PITHAPUR RAJAH'S GOVERNMENTCOLLEGE (AUTONOMOUS)
KAKINADA - 533 001, AP.

Affiliated to Adikavi Nannaya University

NAAC Accredited with "A" Grade (3.17 CGPA)

BOARD OF STUDIES OF CHEMISTRY

B.Sc. CHEMISTRY MAJORS & B.Sc. CHEMISTRY UNDER CBCS

Meeting Minutes/Resolutions

*Convened on 30 April 2024*AY 2024-25

DEPARTMENT OF CHEMISTRY

PITHAPUR RAJAH'S GOVERNMENTCOLLEGE (AUTONOMOUS)

Opp. Mc Laurin High School, Raja Ram Mohan Roy Road, Kakinada

www.prgc.edu.in; e-mail: chemistry@prgc.edu.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.2/A.C./BOS/2024-25, Dated: 23.04.2024

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

REF: 1. UGC Guidelines 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 respective Subject for all Semesters duly following the normsof the UGC Autonomous guidelines.

S. No	Name of the Person	Designation
1	V. Sanjeeva Kumar	Chairman & Lecturer In charge
2	Dr. K. Jhansi Lakshmi ASD Govt. Degree College for Women (Autonomous) Kakinada	University Nominee
3	Dr. D. Chenna Rao Lecturer in Chemistry, Govt. Degree College, Yeleswaram	Subject Expert -I
4	U. Sai Krishna Lecturer in Chemistry, Govt. College, (Autonomous) Rajamahendravaram	Subject Expert - II
5	Dr.N. Ratnakar, AARKISH PHARMACEUTICALS INS NJ, NEW JERSEY	Subject Expert - III
6	Dr. P. KARUNA RAMAN MD, IDEAL ORGANICS HYDERABAD.	Representative from Industry
7	T. V. V. Satyanarayana	Member
8	P. Vijay Kumar	Member
9	V. Ram babu	Member
10	G. Pavani	Member
11	Dr. N. Bujji Babu	Member
12	Dr. Ch. Praveen	Member
13	V. Venkateswara Rao	Member
14	U.S.N. Prasad	Member
15	K.N.S. Swamy	Member
16	S. Vijaya Lakshmi	Member
17	D.Bhavyasri	Member
18	K.Umamaheswari	Student Alumni Member
19	Deepthi Anusha II FBC	Student Member
20	BVNagendra Kumar, II MCCS	Student Member
21	J.Veera Durga I CHEMISTRY MAJORS	Student Member

The above members are requested to attend the BoS meeting on 30-04-2024 and share their valuable reviews, and suggestions on the following functionaries.

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

PRINCIPAL
P. R. Government College(A),
Kakinada

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A)DEPARTMENT OF CHEMISTRY

Meeting of Board of Studies in Chemistry is convened on 30 April 2024 throughoffline/ online at P.R. Govt. College (A), Kakinada, at 10.00 AM.

Venue: JKC AC HALLS , Dt: 30-04-2024, Tuesday – 10.00 A.M.

The Principal Dr. B.V. Tirupanyam; Chairman V. Sanjeeva Kumar; University Nominee Dr. K. Jhansi Lakshmi, Lecturer in Chemistry, ASD Govt. Degree College for Women (Autonomous), Kakinada; Dr. P. KARUNA RAMAN MD, IDEAL ORGANICS HYDERABAD. Industrialist; Subject Experts Dr. D. Chenna Rao, Lecturer in Chemistry, Govt. Degree College, Yeleswaram and U. Sai Krishna Lecturer in Chemistry, Govt. College, (Autonomous), Rajamahendravaram all the faculty members of the Chemistry Department and student alumni attended the meeting.

Agenda:

1. To discuss the I,II,III, IV semesters of a Single major system as B.Sc. Chemistry (Hons), B.Sc. OrganicChemistry (Hons), B.Sc. Analytical Chemistry (Hons) from the academic year 2024-25. & V ,VI semesters of CBCS System
2. To discuss 4th year B.Sc. Honours to the students who were admitted in the academicyear 2021-22.
3. To discuss the Semester System and revised Choice Based Credit System (CBCS)being implemented for the past 04 years, i.e., w.e.f. 2020-21.
4. To discuss and approve the Continuation/Modifications of the syllabus for the Odd& Even Semesters of I, II, III & IV Years for 2024-25.
5. Grant of Extra credits for Online SWAYAM MOOCs, edX, Coursera etc.
6. Syllabus, Model Question Papers and Model Blue Prints, Cos, POs, & PSOs mappingfor I, II, III, IV, V, VII and VIII Semesters.
7. Teaching-learning methodology by 50:50 (External: Internal) ratio I, II, I I I & IV Year Students commenced w.e.f. 2021-22.
8. 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 itshall be approved in the BOS.

9. Minimum of 50% integration of ICT into a transaction of curriculum.
10. Remedial coaching and assignments for slow learners, project works, research, Conferences, Industrial /academic tours & PG Entrance Coaching etc., for advanced learners.
11. Panel of paper setters and examiners.
12. Implementation of compulsory Community Service Project (CSP)/ Internships/ Apprenticeship and Extension activities for the benefit of the society.
13. Department action plan for 2024-25.
14. To discuss and resolve the minor modifications/refinement if any, in the I, II, III, IV, V, VII,&VIII Semester.
15. Any Other Proposal with the permission of the Chairman.
16. Proposal to start new UG honours course i.e, BSc., Pharmaceutical Chemistry for the AY 24-25

Signature of the members who attended the board of studies in B.sc Honors Chemistry and B.sc Three major system chemistry on 30th April 2024 at 10 a.m. Mode of conduct of meeting offline / online

SL.NO	NAME	SIGNATURE	CONTACT NO.
1	V. Sanjeeva Kumar	V. S.	9849324968
2	Dr. K. Jhansi Lakshmi	K. Jhansi Lakshmi	9441256409
3	Dr. P. KARUNA RAMAN MD, IDEAL ORGANICS, HYDERABAD.	Dr. P. Karuna Raman	9398249493
4	Dr. D. Chenna Rao		9560740108
5	U. Sai Krishna	U. Sai Krishna	9347334707
6	T. V. V. Satyanarayana	T. V. V. Satya	9490876913
7	P. Vijay Kumar	P. Vijay	9652023082
8	V. Ram babu		9948485537
9	G. Pavani		9912526493
10	Dr. N. Bujji Babu		9441394792
11	Dr. Ch. Praveen	Praveen	9491185518
12	V. Venkateswara Rao	V. Venkateswara Rao	9885165588
13	U.S.N. Prasad	USN Prasad	6300882584
14	K.N.S. Swamy	KNS Swamy	9908900962
15	S. Vijaya Lakshmi	S. Vijaya Lakshmi	9133941966
16	D.Bhavyasri	D. Bhavya Sri	
17	Ch. Veni	Ch Veni	
18	Deepthi Anusha II FBC	P. Deepthi Anusha	7382468859
19	Syamala, II MCCS	A. Syamala	6300192780
20			

ADDITIONS/DELETIONS IN COURSESCHEMISTRY

2024-25

Year	SEMESTER & PAPER	ADDITIONS	DELETIONS
I	I & I	Adopted the same from APSCHE	
I	I & II	Adopted the same from APSCHE	
I	II & III	Adopted the same from APSCHE	
I	II & IV	Adopted the same from APSCHE	
II	III & III	Adopted the same from APSCHE	
II	IV & IV	Adopted the same from APSCHE	
II	IV & V	Adopted the same from APSCHE	
III	V & VIA	Added Green synthesis of pyrimidine	Green synthesis of Adipic acid
III	V & VIIA	NIL	NIL
III	VI	APPERENTICESHIP	
IV HONOURS	VII & VIIIA/B	Adopted the same from APSCHE	
IV HONOURS	VII & IXA/B	Adopted the same from APSCHE	
IV HONOURS	VII & XA/B	Adopted the same from APSCHE	
IV HONOURS	VII & XIA/B	Adopted the same from APSCHE	
IV HONOURS	VII & XIIA/B	Adopted the same from APSCHE	
IV HONOURS	XIII	ONLINE COURSE	
IV HONOURS	VIII & XIV A/B	Adopted the same from APSCHE	
IV HONOURS	VIII & XV A/B	Adopted the same from APSCHE	
IV HONOURS	VIII & XVIA/B	Adopted the same from APSCHE	
IV HONOURS	VIII & XVIIA/B	Adopted the same from APSCHE	
IV HONOURS	VIII & XVIIIA/B	Adopted the same from APSCHE	
IV HONOURS	XIX	ONLINE COURSE	

CIA structure for Single Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid-examinations will be conducted and the average of the two is considered.
- I mid-examination is to be conducted in offline mode at the college level and II mid-examination is to be conducted in online mode at the department level.
- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answerquestions with five marks each out of four questions and five objective questionswith one mark each for each paper.
- Question paper is to be given as per the following structure for the courses with **4 units**

Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	Objective Questions(1M)
I	1	0	1
II	1	0	1
III	0	2	1
IV	0	2	1+ one question from any unit with more syllabus weightage

- For I mid examination to be conducted in offline mode, Question paperis to be given as per the following structure for the courses with **5 units**

S.No	Unit No	Long Answer Question(10M)	Short Answer Question (5 M)	ObjectiveQuestions (1M)
1	I	1	0	1
2	II	1	0	1
3	III	0	1	1
4	IV	0	1	1
5	V	0	1+ one question from any unit(III or IV or V) with more syllabus weightage	1

- The remaining 25 marks for CIA are allocated as per the followingstructure.

Study Project- 10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system

- Out of 50 marks for CIA, 25 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will beconsidered
  .
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.

- I mid examination to be conducted in offline mode in which the student should attempt **one essay** question for ten marks out of two questions, **two short** answer questions with five marks each out of four questions and five objective questions with one mark each
- The remaining 25 marks for CIA are allocated as per the following structure.

Project-10M	Viva on theory- 3M	Assignment- 5M	Seminar- 5M	Clean & green and Attendance- 2M

CIA structure for 3 Major system for Honors programmes
(2020-21AB)

- Out of 40 marks for CIA, 20 marks are allocated for Mid examinations. In each semester two mid examinations to be conducted and the average of the two will be considered.
- I mid examination is to be conducted in offline mode at college level and II mid examination is to be conducted in online mode at department level.
- I mid examination to be conducted in offline mode in which the student should attempt **Two essay** questions for ten marks each out of three questions, **four short** answer questions with five marks each out of six questions.

- The remaining 20 marks for CIA are allocated as per the following structure.

Assignment- 10M	**Seminar- 5M**	**Quiz -5M**

Allotment of Extra credits guidelines

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

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA DEPARTMENT OF CHEMISTY	Program & Semester General Chemistry II B.Sc. (IV Semester)			
Course Code CHE-3	TITLEOFTHECOURSE **COURSE 9: PHYSICAL CHEMISTRY-II**				
Teaching	HoursAllocated:45 (**Theory**)	L	T	P	C
Pre-requisites	Gas laws, Laws of symmetry, Intermolecular interactions	45	10	30	3+1

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Explain the difference between solids liquids and gases in terms of intermolecular interactions
CO2	Understand the basic concepts of crystallography.
CO3	Discuss the basic concepts of two component systems
CO4	Apply the concepts of adsorption

Course with focus on Skill Development/Employability/Entrepreneurship modules

SkillDevelopment		Employability		Entrepreneurship	

Syllabus:

Unit I - Gaseous state (9 h)

Postulates of Kinetic theory of Gases (exclude derivation) – deduction of gas laws from kinetic gas equation-Vander Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

Unit II: Liquid State (9 h)

Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature variation of viscosity of liquids and comparison with that of gases. Qualitative discussion of the structure of water.

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-III - Solid state (9h)

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

Unit IV - Phase Rule (9 h)

The Concept of phase, components, degrees of freedom. Gibbs phase rule. Phase diagram of one component system – water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point, freezing mixtures.

Unit V Surface Chemistry (9 h)

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

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

Textbooks:

S.NO	AUTHOR	TITLE	PUBLISHER
1	**K L Kapoor Vol.1**	**Text book of physical chemistry**	JPNP publications
2	**Puri, Sharma and Pathania.**	**Principles of physical chemistry**	S.Chand publications

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	**Anthony R. West**	**Solid State Chemistry and its applications**	
2	**S Glasstone**	**Text book of physical chemistry**	**Oxford University Press**
3	**Bahl and Tuli.**	**Advanced physical chemistry**	**Oxford University Press**

WebLinks:

1. https://r.search.yahoo.com/_ylt=Awrx_2xJRzhntwIAF1K7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1732951113/RO=10/RU=https%3a%2f%2fncert.nic.in%2fncerts%2fl%2fkech105.pdf/RK=2/RS=Vm9QfnIDc3bV3suL2OFEa2QmVNU-
2. https://ncert.nic.in/ncerts/l/kech105.pdf
3. https://ncert.nic.in/ncerts/l/lech101.pdf
4. https://in.video.search.yahoo.com/search/video;_ylt=Awr1QGxgSDhn6gEAOiO7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Nj?type=E210IN885G0&p=Phase+rule+ncert+pdf&fr=mcafee&turl=https%3A%2F%2Ftse4.mm.bing.net%2Fth%3Fid%3DOVP.JxFcEpp5NbDamMSQrb4TBgHgFo%26pid%3DApi%26w%3D296%26h%3D156%26c%3D7%26p%3D0&rurl=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DlkyOlL0yuCo&tit=PHASE+RULE+%28+Phase%2C+components+and+degree+of+freedom+in+a+single+shot+with+examples%29&pos=11&vid=81f4608b48f4687d75f45904baeaac3e&sigr=N6uflKlnj6Q5&sigt=hJJod0UFuWJ9&sigi=7h78CUEbal4Y
5. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO 1	Explain the difference between solids liquids and gases in terms of intermolecular interactions
CO 2	Understand the basic concepts of crystallography.
CO 3	Discuss the basic concepts of two component systems
CO 4	Apply the concepts of adsorption

CO-PO Mapping: 1: Low =1 ;2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PSO1	PSO2	PSO 3		
CO1	3	2	2	2	1	2	1	3	2	2		
CO2	3	1	2	2	1	1	1	3	1	2		
CO3	3	2	2	3	2	2	2	3	2	2		
CO4	3	1	1	1	1	1	1	2	1	1		

PROGRAMME OUTCOMES

At the completion of the B.Sc. Chemistry program, the students of our Department will be able to:

(PO1) Knowledge: Attain in depth knowledge about the fundamental principles, essential facts, conclusions and applications of chemical and scientific theories in various domains of chemistry.

(PO2) Critical Thinking: Carry out experiments in the area of organic analysis, estimation, derivative process, inorganic semi micro analysis, preparation, Kinetic, conductometric and potentiometric experiments and spectral analysis applying the domain of critical thinking.

(PO3) Problem Solving: Define the background of reaction mechanisms, complex chemical structures, instrumental method of chemical analysis, and separation techniques and apply appropriate techniques for analyzing specific problems both

qualitatively and quantitatively in laboratories and in industries.

(PO4): Usage of modern tools: Create data using modem chemical tools and ICT for modeling and analyze the data obtained from sophisticated instruments (like UV-Vis, FTIR, NMR, GCMS, Fluorescence, SEM, TEM and XRD) for chemical analysis

(PO5): Communication: Develop Skills to evaluate, analyze and interpret the chemical information and data and to communicate effectively within the chemical community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO6): Life-long Learning: Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and life-long learning in the broadest context of technological and social change.

(PO7) Ethical Practices and Social Responsibility: Generate ideas and solutions for green and sustainable chemistry and approach towards planning and execution of research in frontier areas of chemical sciences.

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our under graduates would be able to:

PSO 1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena,
processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry

PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3 - Evaluate distinct problems in the field of chemical data analysis, scientific interpretation
and reaction mechanisms with an understanding on basic tools to be employed.

Weightage to content

Semester -IV

Course - 9

S.No	Course Content	Long Answer	ShortAnswer	Total marks	As per Blooms Taxonomy
1	Gaseous state	2	1	25	Understanding, Application
2	Liquid State	1	1	20	Remembering, Understanding
3	Solid state	1	2	20	Analysizing & Creation
4	Phase Rule	1	1	15	Evaluation, Understanding
5.	Surface Chemistry	1	2	20	Understanding, Application
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Course-9 :: Physical Chemistry-II
MODEL PAPER

Duration: 2hrs **Max. Marks: 50**

PART- A

Answer any **THREE** of the following questions by choosing at least **ONE** from each section. Each carries **TEN** marks 3 X 10 = 30 M

SECTION -A

1. Unit - I
2. Unit - II
3. Unit – V

SECTION -B

4. Unit - III
5. Unit - IV
6. Unit – I

PART- B

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

7. Unit – I
8. Unit – II
9. Unit – III
10. Unit – III
11. Unit – IV
12. Unit – V
13. Unit – V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA
II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Course-9 :: Physical Chemistry-II

Question Bank

Unit-1:
Essay Questions:
1. Derive the following laws from kinetic theory of gases?
   a) Boyle's law b) Avogadro's law d) Dalton's Law
2. Elaborate Vander Waal equation of state?
3. Derive the mathematical relation between Vander Waal constants and critical constants?

Short answer Questions:
1. Write the postulates of kinetic theory of gases**?**
2. Discuss the Anderw's Isotherm of carbon dioxide?
3. Explain the reduced equation of state and law of corresponding states?
4. What is Joule-Thomson effect and explain inversion temperature?

Unit-2:
Essay Questions:
1. What are liquid crystals and explain their classification?
2. Define surface tension & explain its determination by using drop count method?
3. What is the coefficient of viscosity & explain its determination by using viscometer.

Short answer Questions:
1. Write the applications of liquid crystals?
2. Explain the differences between liquid crystal and solid/liquids
3. Elaborate on the Qualitative discussion of the structure of water.

Unit-3:
Essay Questions:
1. Explain the law of symmetry in crystals?
2. Derive Bragg's equation for the determination of crystal structure?
3. Explain the stoichiometric and non-stoichiometric defects in crystals?

Short answer Questions:
1. Explain the law of constancy of interfacial angles?
2. Define space lattice, lattice point & unit cell?
3. Write about the different crystal systems with examples?
4. what is law of rational indices?

Unit-4:
Essay Questions:
1. Explain the phase diagram of the Water system?
2. Elaborate the phase diagram of the NaCl- Water system?
3. Discuss the phase diagram of the Ag-Pb system

Short answer Questions:
1. Define phase rule and explain the terms involved in it.
2. Discuss the Pattinson' s process for the desilverisation of lead?
3. Define congruent and incongruent melting points give examples?
4. Write a short note on freezing mixtures.

Unit-5:

Essay Questions:

1. Define is Langmuir adsorption isotherm and explain?
2. What is physisorption and Chemisorption and write their differences?
3. Explain the various factors that effecting adsorption of gases on solids?
4. Explain the following

    a) Hardy-Schulze rule. b) Gold number c) Coagulation

Short answer Questions:

1. Define colloids and their classification?
2. Write a short note on Freundlich adsorption isotherm.
3. Write the applications of adsorption?

SEMESTER-IV

COURSE 9: PHYSICAL CHEMISTRY-II

Practical Credits: 1 2 hrs/week

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. Apply concepts of surface chemistry in experiments.
3. Be familiar with the concepts & practical applications of Surface tension and viscosity of liquids.

Physical Chemistry Practical Syllabus:

1. Determination of surface tension of liquid by drop count method
2. Determination of surface tension of liquid by drop weight method
3. Determination of surface tension of mixture (liquid + detergent) using stalagmometer.
4. Determination of coefficient of viscosity of an organic liquid.
5. Determination of composition of a glycerol in glycerol + water mixture using viscometer.
6. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm

Co-Curricular Activities:

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

1. For Teacher: Training of students by teacher in laboratory and field for not lessthan15 hourson 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.
2. 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 exceeding10 pages in the given format to the teacher.
3. Max marks for Fieldwork/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. 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 othermaterial.
3. Visits of facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester Gen Chemistry II B.Sc. (IV Semester) AB 2023-24			
Major 10	TITLE OF THE COURSE **GENERAL & PHYSICAL CHEMISTRY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
	Stereochemistry of carbon compounds, Bioinorganic chemistry, Ionic equilibrium, Chemical kinetics-I, Chemical kinetics-II.	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Correlate and describe the stereochemical properties of organic compounds
CO2	Explain the biological significance of various elements present in the human body.
CO3	Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis..
CO4	Determine the order of a chemical reaction
CO5	Describe the basic concepts of enzyme catalysis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT-I : Stereo chemistry of carbon compounds (9 h)

Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarised light, opticalrotation 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.

Unit II: Bioinorganic Chemistry (9 h)

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Na / K- pump, carbonic anhydrase and carboxy peptidase. Toxicity of metal ions (Hg, Pb,), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its applications in biosystems (Hemoglobin).

Unit III: Ionic equilibrium (9 h)

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, Buffer solutions-Henderson's equation. Indicators-theories of acid – base Indicators, selection of Indicators,

Common ion effect Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV : Chemical Kinetics-I (9 h)

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (similar and different reactants). Half–life of a reaction. General methods for determination of order of a reaction.

Unit V : Chemical Kinetics-II (9 h)

Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.

Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation and significance of Michaels- Menten constant.

Reference & Text books

1.Text book of physical chemistry by S Glasstone

2.Concise Inorganic Chemistry by J.D.Lee

3.Advanced physical chemistry by Gurudeep Raj

4.Advanced physical chemistry by Bahl and Tuli

5.Inorganic Chemistry by J.E.Huheey

6. Basic Inorganic Chemistry by Cotton and Wilki

Blooms Taxonomy:

Code	Meaning	Description
K1	Remembering	Describe, relate, tell,find
K2	Understanding	Out line, expect, credit
K3	Applying	Illustrate, complete, solve
K4	Analyse	Compare,explain,categorise
K5	evaluating	Prioritize, rate, justify
K6	create	Imagine, desine, plan

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	1	2	2	2	2	1	2	2	2
CO2	2	3	3	3	3	2	2	2	2	2	2	2	2
CO3	2	3	3	3	3	2	2	2	2	2	2	2	2
CO4	2	1	1	2	2	2	1	1	1	2	2	2	2
Avg.	2	2.5	2.2	2.7	2.2	2	1.7	1.7	1.7	1.7	2	2	2

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

PO1: Knowledge in Chemistry: Apply the basic knowledge about the fundamental's principles, essential facts and applications of general and physical chemistry

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

principles of chemistry.

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel studies for the development of new methods.

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 adapting new physical methods.

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

PO6 : The Chemist & 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 complex Chemical activities with the Chemistry community and with society at large, such as, being able to comprehend and write effective reports, design documentation and make effective 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 identify, formulate and analyze the problems in Chemistry by using principles of Organic, Inorganic and Physical Chemistry fundamentals

PSO-2: Applying Chemistry knowledge to design a system, analyze and interpret data to obtain valid conclusions

PSO-3: Use of various Simulation tools such as CADD Vault, Dotmatics, Schrodinger etc for Molecular design and analysis of various systems.

Weightage to the Content
C-10 :: Gen Chem Hons

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Stereochemistry of carbon compounds	2	1	25	Understanding, Application
2	Bioinorganic chemistry	1	2	20	Remembering, Understanding
3	Ionic equilibrium	1	1	15	Application & Creation
4	Chemical kinetics-I	1	2	20	Remembering, Understanding
5	Chemical kinetics-II	1	1	15	Application & Creation
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

II YEAR B.Sc Gen Chem (Hons)

(Examination at the end of IV semester)

(GENERAL & PHYSICALCHEMISTRY), Course Code 04

MODEL PAPER

Duration: 2hrs **Max. Marks: 50**

Section -I

Answer any THREE questions choosing at least one from each part. Each question carries TEN marks. **3 X 10 = 30 Marks**

PART-A

1. Unit-I
2. Unit-II
3. Unit-V

PART-B

4. Unit-III
5. Unit-IV
6. Unit-I

Section-II

Answer any four of the following questions. Each question carries FIVE marks. **4x5=20 Marks**

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

QUESTION BANK

Semester -IV

(GENERAL & PHYSICALCHEMISTRY), Course code 10

Unit-I

Essay Questions:

1.Explain the different types of Molecular representations of stereo chemistry of carbon compounds
2.Explain the optical isomerism of Tartaric acid .
3.Explain the optical isomerism of 2,3-dibromopentane.

Short Questions:

1. Explain symmetry of Elements.
2. Explain the Enantiomers and Diastereomers.
3. Write about Specific rotation
4. Explain optical isomerism of Glyceraldehyde and Alanine.

Unit-II

Essay Questions:

1.Explain the Structure and functions of Hemoglobin.
2.What is Toxicity? Explain the toxicity of Lead and Mercury.
3.Explain Na/K^+ pump in bioinorganic chemistry.

Short Questions:

1.write about cisplatin.
2.Explain briefly about Myoglobin.
3.Write about carbonic anhydrase.
4.Write about carboxy peptidase.

Unit-III

Essay Questions:

1.Eplain Theory of acid-base indicators.
2.Explain the factors affecting degree of ionization.

Short Questions:

1.Write about Buffer solution.
2.Explain the Solubility product and Common ion effect.

Unit -IV

Essay Questions:

1.Define first order reaction. Derive first order rate constant equation.
2.Define Second order reaction. Derive second order rate constant equation.
3.Explain the general methods for determination of order of reaction,

Short Questions:

1.Define Order of reaction and Molecularity. Give examples.
2.What is zero order reaction.Give one example.

Unit-V

Essay Questions:

1.Explain collision theory of reaction rates?
2.Derive Michaels-Menten equation and write significance Michaels-Menten constant.

Short Questions:

1.Write a note on Enzyme catalysis.
2.Write about concept of activation energy.

IV SEMESTER
LABORATORY COURSE

Course Code:10 **, Physical Chemistry - Volumetric Analysis (credits: 01)**

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 concepts learnt 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.

Volumetric analysis:

1. Estimation of sodium hydroxide using standardized HCl solution.
2. Estimation of sodium carbonate and sodium hydroxide present in a mixture.
3. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard. (internal indicator method)
4. Determination of Fe (II) using $K_2Cr_2O_7$ with oxalic acid as primary standard. (internal indicator method)
5. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$

List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3rd Edition) –A.I.Vogel
2. Web related references suggested by teacher.

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	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester			
Course Code CHE-XI	TITLE OF THE COURSE **Nitrogen containing Organic Compounds & Spectroscopy** **2023-24 AB**	II B.Sc. Chemistry Hons (IV Semester)			
Teaching	Hours Allocated: 45 (**Theory**)	L	T	P	C
Pre-requisites	Halogen compounds, Hydroxy compounds, Carbonyl compounds, Carboxylic acids, Carbohydrates,	45	10	30	3+1

Course Objectives:

1. Amines
2. Amino acids
3. Nitro hydrocarbons
4. Heterocyclic compounds
5. Spectroscopy

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Distinguish primary secondary and tertiary amines and their properties.
CO2	Describe the preparation and properties of amino acids
CO3	Explain the reactivity of nitro hydrocarbons.
CO4	Discuss heterocyclic compounds with N, O and S.
CO5	Apply the concepts of UV and IR to ascertain the functional group in an organic compound.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

Syllabus:

Unit I :: Amines: **(9 h)**

Classification, chirality in amines (pyramidal inversion), preparations – Gabriel synthesis, Hoffmann- Bromamide reaction (with mechanism), reduction of amides and Schmidt reaction. Distinction between Primary, secondary and tertiary amines using Hinsberg's method and nitrous acid. Discussion of the following reactions with emphasis on the

mechanistic pathway: Carbylamine reaction, Hoffmann's exhaustive methylation, Hofmann and Cope elimination.

Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).

UNIT- II :: Amino acids (9 h)

Definition and classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: a) from halogenated carboxylic acid, b) Gabriel Phthalimide synthesis c) Strecker's synthesis. Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heatingpeptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

UNIT- III :: Nitro hydrocarbons (9h)

Nomenclature and classification, structure -Tautomerism of nitroalkanes leading to acid and keto form, Preparation of Nitroalkanes, reactivity - halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction and reduction.

Unit IV :: Heterocyclic Compounds (9 h)

Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan, Thiophene and Pyrrole - Aromatic character – Preparation from 1, 4, -dicarbonyl compounds, Paul-Knorr synthesis. Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation - Diels Alder reaction in furan. Pyridine – synthesis - Aromaticity -Basicity - Comparison of basicity with pyrrole- Reactivity towards Nucleophilic substitution reaction (Chichibabin reaction).

Unit V :: UV-Visible & IR Spectroscopy (9 h)

Selection rules for electronic spectra, types of electronic transitions in molecules, concept of chromophore and auxochrome, effect of conjugation in dienes and α,β unsaturated compounds. Woodward Fischer rules for calculating λmax of conjugated dienes and α,β unsaturated compounds.

Infrared spectroscopy - types of molecular vibrations - fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intra molecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).

Unit No	Additions	Deletions	Remarks as per Blooms Taxonomy
1			
2			
3			
4			
5			

Reference & Text books:

1. A Text Book of Organic Chemistry by Bahl and Arunbahl
2. A Text Book of Organic chemistry by I L FinarVol I
3. Organic chemistry by Bruice
4. Organic chemistry by Clayden
5. Spectroscopy by William Kemp
6. Spectroscopy by Pavia
7. Organic Spectroscopy by J. R. Dyer
8. Elementary organic spectroscopy by Y.R. Sharma
9. Spectroscopy by P.S.Kalsi
10. Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster

Weightage to content

Semester -IV
Paper-XI

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Amines	1	2	20	Understanding, Application
2	Amino acids	1	1	15	Remembering, Understanding
3	Nitro hydrocarbons	1	1	15	Application & Creation
4	Heterocyclic compounds	1	2	20	Remembering, Understanding
5	Spectroscopy	2	1	25	Application & Creation
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Paper-XI :: Nitrogen containing Organic Compounds & Spectroscopy
MODEL PAPER

Duration: 2hrs **Max. Marks: 50**

PART- A

Answer any **THREE** of the following questions by choosing at least **ONE** from each section. Each carries **TEN** marks 3 X 10 = 30 M

SECTION -A

1. Unit - I
2. Unit - II
3. Unit – V

SECTION -B

4. Unit - III
5. Unit - IV
6. Unit – V

PART- B

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

7. Unit – I
8. Unit – I
9. Unit – II
10. Unit – III
11. Unit – IV
12. Unit – IV
13. Unit – V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA
II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Practical Paper – XI :: Organic preparations and IR Spectral Analysis

Credits: 01 30 hrs (2 h / W) **50Marks**

Course outcomes:

On completion of the course, the student will be able to:

1) Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
2) Calculate limiting reagent, theoretical yield, and percent yield.
3) Engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately.
4) Dispose of chemicals in a safe and responsible manner.
5) Perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration.
6) Create and carry out work up and separation procedures.

Syllabus

A. Organic preparations: 40M

1) Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine) a. Using conventional method and b. Using green approach

2) Benzoylation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, p-anisidine)

3) Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method

B.IR Spectral Analysis 10M

IR Spectral Analysis of the following functional groups with examples

a) Hydroxyl groups b) Carbonyl groups c) Amino groups d) Aromatic groups

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. 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 Agarwal R. Comprehensive Practical Organic Chemistry, University press.

4. Web related references suggested by teacher

Scheme of Evaluation

S.No	Content	Marks
1	Preparation (write up)	10
2	Preparation (practical)	15
3	Report Principle Appearance Yield Melting point	5
4	IR spectral analysis	10
5	Viva voce	5
6	Record	5

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE(A) KAKINADA DEPARTMENT OF CHEMISTY	Program & Semester Minor Chemistry II B.Sc. (IV Semester)			
Course Code CHE-3	TITLEOFTHECOURSE **COURSE 3: PHYSICAL CHEMISTRY-II**				
Teaching	HoursAllocated:45 (**Theory**)	L	T	P	C
Pre-requisites	Gas laws, Laws of symmetry, Intermolecular interactions	45	10	30	3+1

CourseOutcomes:

On Completion of the course, the students will be able to	
CO1	Explain the difference between solids liquids and gases in terms of intermolecular interactions
CO2	Understand the basic concepts of crystallography.
CO3	Discuss the basic concepts of two component systems
CO4	Apply the concepts of adsorption

Course with focus on Skill Development/Employability/Entrepreneurship modules

SkillDevelopment		Employability		Entrepreneurship	

Syllabus:

Unit I - Gaseous state (9 h)

Postulates of Kinetic theory of Gases (exclude derivation) – deduction of gas laws from kinetic gas equation-Vander Waal's equation of state. Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. Relationship between critical constants and vander Waal's constants. Law of corresponding states. Joule- Thomson effect. Inversion temperature.

Unit II: Liquid State (9 h)

Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature variation of viscosity of liquids and comparison with that of gases. Qualitative discussion of the structure of water.

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-III - Solid state (9h)

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

Unit IV - Phase Rule (9 h)

The Concept of phase, components, degrees of freedom. Gibbs phase rule. Phase diagram of one component system – water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point, freezing mixtures.

Unit V Surface Chemistry (9 h)

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

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

Textbooks:

S.NO	AUTHOR	TITLE	PUBLISHER
1	**K L Kapoor Vol.1**	**Text book of physical chemistry**	JPNP publications
2	**Puri, Sharma and Pathania.**	**Principles of physical chemistry**	S.Chand publications

Reference books

S.NO	AUTHOR	TITLE	PUBLISHER
1	**Anthony R. West**	**Solid State Chemistry and its applications**	
2	**S Glasstone**	**Text book of physical chemistry**	**Oxford University Press**
3	**Bahl and Tuli.**	**Advanced physical chemistry**	**Oxford University Press**

WebLinks:

1. https://r.search.yahoo.com/_ylt=Awrx_2xJRzhntwIAF1K7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1732951113/RO=10/RU=https%3a%2f%2fncert.nic.in%2fncerts%2fl%2fkech105.pdf/RK=2/RS=Vm9QfnIDc3bV3suL2OFEa2QmVNU-
2. https://ncert.nic.in/ncerts/l/kech105.pdf
3. https://ncert.nic.in/ncerts/l/lech101.pdf
4. https://in.video.search.yahoo.com/search/video;_ylt=Awr1QGxgSDhn6gEAOiO7HAx.;_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA3Nj?type=E210IN885G0&p=Phase+rule+ncert+pdf&fr=mcafee&turl=https%3A%2F%2Ftse4.mm.bing.net%2Fth%3Fid%3DOVP.JxFcEpp5NbDamMSQrb4TBgHgFo%26pid%3DApi%26w%3D296%26h%3D156%26c%3D7%26p%3D0&rurl=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DlkyOlL0yuCo&tit=PHASE+RULE+%28+Phase%2C+components+and+degree+of+freedom+in+a+single+shot+with+examples%29&pos=11&vid=81f4608b48f4687d75f45904baeaac3e&sigr=N6uflKlnj6Q5&sigt=hJJod0UFuWJ9&sigi=7h78CUEbal4Y
5. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=13G8VouhmrFfuhs6rkiyTA==

Course outcome & Program outcome mapping

On Completion of the course, the students will be able to	
CO 1	Explain the difference between solids liquids and gases in terms of intermolecular interactions
CO 2	Understand the basic concepts of crystallography.
CO 3	Discuss the basic concepts of two component systems
CO 4	Apply the concepts of adsorption

CO-PO Mapping: 1: Low =1 ;2: Moderate = 2 ; 3: High = 3 ; 4: No Correlation = 0

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO 7	PSO1	PSO2	PSO 3		
CO1	3	2	2	2	1	2	1	3	2	2		
CO2	3	1	2	2	1	1	1	3	1	2		
CO3	3	2	2	3	2	2	2	3	2	2		
CO4	3	1	1	1	1	1	1	2	1	1		

PROGRAMME OUTCOMES

At the completion of the B.Sc. Chemistry program, the students of our Department will be able to:

(PO1) Knowledge: Attain in depth knowledge about the fundamental principles, essential facts, conclusions and applications of chemical and scientific theories in various domains of chemistry.

(PO2) Critical Thinking: Carry out experiments in the area of organic analysis, estimation, derivative process, inorganic semi micro analysis, preparation, Kinetic, conductometric and potentiometric experiments and spectral analysis applying the domain of critical thinking.

(PO3) Problem Solving: Define the background of reaction mechanisms, complex chemical structures, instrumental method of chemical analysis, and separation techniques and apply appropriate techniques for analyzing specific problems both

qualitatively and quantitatively in laboratories and in industries.

(PO4): Usage of modern tools: Create data using modem chemical tools and ICT for modeling and analyze the data obtained from sophisticated instruments (like UV-Vis, FTIR, NMR, GCMS, Fluorescence, SEM, TEM and XRD) for chemical analysis

(PO5): Communication: Develop Skills to evaluate, analyze and interpret the chemical information and data and to communicate effectively within the chemical community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO6): Life-long Learning: Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and life-long learning in the broadest context of technological and social change.

(PO7) Ethical Practices and Social Responsibility: Generate ideas and solutions for green and sustainable chemistry and approach towards planning and execution of research in frontier areas of chemical sciences.

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our under graduates would be able to:

PSO 1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena,
processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry

PSO2 - Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3 - Evaluate distinct problems in the field of chemical data analysis, scientific interpretation
and reaction mechanisms with an understanding on basic tools to be employed.

Weightage to content

Semester -IV

Course - 3

S.No	Course Content	Long Answer	ShortAnswer	Total marks	As per Blooms Taxonomy
1	Gaseous state	2	1	25	Understanding, Application
2	Liquid State	1	1	20	Remembering, Understanding
3	Solid state	1	2	20	Analysizing & Creation
4	Phase Rule	1	1	15	Evaluation, Understanding
5.	Surface Chemistry	1	2	20	Understanding, Application
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Course-3 :: Physical Chemistry-II
MODEL PAPER

Duration: 2hrs **Max. Marks: 50**

PART- A

Answer any **THREE** of the following questions by choosing at least **ONE** from each section. Each carries **TEN** marks 3 X 10 = 30 M

SECTION -A

1. Unit - I
2. Unit - II
3. Unit – V

SECTION -B

4. Unit - III
5. Unit - IV
6. Unit – I

PART- B

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

7. Unit – I
8. Unit – II
9. Unit – III
10. Unit – III
11. Unit – IV
12. Unit – V
13. Unit – V

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA
II YEAR B.Sc Chemistry Hons (2023-24 AB)
(Examination at the end of IV semester)
Course-3 :: Physical Chemistry-II

Question Bank

Unit-1:
Essay Questions:
1. Derive the following laws from kinetic theory of gases?
   a) Boyle's law b) Avogadro's law d) Dalton's Law
2. Elaborate Vander Waal equation of state?
3. Derive the mathematical relation between Vander Waal constants and critical constants?

Short answer Questions:
1. Write the postulates of kinetic theory of gases**?**
2. Discuss the Anderw's Isotherm of carbon dioxide?
3. Explain the reduced equation of state and law of corresponding states?
4. What is Joule-Thomson effect and explain inversion temperature?

Unit-2:
Essay Questions:
1. What are liquid crystals and explain their classification?
2. Define surface tension & explain its determination by using drop count method?
3. What is the coefficient of viscosity & explain its determination by using viscometer.

Short answer Questions:
1. Write the applications of liquid crystals?
2. Explain the differences between liquid crystal and solid/liquids
3. Elaborate on the Qualitative discussion of the structure of water.

Unit-3:
Essay Questions:
1. Explain the law of symmetry in crystals?
2. Derive Bragg's equation for the determination of crystal structure?
3. Explain the stoichiometric and non-stoichiometric defects in crystals?

Short answer Questions:
1. Explain the law of constancy of interfacial angles?
2. Define space lattice, lattice point & unit cell?
3. Write about the different crystal systems with examples?
4. what is law of rational indices?

Unit-4:
Essay Questions:
1. Explain the phase diagram of the Water system?
2. Elaborate the phase diagram of the NaCl- Water system?
3. Discuss the phase diagram of the Ag-Pb system

Short answer Questions:
1. Define phase rule and explain the terms involved in it.
2. Discuss the Pattinson' s process for the desilverisation of lead?
3. Define congruent and incongruent melting points give examples?
4. Write a short note on freezing mixtures.

Unit-5:

Essay Questions:

1. Define is Langmuir adsorption isotherm and explain?
2. What is physisorption and Chemisorption and write their differences?
3. Explain the various factors that effecting adsorption of gases on solids?
4. Explain the following

    a) Hardy-Schulze rule. b) Gold number c) Coagulation

Short answer Questions:

1. Define colloids and their classification?
2. Write a short note on Freundlich adsorption isotherm.
3. Write the applications of adsorption?

SEMESTER-IV

COURSE 3: PHYSICAL CHEMISTRY-II

Practical Credits: 1 2 hrs/week

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. Apply concepts of surface chemistry in experiments.
3. Be familiar with the concepts & practical applications of Surface tension and viscosity of liquids.

Physical Chemistry Practical Syllabus:

1. Determination of surface tension of liquid by drop count method
2. Determination of surface tension of liquid by drop weight method
3. Determination of surface tension of mixture (liquid + detergent) using stalagmometer.
4. Determination of coefficient of viscosity of an organic liquid.
5. Determination of composition of a glycerol in glycerol + water mixture using viscometer.
6. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm

Co-Curricular Activities:

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

1. For Teacher: Training of students by teacher in laboratory and field for not lessthan15 hourson 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.
2. 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 exceeding10 pages in the given format to the teacher.
3. Max marks for Fieldwork/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. 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 othermaterial.
3. Visits of facilities, firms, research organizations etc.
4. Invited lectures and presentations on related topics by field/industrial experts

	PITHAPUR RAJAH'S GOVERNMENT COLLEGE Kakinada	Program & Semester II B.Sc. (IV Semester)			
Minor Course Code 04	TITLE OF THE COURSE **GENERAL & PHYSICAL CHEMISTRY**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
	Stereochemistry of carbon compounds, Bioinorganic chemistry, Ionic equilibrium, Chemical kinetics-I, Chemical kinetics-II.	45	10	30	3+1

Course Outcomes:

On Completion of the course, the students will be able to	
CO1	Correlate and describe the stereochemical properties of organic compounds
CO2	Explain the biological significance of various elements present in the human body.
CO3	Apply the concepts of ionic equilibrium for the qualitative and quantitative analysis..
CO4	Determine the order of a chemical reaction
CO5	Describe the basic concepts of enzyme catalysis.

Course with focus on employability / entrepreneurship / Skill Development modules

Skill Development		Employability		Entrepreneurship	

UNIT-I : Stereo chemistry of carbon compounds (9 h)

Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarised light, opticalrotation 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.

Unit II: Bioinorganic Chemistry (9 h)

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals, Na / K- pump, carbonic anhydrase and carboxy peptidase. Toxicity of metal ions (Hg, Pb,), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its applications in biosystems (Hemoglobin).

Unit III: Ionic equilibrium (9 h)

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, Buffer solutions-Henderson's equation. Indicators-theories of acid – base Indicators, selection of Indicators,

Common ion effect Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV : Chemical Kinetics-I (9 h)

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (similar and different reactants). Half–life of a reaction. General methods for determination of order of a reaction.

Unit V : Chemical Kinetics-II (9 h)

Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.

Enzyme catalysis- Specificity, factors affecting enzyme catalysis, Inhibitors and Lock & key model. Michaels- Menten equation- derivation and significance of Michaels- Menten constant.

Reference & Text books

1.Text book of physical chemistry by S Glasstone

2.Concise Inorganic Chemistry by J.D.Lee

3.Advanced physical chemistry by Gurudeep Raj

4.Advanced physical chemistry by Bahl and Tuli

5.Inorganic Chemistry by J.E.Huheey

6. Basic Inorganic Chemistry by Cotton and Wilki

Blooms Taxonomy:

Code	Meaning	Description
K1	Remembering	Describe, relate, tell,find
K2	Understanding	Out line, expect, credit
K3	Applying	Illustrate, complete, solve
K4	Analyse	Compare,explain,categorise
K5	evaluating	Prioritize, rate, justify
K6	create	Imagine, desine, plan

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	1	2	2	2	2	1	2	2	2
CO2	2	3	3	3	3	2	2	2	2	2	2	2	2
CO3	2	3	3	3	3	2	2	2	2	2	2	2	2
CO4	2	1	1	2	2	2	1	1	1	2	2	2	2
Avg.	2	2.5	2.2	2.7	2.2	2	1.7	1.7	1.7	1.7	2	2	2

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

PO1: Knowledge in Chemistry: Apply the basic knowledge about the fundamental's

principles, essential facts and applications of general and physical chemistry

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

PO3: Design/development of solutions: Design solutions for simple to complex problems and designing novel studies for the development of new methods.

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 adapting new physical methods.

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

PO6 : The Chemist & 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 complex Chemical activities with the Chemistry community and with society at large, such as, being able to comprehend and write effective reports, design documentation and make effective 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 identify, formulate and analyze the problems in Chemistry by using principles of Organic, Inorganic and Physical Chemistry fundamentals

PSO-2: Applying Chemistry knowledge to design a system, analyze and interpret data to obtain valid conclusions

PSO-3: Use of various Simulation tools such as CADD Vault, Dotmatics, Schrodinger etc for Molecular design and analysis of various systems.

Weightage to Content
Semester -IV Minor

S.No	Course Content	Long Answer	Short Answer	Total marks	As per Blooms Taxonomy
1	Stereochemistry of carbon compounds	2	1	25	Understanding, Application
2	Bioinorganic chemistry	1	2	20	Remembering, Understanding
3	Ionic equilibrium	1	1	15	Application & Creation
4	Chemical kinetics-I	1	2	20	Remembering, Understanding
5	Chemical kinetics-II	1	1	15	Application & Creation
	TOTAL	**6**	**7**	**95**	

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (A) :: KAKINADA

II YEAR B.Sc
(Examination at the end of IV semester)
(GENERAL & PHYSICALCHEMISTRY), Course Code 04
MODEL PAPER

Duration: 2hrs **Max. Marks: 50**

Section -I

Answer any THREE questions choosing at least one from each part. Each question carries TEN marks. **3 X 10 = 30 Marks**

PART-A

1. Unit-I
2. Unit-II
3. Unit-V

PART-B

4. Unit-III
5. Unit-IV
6. Unit-I

Section-II

Answer any four of the following questions. Each question carries FIVE marks. **4x5=20 Marks**

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

QUESTION BANK

Semester -IV

(GENERAL & PHYSICALCHEMISTRY), Course code 04

Unit-I

Essay Questions:

1.Explain the different types of Molecular representations of stereo chemistry of carbon compounds
2.Explain the optical isomerism of Tartaric acid .
3.Explain the optical isomerism of 2,3-dibromopentane.

Short Questions:

1. Explain symmetry of Elements.
2. Explain the Enantiomers and Diastereomers.
3. Write about Specific rotation
4. Explain optical isomerism of Glyceraldehyde and Alanine.

Unit-II

Essay Questions:

1.Explain the Structure and functions of Hemoglobin.
2.What is Toxicity? Explain the toxicity of Lead and Mercury.
3.Explain Na/K^+ pump in bioinorganic chemistry.

Short Questions:

1.write about cisplatin.
2.Explain briefly about Myoglobin.
3.Write about carbonic anhydrase.
4.Write about carboxy peptidase.

Unit-III

Essay Questions:

1.Eplain Theory of acid-base indicators.
2.Explain the factors affecting degree of ionization.

Short Questions:

1.Write about Buffer solution.
2.Explain the Solubility product and Common ion effect.

Unit -IV

Essay Questions:

1.Define first order reaction. Derive first order rate constant equation.
2.Define Second order reaction. Derive second order rate constant equation.
3.Explain the general methods for determination of order of reaction,

Short Questions:

1.Define Order of reaction and Molecularity. Give examples.
2.What is zero order reaction.Give one example.

Unit-V

Essay Questions:

1.Explain collision theory of reaction rates?
2.Derive Michaels-Menten equation and write significance Michaels-Menten constant.

Short Questions:

1.Write a note on Enzyme catalysis.
2.Write about concept of activation energy.

IV SEMESTER
LABORATORY COURSE

Course Code:04 , Physical Chemistry - Volumetric Analysis (credits: 01)

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 concepts learnt 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.

Volumetric analysis:

1. Estimation of sodium hydroxide using standardized HCl solution.
2. Estimation of sodium carbonate and sodium hydroxide present in a mixture.
3. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard. (internal indicator method)
4. Determination of Fe (II) using $KMnO_4$ with oxalic acid as primary standard. (external indicator method)
5. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$

List of reference books:

1. A Text Book of Quantitative Inorganic Analysis(3^{rd}Edition) –A.I.Vogel
2. Web related references suggested by teacher.

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