interfacial angles, law of rationality of indices and the law of symmetry.
2. Write short note on Bravais lattices and crystal systems.
3. Define lattice point, space lattice and unit cell?

Unit-IV

ESSAY QUESTIONS

1. Derive the relationship between Critical constants & Vander Waal's constants
2. Why do real gases deviate from ideal gas behavior? Derive Vander Waal's equation of state?
3. State and explain Joule- Thomson effect.

SHORT ANSWER QUESTIONS

1. What are liquid Crystals? Explain.
2. Explain applications of liquid crystals as LCD devices?
3. What is Inversion Temperature? Give Examples.

Unit -V

ESSAY QUESTIONS

1. What is Osmotic Pressure? Determine the molar weight of a non-volatile solute using osmotic pressure?
2. What is Critical Solution temperature? Explain Critical solution temperature for Phenol-water system.

SHORT ANSWER QUESTIONS

1. State and write the applications of Nernst distribution Law?
2. Define colligative properties. Write different types of colligative properties.
3. Explain briefly Common ion effect & Solubility product?

LABORATORY COURSE -I

30hrs (2h/ w)

Practical-I Analysis of SALT MIXTURE

(At the end of Semester-I)

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

50M

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

	P R Govt College(A), Kakinada	Program&Semester			
Course Code CHE-III	TITLE OF THE COURSE ORGANIC CHEMISTRY & SPECTROSCOPY	II B.Sc. (III Semester)			
Teaching	HoursAllocated:60 (Theory)	L	T	P	C
Pre-requisites	Types of Organic Reactions, Reaction Intermediates, Molecular Energy levels, Symmetry rules, Resonance.	60	10	30	4+1

Course Objectives:

1. Mechanism of Nucleophilic substitution reactions
2. Stereo chemical aspects of Nucleophilic Substitution reactions
3. Mechanisms of some important named reactions related to Alcohols, Phenols, Carbonyl compounds, Carboxylic Acids.
4. Preparations and synthetic applications of Active Methylene compounds.
5. UV, IR, Rotational & NMR spectroscopic techniques and their applications.

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on different preparation methods of alkyl and aryl halogen compounds & Understand the nucleophilic substitution reactions- S_N1 , S_N2 , S_NAr mechanisms with stereo chemical aspects
CO2	Comprehend the mechanism of different reactions of alcohols, phenols, Carbonyl compounds and Carboxylic acids in synthetic organic chemistry
CO3	Understand the Preparations and synthetic applications of Active methylene compounds.
CO4	Understand UV, IR, Rotational & NMR spectroscopic techniques and their applications.

Coursewithfocusonemployability/entrepreneurship/SkillDevelopment modules

SkillDevelopment		Employability		Entrepreneurship	
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UNIT I:

1. Chemistry of Halogenated Hydrocarbons:

Alkyl Halides: Methods of preparation and properties, nucleophilic substitution reactions— S_N1 , S_N2 and mechanisms with stereo chemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination, Williamson's synthesis.

Aryl Halides: Preparation (including preparation from diazonium salts) and properties, nucleophilic aromatic substitution; S_NAr , Benzyne mechanism. Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Additional Input: Applications of Diazonium salts,

2. Alcohols & Phenols

Alcohols: preparation, properties and relative reactivity of 1° , 2° , 3° alcohols, Bouvet Blanc Reduction, Oxidation of Diols by Periodic Acid and lead Tetra acetate, Pinacol- Pinacolone Rearrangement;

Phenols: Preparation and Properties; Acidity and Factors Affecting It, Ring substitution reactions, Reimer-Tiemann and Kolbe's-Schmidt Reactions, Fries and Claisen Rearrangement with mechanism.

Additional Input: Distinguish methods of 1° , 2° , 3° alcohols.

UNIT II:

Carbonyl Compounds:

Structure, reactivity, preparation and properties; Nucleophilic Addition, Nucleophilic Addition-elimination reactions with ammonia derivatives Mechanisms of Aldol and Benzoin Condensation, Cannizzaro, Claisen-Schmidt, Perkin, and Wittig reaction, Beckmann rearrangement & Haloform Reaction oxidations and reductions (Baeyer Villiger oxidation, Clemmensen, Wolf-Kishner, with $LiAlH_4$ & $NaBH_4$). Addition Reactions of α , β unsaturated carbonyl compounds: Michael Addition.

Additional Input: Crossed Aldol condensation, Selectivity of $LiAlH_4$ & $NaBH_4$

UNIT III:

1. Carboxylic Acids and their Derivatives:

General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituents on acidic strength. 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, Reformatsky reactions. Reactions involving H, OH and COOH groups—salt formation, anhydride formation, acid chloride formation, amide formation and

esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt- Eistert synthesis, halogenation by Hell-Volhard- Zelinsky reaction.

2. Active Methylene Compounds:

Keto-enol tautomerism. Preparation and Synthetic Applications Diethyl malonate and ethyl acetoacetate.

SPECTROSCOPY30h(2h/w)

UNITIV:

Molecular Spectroscopy: Interaction of electromagnetic radiation with molecules and various types of spectra. Morse Potential curve

Vibrational Spectroscopy: Classical Equation of Vibration, computation of force constant, Infrared radiation and types of molecular vibrations, functional group and fingerprint region.

Electronic spectroscopy: Energy levels of molecular orbitals (σ, π, n) . Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore. Bathochromic and hypsochromic shifts. Beer-Lambert's law and its limitations.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, Factors effecting chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants.

Additional Input: Fermi resonance, Fundamental Frequencies, overtones and hot bands. and coupling constant.

UNITV:

Application of Spectroscopy to Simple Organic Molecules

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

IR Spectral interpretation of alkanes, alkenes, Aromatic Hydrocarbons and simple alcohols

(inter and intramolecular hydrogen bonding), aldehydes, ketones and carboxylic acids
amines.

Applications of NMR with suitable examples – ethyl bromide, ethanol, acetaldehyde, 1,1,2-
tribromoethane, ethyl acetate and Acetophenone.

Textbooks:

1. Organic chemistry by Jonathan Clayden, Nick Greeves and Stuart Warren, Second edition, Oxford University press
2. Elementary organic spectroscopy by Y.R. Sharma
3. Spectroscopy by Jag Mohan

Reference books:

1. Reaction Mechanism in Organic Chemistry by S.M. Mukherjee and S.P. Singh, Revised edition, Trinity Press
2. A Text Book of Organic Chemistry by Bahland Arunbahl
3. A Text book of Organic chemistry by IL Finar Vol I
4. Organic chemistry by Bruice
5. Organic chemistry by Clayden
6. Spectroscopy by William Kemp
7. Spectroscopy by Pavia
8. Organic Spectroscopy by J.R.Dyer
9. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
10. Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster.
11. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)
12. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis

Web links:

1. <https://www.youtube.com/watch?v=JlxM1QsvdUU&list=PLBWC8FLcfD-Dama4OPQUcTfydQp09mXAL>

- https://www.youtube.com/watch?v=0fKpYsV_F9o&list=PL88zE4oO5RTHRh817Cm8Yugh-qqhKVqcg
- https://www.youtube.com/watch?v=Igt0mIIwd9I&list=PL2-xuUUvX2qvFISUfBmWXgsj8KqT_v95g
- https://www.youtube.com/watch?v=Uy7MeQ_DYNc&list=PLeMMHhzzYaoDRq7HR1GeYz4spJT_jj8JS
- <https://www.youtube.com/watch?v=1ApGSzDdQnM>
- <https://www.youtube.com/watch?v=aJHErmj7Z6A&list=PLYXnZUqtB3K9MmJeTRJh9e9fcdq3lhA-b>

CO-PO Mapping:

On Completion of the course, the students will be able to	
CO1	Acquire knowledge on different preparation methods of alkyl and aryl halogen compounds & Understand the nucleophilic substitution reactions – SN^1 , SN^2 , SN^{Ar} mechanisms with stereo chemical aspects
CO2	Comprehend the mechanism of different reactions of alcohols, phenols, Carbonyl compounds and Carboxylic acids in synthetic organic chemistry
CO3	Understand the Preparations and Gains Knowledge about synthetic applications of Active methylene compounds.
CO4	Understand UV, IR, Rotational & NMR spectroscopic techniques and their applications.

1: Low = 1 ; 2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	2	2	1	3	2	3	1	3
CO2	3	2	3	2	2	2	1	1	3	3	3	2	1
CO3	3	1	3	3	1	2	2	2	2	1	2	1	2
CO4	2	3	2	2	3	3	3	2	3	2	2	2	1
Avg.	2.75	1.75	2.5	2.25	1.75	2.25	2	1.5	2.75	2	2.5	1.5	1.75

PO1: Knowledge in Chemistry: Apply the knowledge of reaction mechanism to study the characteristics of alkyl halides, aryl halides, Alcohols, Phenols, Carbonyl compounds, Carboxylic acids.

PO2: Problem analysis: Various spectral techniques and their principles for the determination of organic reaction mechanisms and Organic synthesis of molecules.

PO3: Design/development of solutions: Design solutions for simple to complex molecules for their synthesis.

PO4: Conduct investigations of complex problems: Use fundamental research-based knowledge and available research methods including design of experiments, analysis and interpretation of data, and synthesis of the organic molecules.

PO5: Modern tool usage: applying available IT tools for synthesis of organic molecules and their structural interpretation

PO6: Society: Applying the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the importance of synthesis organic molecules for various solutions in societal and environmental context and demonstrate the knowledge and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the science-based practice.

PO9 : Communication: Communicate effectively on issues related to reaction mechanism and spectral characteristics of organic molecules with chemistry community, being able to write the effective reports and documentation, presentations.

PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-1: To have a firm foundation in the fundamentals/concepts/theories and its applications in organic reaction mechanisms

PSO-2: To understand the elucidation of structure and properties of organic molecules by using spectral techniques like UV, IR, NMR.

PSO-3: To acquaint with safety measures in laboratory and develop skills in proper handling of chemicals and apparatus/instruments and carry out experiments, record the observations and present the inference/results

WEIGHTAGE TO THE COURSE CONTENT
Second Year Semester - III
ORGANIC AND SPECTROSCOPY-III

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Chemistry of Halogenated compounds, Aryl Halides and Alcohols and Phenols	2	2	30	1. Understanding 2. Application 3. Evaluation
2	Carbonyl Compounds	1	2	20	1. Remembering 2. Understanding 3. Application
3	Carboxylic Acids & Their Derivatives, Active methylene compounds	1	1	15	1. Knowledge 2. Comprehension
4	Spectroscopy	1	2	20	1. Understanding 2. Evaluation 3. Analyzing
5	Application of Spectroscopy to Simple Organic Molecules	1	1	15	1. Understanding 2. Application 3. Creation
	Total	6	8	100	

P.R.GOVERNMENT COLLEGE, KAKINADA

MODEL PAPER FOR SEMESTER - II

Paper III (ORGANIC CHEMISTRY & SPECTROSCOPY)

Duration: 2hrs.30Min

Max. Marks: 50

PART-A

4X 5=20Marks

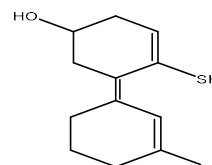
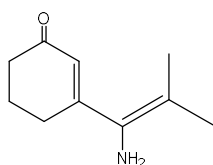
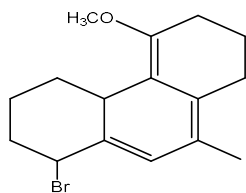
Answer any Four of the following questions. Each carries FIVE marks

1. How would you demonstrate the differences between nucleophilic substitution and elimination reactions?
2. How can you distinguish of primary, secondary, and tertiary alcohols?
3. How would you generalize wolf kishner and Clemenson reduction?
4. What action would you take to perform haloform reaction in ethyl alcohol and acetophenone.
5. Describe what happens when acid react with alcohol?
6. How would you explain spin spin coupling and chemical shift?
7. Discuss fingerprint region?
8. What can you infer from the effect of hydrogen bonding on vibrational frequency?

PART-B

Answer any THREE questions. Each carries TEN marks 3X10=30Marks

1. How could you verify S_N1 & S_N2 reactions? Explain their mechanism with an example?
2. Suggest the mechanism of (i) Reimer - Tieman reaction
(ii) Williamson ether synthesis.
3. Elaborate the mechanism of Aldol condensation & Cannizaro reaction.
4. How can you prepare Acetoacetic ester and explain synthetic applications of acetoacetic ester?
5. What criteria would you use to explain Absorption laws and electronic transitions.
6. How would you calculate λ_{max} for the following compounds?



Unit No	Additions	Deletions	Remarks as per Blooms Taxonomy	% of added/deleted
I	<ol style="list-style-type: none"> Applications of Diazonium salts. Distinguish methods of various alcohols 	S _N i- Mechanism	Application Understanding	2%
II	<ol style="list-style-type: none"> Crossed Aldol condensation. Selectivity of LiAlH₄ & NaBH₄ 	-----	Application Analysis	2%
III	<ol style="list-style-type: none"> Active Methylene Compounds: Keto-enol tautomerism. Preparation Synthetic Applications Diethyl malonate and ethyl acetoacetate 	<p>Typical Reactions of dicarboxylic acids and unsaturated carboxylic acids</p> <p>-----</p>	Knowledge Comprehension	4%
IV	Types of molecular vibration. Functional group and fingerprint region	<p>Rotation spectroscopy.</p> <p>Harmonic and anharmonic oscillator & Selection rules for vibrational transitions.</p> <p>Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate and acetophenone.</p>	Understanding Evaluation Analysing	2%
V	1.Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate and acetophenone.	<p>Types of molecular vibration.</p> <ol style="list-style-type: none"> Types of molecular vibrations. Functional group and fingerprint region 	Understanding Application Creation	2%

Practical Paper-III (At the end of Semester-III)**Organic Preparations and IR Spectral Analysis Lab: 50 Marks****Course Outcomes**

1. How to use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2. How to calculate limiting reagent, theoretical yield, and percent yield
3. How to engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately
4. How to dispose of chemicals in a safe and responsible manner
5. How to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration
6. How to create and carry out workup and separation procedures
7. How to critically evaluate data collected to determine the identity, purity, and percent yield of products and to summarize findings in writing in a clear and concise manner

Organic preparations: 30M

- i. Acetylation of one of the following compounds:

Amines (aniline) and phenols (β -naphthol, salicylic acid) by any one method:

- a. Using conventional method.
 - b. Using green approach
- ii. Benzoylation of amine (aniline)
 - a. Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method
 - b. Salicylic acid by green approach (using Ceric Ammonium Nitrate).

IR Spectral Analysis: 10M

IR Spectral Analysis of the following functional groups with examples

- a) Hydroxyl groups
- b) Carbonyl groups
- c) Aminogroups
- d) Aromatic groups

SCHEME OF VALUATION

S.NO	DISCRIPTION	MARKS
1	Organic Preparations	30
	i. Reaction with Mechanism	10
	ii. Procedure	10
	iii. Recrystallization	05
	iv. Report	05
2	Interpretation of IR Spectra of given Organic Compounds	10
3	Record	05
4	Viva	05

	P R Govt College (A) Kakinada	Program & Semester			
CourseCode CHE-6A	TITLEOFTHECOURSE SYNTHETIC ORGANIC CHEMISTRY	III B.Sc. (V Semester)			
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Symmetry and Photochemistry, Oxidation, Condensation and Reduction reactions	60	10	30	4+2

CourseObjectives:

1. Pericyclic Reactions
2. Organic Photochemistry
3. Retro synthesis
4. C-C bond formation, Oxidation and Reduction Reactions.

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Student will acquire knowledge on basic concepts in different types of pericyclic reactions
CO2	Student will get the knowledge in understanding the fundamental concepts involved in the organic photochemistry and gets acquainted with new kind of reactions
CO3	Student shall have opportunity to understand the importance of retrosynthesis in organic chemistry which is a key analysis in recent research trends.
CO4	Students shall Comprehend the applications of different novel reagents and reactions in synthetic organic chemistry.

Course with focus on Skill Development/Employability/Entrepreneurship modules

SkillDe velopment		Employability		Entrepreneurship	
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Syllabus:

UNIT-I Pericyclic reactions:

15 h

A brief introduction to synthetic organic chemistry – Features and classification of pericyclic reactions : Phases, nodes and symmetry properties of molecular orbitals in ethylene,1,3-butadiene,1,3,5-hexatriene,Thermal and photochemical reactions. Introduction of Frontier Molecular Orbitals –

Electro cyclic reactions: Definition and examples, definitions of con and dis rotation, Woodward-Hoffmann selection rules. (Correlation diagrams are not required) Cycloaddition reactions: Definition and examples, definitions of suprafacial and antrafacial addition, Woodward- Hoffmann selection rules. (Correlation diagrams are not required)

UNIT-II Organic photochemistry: 9h

Jablonski diagram-singlet and triplet states -Photochemistry of Carbonyl compounds- $\pi-\pi^*$ and $n-\pi^*$ transitions, **Norrish type-1 and type-2 reactions - Paterno- Buchi reaction - Photo Fries Rearrangement**

UNIT-III Retrosynthesis 12 h

Important terms in Retrosynthesis with examples- Disconnection, Target molecule, FGI, Synthons, Retrosynthetic analysis, **chemo selectivity, regio selectivity & stereo selectivity.** Importance of Order of events in organic synthesis - **Retrosynthetic analysis of the compounds: a. cyclohexene, b. 4-Nitro toluene, c. Paracetamol.**

Unit-4: Synthetic Reactions 12 h

Shapiro reaction, Stork - Enamine reaction (only alkylation), Wittig reaction, Robinson annulation, Baily-Hillman reaction, Heck reaction, Suzuki coupling. Concept of Umpolung - Synthesis of aldehydes and ketones using 1,3-Dithiane.

Unit-5: Reagents in Organic Chemistry 12h

Oxidizing agents: PCC, OsO₄, SeO₂ (Riley oxidation), DDQ.

Reducing agents: LiAlH₄ (with mechanism), NaBH₄, Metal-solvent reduction (Birch reduction), Introduction Catalytic reduction (Heterogeneous catalysis).

Text books:

1. Reaction Mechanism in Organic Chemistry by S.M. Mukherji and S.P. Singh, Revised edition, Trinity Press.
2. Organic Chemistry by Jonathan Clayden, Nick Greeves and Stuart Warren, Second Edition, Oxford University Press

Reference books

1. Pericyclic reactions by Ian Fleming, Second edition, Oxford University press.
2. Pericyclic Reactions-A Textbook: Reactions, Applications and Theory by Sankararaman, WILEY-V CH.
3. Pericyclic reactions-A Mechanistic study by S.M. Mukherji, Macmillan India.
4. Organic synthesis: The disconnection approach by Stuart Warren, John Wiley & Sons.
5. Reactions, Reagents and Rearrangements by S.N. Sanyal, Bharati Bhawan Publishers & Distributors

WebLinks:

1. <https://youtu.be/c9-h83KDiAk>
2. <https://youtu.be/NDHQ7W2TKIY>
3. <https://youtu.be/mdWsJWybUcA>
4. <https://youtu.be/CyYUGaSWihE>

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Student will acquire knowledge on basic concepts in different types of pericyclic reactions
CO2	Student will get the knowledge in understanding the fundamental concepts involved in the organic photochemistry and gets acquainted with novel reactions
CO3	Student shall have opportunity to understand the importance of retrosynthesis in organic chemistry which is a key analysis in recent research trends.
CO4	Students shall Comprehend the applications of different novel reagents and reactions in synthetic organic chemistry.

CO-PO Mapping:

1: Low = 1 ; 2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	3	1	3	2	3	2	2	2	3	3	2
CO2	3	3	2	3	2	2	1	2	2	2	3	3	2
CO3	3	3	3	3	3	2	2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2	2	2	2	3	2	3
Avg.	3	2.8	2.8	2.5	2.8	2	2	2	2	2	3	2.8	2.3

PO1 : Knowledge in Chemistry : Apply the knowledge of synthetic organic chemistry to the solution of simple to complex synthesis of organic molecules.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze simple to complex problems reaching substantiated conclusions using fundamental principles of synthetic organic chemistry.

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel routes for the synthesis of bioactive / active pharmaceutical ingredients.

PO4: Conduct investigations of complex problems: Use fundamental research-based knowledge and available research methods including design of experiments, analysis and interpretation of data, and synthesis of the organic molecules.

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and IT tools for modeling and interpretation of simple to complex organic molecules.

PO6 : Society: Applying the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the importance of synthetic organic chemistry for various solutions in societal and environmental context and demonstrate the knowledge and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and

norms of the science-based practice.

PO9 : Communication: Communicate effectively on issues related to synthetic organic chemistry with the chemistry community, being able to write the effective reports and documentation, presentations.

PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-1: To have a firm foundation in the fundamentals/concepts/theories and its applications in synthetic organic chemistry.

PSO-2: To understand the structure and properties of reagents, Characteristics mechanisms of chemical reactions and their synthetic utility.

PSO-3: To acquaint with safety measures in laboratory and develop skills in proper handling of chemicals and apparatus/instruments and carry out experiments, record the observations and present the inference/results

Weightage to content
Semester -V
Paper-6A

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Pericyclic reactions	2	2	30	Understanding, Application
2	Organic Photo Chemistry	1	2	20	Remembering, Understanding
3	Retrosynthesis	2	1	25	Analysizing & Creation
4	Synthetic Reactions	2	1	25	Evaluation, Understanding
5	Reagents in Organic Chemistry	1	2	20	Application & Creation
	TOTAL	8	8	120	

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III YEAR B.Sc (Examination at the end of V semester)
(Synthetic Organic Chemistry)

Paper-6A
MODELPAPER

Duration: 2hrs.30Min

Max.Marks:60

PART-A

Answer any **Four** of the following questions. Each carries FIVE marks 4X5=20Marks

1. Draw the Molecular orbital diagram of 1,3-butadiene.
2. How would you differentiate electrocyclic reactions and cyclo addition reactions.
3. How would you generalize Norrish Type-I reaction.
4. What is Photo Fries rearrangement
5. What can you infer Target molecule and synthon with an example.
6. Suggest the mechanism of Stork- Enamine alkylation reaction.
7. How would you explain Birch reduction with mechanism.
8. How would you present PCC as oxidizing agent.

PART-B

Answer ALL the questions. Each carries TEN marks 4X10=40Marks

9. How do you explain [2+2] - cycloaddition reaction with example with any one method

(OR)

Discuss Electro cyclic reactions by taking anyone example with any one method

- 10.Elaborate Paterno-Buchi reaction and Norrish type- II reaction with an example.

(OR)

Suggest the acceptable mechanism for reduction with LiAlH_4 and give any two synthetic applications of LiAlH_4 .

- 11.Devise ways for retrosynthetic analysis of Cyclohexene and Paracetamol.

(OR)

What explanation do you have for the terms a) Chemo selectivity b) Regio selectivity

- 12.How can you describe the mechanisms of Suzuki coupling and Robinson annulation.

(OR)

Elaborate the mechanism of Wittig and Shapiro reaction

Unit No	Additions	Deletions	Remarks as per Blooms Taxonomy	Percentage added/deleted
1	Introduction of Frontier Molecular Orbitals	Symmetry properties of molecular orbitals in alkylation and ally radical.	Analysis	2 %
2	Photo Fries Rearrangement	-----	Understanding	2 %
3	Stereo selectivity	-----	Creation	2 %
4	Concept of Umpolung	-----	Remembering	2 %
5	OsO ₄ , DDQ, NaBH ₄	PDC, LTBA	Evaluating	2 %

LABORATORY COURSE

Practical Paper – 6A:: Synthetic Organic Chemistry

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

50Marks

Learning Out comes:

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

1. Prepare acetanilide using the green synthesis.
2. Demonstrate the preparation of an azodye.

Practical Syllabus

1. Identification of various equipment in the laboratory.
2. Acetylation of amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Radical coupling reaction: Preparation of 1,1-bis-2-naphthol
5. Green oxidation reaction: Synthesis of adipic acid
6. Photoreduction of Benzophenone to Benzopinacol in the presence of sunlight.
7. Green reduction reaction: Synthesis of.....

References:

1. Vogel A.I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia. And Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F.G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Co-Curricular Activities:

a) Mandatory: (Lab/field training of students by teacher: (lab:10+field:05):

5. For Teacher: Training of students by teacher in laboratory and field for not less than 15 hours on the field techniques/skills of preparation of acetanilide, preparation of azodye, use of separating funnel for solvent extraction, separation of organic compounds in a mixture.

6. For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the techniques used for the separation of organic compounds. Write their observations and submit a hand written fieldwork/project work report not exceeding 10 pages in the given format to the teacher.

7. Max marks for Fieldwork/project work Report: 05.

8. Suggested Format for Fieldwork/project work: Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.

9. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students' by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics), collection of videos and other material.
3. Visits of facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts

SCHEME OF VALUATION

Practical Paper - 6A:: Synthetic Organic Chemistry
(at the end of semester V)

a. Correct Equation with Mechanism	10 marks
b. Procedure	10 marks
c. Recrystallization	10 marks
d. Yield	10 marks
e. Record	05 marks
f. Viva voce	05 marks
TOTAL	50 marks

	P R Govt College (A) Kakinada	Program & Semester			
CourseCode CHE-7A	TITLE OF THE COURSE ANALYSIS OF ORGANIC COMPOUNDS	III B.Sc. (V Semester)			
Teaching	Hours Allocated:60 (Theory)	L	T	P	C
Pre-requisites	Symmetry and Photochemistry, Oxidation, Condensation and Reduction reactions	60	10	30	4+2

CourseObjectives:

1. Gains knowledge in Mass spectroscopy
2. Structural elucidation by IR, NMR and Mass spectroscopic techniques
3. Applications of Paper and Thinlayer chromatographic techniques
4. Problem solving approach to elucidation of the structure and separation of organic compounds.

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Identify the importance of mass spectrometry in the structural elucidation of organic compounds
CO2	Acquire the knowledge on structural elucidation of organic compounds
CO3	Understand various chromatography methods in the separation and identification of organic compounds.
CO4	Demonstrate the knowledge gained in solvent extraction for the separation of organic compounds

Coursewithfocusonemployability/entrepreneurship/SkillDevelopment modules

Skill Development		Employability		Entrepreneurship	
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Syllabus:

Unit-1: Mass Spectrometry

10h

A brief introduction to analysis of organic compounds

Basic principles, Instrumentation - Mass spectrometer, electron Ionization (Electron Impactionization, EI), Molecular ions, Nitrogen rule, metastable ions, Isotope abundance. Basic fragmentation types. - McLafferty rearrangement Fragmentation patterns inToluene,2-Butanol, Butyraldehyde,Propionicacid.

Unit-2: Structural elucidationof organic compounds using IR, NMR, mass spectral data-

8h

2,2,3,3-Tetramethylbutane,Butane-2,3-dione,Propionicacid, methylpropionateand N,N-dimethyl amine

Unit-3: Structural elucidation of organic compounds using IR, NMR, Mass spectral data- 8h
Phenylacetylene, acetophenone, benzoic acid, p-nitroaniline and Coumarin

Unit-4: Separation techniques-1 12h

Solvent extraction-Principle and theory, Batch extraction technique, application of batch extraction in the separation of organic compounds from mixture- acid & neutral, base & neutral.

Chromatography- Principle and theory, classification, types of adsorbents, eluents, R_f values and factors affecting R_f values. Thin layer chromatography -principle, experimental procedure, advantages and applications.

Unit-5: Separation techniques-2 12h

Paper chromatography-Principle, experimental procedure, ascending, descending, radial and two dimensional, applications.

Column chromatography- Principle, classification, experimental procedure, advantages and applications.

Textbooks:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition Pearson
2. Fundamentals of Analytical Chemistry by F. James Holler, Stanley R Crouch, Donald M. West and Douglas A. Skoog, Ninth edition, Cengage.
3. Organic Spectroscopy by William Kemp, Third Edition, Palgrave USA

Referencebooks

1. Introduction to Spectroscopy by Pavia, Lampman, Kriz and Vyvyan, Fifth edition, Cengage
2. Organic Spectroscopy: Principles and Applications by Jag Mohan, Second edition, Alpha Science
3. Spectroscopy of Organic Compounds by P.S. Kalsi, Seventh edition, New Age International.
4. Spectroscopic Methods in Organic Chemistry by Ian Fleming and Dudley Williams, Seventh edition, Springer.
5. Analytical Chemistry by Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, Seventh edition, Wiley.
6. Quantitative analysis by R.A. Day Jr. and A.L. Underwood, Sixth edition, Pearson

WebLinks:

1. <https://youtu.be/rzF-dW08UIw>
2. <https://youtu.be/bPsXkPYexJY>
3. <https://youtu.be/inbiTYI5NIw>
4. https://www.youtube.com/watch?v=qpZhc2Zn_TI

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO1	Identify the importance of mass spectrometry in the structural elucidation of organic compounds
CO2	Acquire the knowledge on structural elucidation of organic compounds
CO3	Understand various chromatography methods in the separation and identification of organic compounds.
CO4	Demonstrate the knowledge gained in solvent extraction for the separation of organic compounds

CO-PO Mapping:

1: Low =1 ; 2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	2	1	1	2	2	1
CO2	3	3	3	3	3	2	2	2	2	2	1	3	1
CO3	3	3	3	3	3	2	2	2	2	2	2	2	1
CO4	2	2	2	2	2	2	2	2	2	2	2	1	1
Avg.	2.8	2.8	2.8	2.8	2.8	2	2	2	1.8	1.8	1.8	2	1

PO1 : Knowledge in Chemistry : Apply the knowledge of structural elucidation techniques to the solution of simple to complex organic molecules.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze simple to complex problems reaching substantiated conclusions using fundamental principles of analysis of organic compounds.

PO3: Design/development of solutions: Design separation techniques for simple to complex molecules.

PO4: Conduct investigations of complex problems: Use fundamental research-based knowledge and available structural elucidation methods for analysis and interpretation of structural data of the organic molecules.

PO5 : Modern tool usage: Create IT & AI enabled structural elucidation techniques, for modeling and optimization of simple to complex organic molecules.

PO6 : Society: Applying the contextual knowledge to assess societal, health, safety, legal and cultural issues.

PO7: Environment and sustainability: Understand the importance of analysis of organic compounds for various solutions in societal and environmental context and demonstrate the knowledge and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the science-based practice.

PO9 : Communication: Communicate effectively on issues related to analysis of organic compounds with the chemistry community, being able to write the effective reports and documentation, presentations.

PO10: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-1: To have a firm foundation in the fundamentals/concepts/theories and its applications in analysis of organic compounds.

PSO-2: To understand the structure and properties of organic molecules.

PSO-3: To acquaint with safety measures in laboratory and develop skills in proper handling of chemicals and apparatus/instruments and carry out experiments, record the observations and present the inference/results

Weightage to content
Semester -V
Paper-7A

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Mass Spectrometry	2	2	30	Understanding, Evaluating
2	Structural elucidation of organic compounds using IR, NMR, mass spectral data	1	1	15	Analyzing, Applying
3	Structural elucidation of organic compounds using IR, NMR, mass spectral data	1	1	15	Analyzing, Applying
4	Separation techniques-1	2	2	30	Remembering, Applying
5	Separation techniques-2	2	2	30	Evaluating, Creation
	TOTAL	8	8	120	

P.R. GOVERNMENT COLLEGE(A),KAKINADA

III YEAR B.Sc (Examination at the end of V semester)

Paper-7A :: Analysis of Organic Compounds

MODELPAPER

Duration: 2hrs.30Min

Max.Marks:60

PART-A

Answer any Four of the following questions. Each carries FIVE marks 4 X 5=20 Marks

1. How can you describe Electron Impact ionization.
2. Elaborate on McLafferty rearrangement.
3. What is the IR spectral data Analysis for Propionic acid.
4. How would you explain NMR spectral data for acetophenone and P-Nitro Aniline?
5. What do you remember about the principle and theory involved in solvent extraction.
6. What applications do you find for TLC.
7. How could you explain the principle and experimental procedure involved in Paper chromatography.
8. Point out the experimental procedure involved in Column chromatography

PART-B

Answer ALL the questions. Each carries TEN marks

4 X 10=40 Marks

9. a) i) What is the significance of Isotopic abundance in Mass Spectrometry.
ii) What are metastable ions. How can you describe their characteristics.

(OR)

b) Who would you identify the Mass Spectral fragmentation patterns of Toluene and 2-Butanol.

10. Write the IR, NMR and Mass spectral analysis for 2,2,3,3- tetramethyl butane and methyl Propionate

(OR)

Write the IR, NMR and Mass spectral analysis of phenyl acetylene and Coumarin

10. How would you define Batch extraction? How would you outline the Solvent extraction technique for separation of mixture of acidic and neutral organic compounds.

(OR)

How would you explain the Principle, experimental procedure and advantages of Thin Layer Chromatography?

11. How would you elaborate ascending, descending, radial and two dimensional paper chromatography. Suggest any of its applications.

OR

What explanation do you have for Principle involved in Column chromatography and give its important applications

Unit No	Additions	Deletions	Remarks as per Blooms Taxonomy	Percentage of Syllabus Added/deleted
1	Nitrogen rule, McLafferty rearrangement	----	Remembering	2 %
2	N,N- dimethyl amine	----	Understanding	2 %
3	Coumarin	----	Application	2 %
4	Advantages of Column chromatography.	HPLC-Principle, Instrumentation-block diagram and applications.	Evaluating	2 %

LABORATORY COURSE

Practical Paper – 7A:: Analysis of Organic Compounds

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

50Marks

Learning Outcomes:

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

1. Perform the organic qualitative analysis for the detection of N, S and halogens using the green procedure.
2. Acquire skills in these parathion of organic compounds in the given mixture using solvent extraction.
3. Learn the procedure for the separation of mixture of amine acids using Paper Chromatography.
4. Prepare the TLC plates for TLC chromatography.
5. Acquire skills in conducting column chromatography for the separation of dyes in the given mixture.

Practical(Laboratory)Syllabus:

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Separation of organic compounds in a mixture (acidic compound + neutral compound) using solvent extraction.
3. Separation of organic compounds in a mixture (basic compound + neutral compound) using solvent extraction.
4. Separation of given mixture of amino acids (glycine and phenylalanine) using ascending paper chromatography.
5. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina adsorbent).
6. Separation of triglycerides using TLC
7. Separation of mixture of methyl orange and methylene blue by column chromatography
8. Separation of food dyes using Column Chromatography

SCHEME OF VALUATION

Practical Paper – 7 A:: Analysis of Organic Compounds
(at the end of semester V)

a. Nature of the mixture	5 marks
b. Separation of the mixture into two components	10 marks
Systematic analysis of each component which involves following	
c. Preliminary Tests (Ignition, M.P/B.P, Unsaturation)	03 + 03 marks
d. Detection of extra elements	04 + 04 marks
e. Detection of the functional group (Preliminary & Confirmation)	04+ 04 marks
f. Report	01 + 01 marks
g. Viva voce	06
h. Record	05
TOTAL	50 marks

References:

1. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
2. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley-Eastern.
3. Ahluwalia V.K .and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
4. Mann F. G and Saunders B.C, Practical Organic Chemistry, Pearson Education.

Co-CurricularActivities

a) Mandatory:(*Lab/fieldtrainingofstudentsbyteacher:(lab:10+field:05)*):

1. **For Teacher:** Training of students by the teacher in laboratory and field for not less than 15 hours on the field techniques/skills of detection of N, Sand halogens using the green procedure, preparation of TLC plates, detection of organic compounds using R_f values in TLC/ paper chromatography, loading of column, selection of solvent system for column chromatography, separation of amino acids and dye mixture using chromatographic techniques.
2. **For Students:** Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the synthetic reactions. Write their observations and submit a hand-written fieldwork/project work report not exceeding 10 pages in the given format to the teacher.
3. Max marks for Field work/project work Report: 05.
4. Suggested Format for Fieldwork/project work: *Title page, student details, index page, details*

of place visited, observations, findings, and acknowledgements.

5. Unittests(IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments, Seminars and Quiz (on related topics), collection of relevant videos and material.
3. Visits of abilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts