P. R. GOVERNMENT COLLEGE (A) KAKINADA
(Affiliated to Adikavi Nannaya University)

DEPARTMENT OF CHEMISTRY

B. Sc Chemistry Syllabus under CBCS

BOARD OF STUDIES

2019-20

P.R.Govt. College (A), Kakinada

Recommended Composition of the Board of Studies of Chemistry

And it's Functions of an Autonomous College

April-2019-20

I Composition

1. **Head of the Department concerned (Chairman):**

   Sri T. Vara Prasad, M.Sc., M.Phil, M.Ed (Ph.D)

2. **The entire faculty of each specialization.**

   1. Sri D.Rama Rao, M.Sc., B. Ed., M.Phil.
   2. Sri V.Mallikarjuna Sarma,MSc, M.Phil,NET
   3. Dr.V.Narayana Rao M.Sc, NET, Ph.D
   4. Sri U.Sai Krishna M.Sc,NET

3. **ONE experts in the subject from outside the college to be nominated by the Academic Council**

   1.Dr. K . Jhansi Lakshmi, Lecturer in Chemistry, Ideal Degree College, Kakinada

4. **One expert to be nominated by the Vice-Chancellor from a panel of six recommended by the College Principal**

   1. Dr. K. Deepti, Adikavi Nannaya University, Rajahmundry

5. **One representative from industry/ Corporate Sector/ allied area relating to Placement.**

   1. Ch. V. N. S. Vara Prasad, Managing partner, DAS Pharma Ltd, Kakinada

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

   1. Dr.K.Raghavachari M.Sc., M.Phil, Ph.D.

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.

Signatures of the members who attended the

Board of studies in Chemistry on 01.04.2019 at 10.00am

1.	Sri T. Vara Prasad	Chairman & Lecturer in Charge
2.	Dr. K. Deepti,	University representative Adikavi Nannaya University Rajamahendravaram
3.	Ch. V. N. S. Vara Prasad,	Managing partner, DAS Pharma Ltd, Kakinada
4.	Dr. K. Jhansi Lakshmi	Subject expert Lecturer in Chemistry, Ideal Degree College, Kakinada
5.	. Dr.K.Raghavachari	Retired Head of the Chemistry Department
6.	Sri D. Rama Rao	Member
7.	Sri V. Mallikarjuna Sarma	Member
8.	Dr.V.Narayana Rao	Member
9.	Sri U.Sai Krishna	Member
10.	Dr.D.S.V.N.M.Rama Murthy	Member
11.	Sri K.Babu Rao	Member
12.	Smt.S.Swarna Latha	Member
13.	Miss. M.S.T.B.V.Ratnam	Member
14.	Miss.G.Rama Lakshmi.	Member
15.	Mr.B.V.Siva Kumar	Member
16.	Miss.S.G.Kalyani	Member
17.	G.Sandhya	Member
18.	P.K.M.S.Devi	Member

Signatures of the members who attended the

Board of studies in Chemistry on 01.04.2019 at 10.00am

1.	Dr. T. Vara Prasad	Chairman & Lecturer in Charge 1/4/19
2.	Dr. K. Deepti,	University representative 1/4/19 Adikavi Nannaya University Rajamahendravaram
3.	Dr.Ch. V. N. S. Vara Prasad,	Managing partner DAS Pharma Ltd, Kakinada
4.	Dr. K. Jhansi Lakshmi	Subject expert Lecturer in Chemistry, Ideal Degree College, Kakinada
5.	. Dr.K.Raghavachari	Retired Head of the Chemistry Department
6.	Sri D. Rama Rao	Member
7.	Sri V. Mallikarjuna Sarma	Member
8.	Dr.V.Narayana Rao	Member
9.	Sri U.Sai Krishna	Member 01/4/19
10.	Dr.D.S.V.N.M.Rama Murthy	Member 1/4/19
11.	Sri K.Babu Rao	Member 01/4/2019
12.	Smt.S.Swarna Latha	Member 1/4/2019
13.	Miss. M.S.T.B.V.Ratnam	Member 01/04/19
14.	Miss.G.Rama Lakshmi.	Member 01/04/19
15.	Mr.B.V.Siva Kumar	Member 01/04/19.
16.	Miss.S.G.Kalyani	Member
17.	G.Sandhya	Member
18.	P.K.M.S.Devi	Member
19.	J.Aruna Kalyani (MPC EM)	Student Member
20.	Sankar Rao (MPC EM)	Student Member
21.	A.Sravani Devi (MBC)	Student Member

ACTION PLAN BOS MEETING -CHEMISTRY HELD ON 01 -04-2019.

1. Department activities for 2019-2020 academic year. Annexure I

Month	Activity proposed	Faculty member in charge
June-19	Departmental staff meeting to review results and class work allotment	T. Vara Prasad
	Preparation of curricular plans, time-tables etc.,	
	Remedial coaching classes for II & III year supplementary exams	
	Bridge classes for I year students	
July-19	Student awareness programmes on ragging& eve teasing - consequences , self-discipline, career guidance, higher education opportunities etc.,	T.Vara prasad
August-19	Conference on prospects in pharmaceutical industries	T. Vara Prasad
	Study tour / Field trips	
Sept-19	Ozone day	
Oct-19	MOLE Day	D.Ramarao
	Faculty development programme	V.Mallikarjuna sarma
Nov-19	11th National Education Day – Out reach Programme to nearby school	
Dec-19	World AIDS Day	
	Chemistry day & Chem fest	V.Mallikarjuna sarma
Jan-20	10 days coaching for PG entrance examinations in chemistry Study tour / Field trips	V.Mallikarjuna sarma
Feb-20	NATIONAL SCIENCE DAY	V.Mallikarjuna sarma
March-20	Consumer awareness day	T. Vara Prasad

2. Organizing National/ State level seminars/Workshops/ Conferences/ Training programmes etc., with topics and other details.
(Mandatory for each Department)

i) Staff development programme

ii) Training in the use of HPLC
iii) Awareness on OZONE protection
iv) National Chemistry day
v) Chem. fest
vi) National Science day 2019
vii) Guest lectures
viii) National seminar in chemistry
ix) Training in Soil analysis
x) Training in water analysis

3. **Change of modules in the syllabus content.**
   Syllabus changed for first and second years as per university regulations. CBCS introduced for final year w.e.f. 2018-19.

4. **Plan for utilization of funds for Autonomous/CPE/other grants available for arranging guest lectures, faculty improvement programmes, 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 Hydrololgy, 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.

1. Sophisticated version UV-Visible spectrophotometer- 5.0 lakhs
2. Other equipment 1.0 lakhs
3. Petrochemicals equipment 1.0 lakhs

5. **Plan for organizing subject oriented community outreach programmes & allocation of necessary funds. (Mandatory for each Department)**
   i) Adoption of village Rs. 20,000
   ii) Medical Awareness programmes 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 programmes –PG/UG/Diploma and certificate courses.**

New courses to be proposed.

S.No.	New course proposed	Justification	Employability
1	Under graduate course in Industrial chemistry	There is dearth of skilled persons to operate various instruments like uv visible spectrophotometer, Atomic absorption spectrophotometer, PH meter, flame photometer, rotavapour instrument, HPLC.GLC, distillation, etc which play as key role in any industry related to chemistry.	Technical assistants, Quality control managers, Plant supervisors etc.

8. **Any other programme 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. **Change in internal assessment exams for conducting II mid Semester by way of Project work/Assignment.**
   Not possible as the number of students is more. However it is proposed to give 33.3% weitage for competitive exam questions pertaining to the syllabus prescribed.
10. **proposed panel of examiners/paper setters & other experts/nominees for BOS deliberations.**
    Chemistry:
    1. Sri N. Lakshmana Rao, SKBR College, Amalapuram.
    2. Dr. D. Madhava Sarma, GDC,Tadepalligudem
    3. Dr. V. Sambasiva Rao, Govt.Arts College, Rajahmundry.
    4. Dr. K. A.R.S.S.Prasad, VS Krishna College, Visakhapatnam.
    5. Sri S.V. Ramana , Arts College, Rajahmundry
    6. Sri Machi Raju, Arts College, RajahmundrY
    7. Smt. C. Jyoti, St.Therisa college,Eluru.
    8. P. Krishna kumar,S.K.B.R.College,Amalapuram.
    9. Dr. G. Venkatarao,GDC,Vijayavada
    10. Shri B.Venkatarao, GDC,Tadepalligudem
    11. Dr.Ramchadarao,Y.N.College,Narasapuram

P.R.GOVT.COLLEGE (A),KAKINADA

DEPARTMENT OF CHEMISTRY,

Minutes of board of studies(BOS) meeting 2019-20 on 01-04-2019 at 10.30am

Resolutions:

The board of studies meeting chemistry department on 01-04-19 at 10.30 am in the guest room of the college under the chairmanship of Dr. T.Vara Prasad ,in charge of the department The principal Dr. Chappidi Krishna, Dr.K.Deepthi, University Nominee., Dr.K.Jhansi Lakshimi, Head in Chemistry, Ideal College, Kakinada., all members of the faculty of chemistry and student representatives attanded the meeting. agenda items are discussed and resolutions are made.

1. It is resolved to cotinue choice based credit system in the chemistry combination programmes as per the directions of the CCE, Hydreabad to the first year and second year and second year and final year students w.e.f. 2017-2018.

2. Resolved to follow 60%-40% extenrnal and internal w.e.f. 2017-2018 admitted batch and it continued in second and third year.

3. It is resolved to allot 50 marks project work for final year students in chemistry preferably in cluster paper C_3 practicals.w.e.f 2019-20 accordance with APSCHE.

4. in the first year admitted batch w.e.f 2019-20 multiple choice questions and question bank prepared in the first year students only.

i) Mid examination –I follows online

ii)Mid examination –II follows offline

5. It is resolved to conduct departmental activities such as OZONE DAY, CHEM. FEST , CHEMISTRY DAY and SCIENCE DAY.

6. It Is Resolved to offer Subject Electives and clusters in the V and Vi Semester Respectively as per the guidelines of AKNU we adopted the folling syllabus

Elective paper -1

Cluster VIII C papers - 3 (C_1, C_2, C_3)

7. It is resolved to implement the recommended padagogy for the first semester 2018-2019

8. Resolved to conduct practical examinations semester wise.

9. It is resolved to organize guest lectures by eminent professors.

10. Resolved to implement pass minimum for internal assessment for CBSE pattern students as the pattern is learner oriented.

11. It is resolved syllabus change for I , II, III elective, clusters as per the AKNU lines.

12. CBCS introduced for final years w.e.f. 2016-2017.

13. Introduced cluster system for final year w.e.f 2017-2018.

14. cluster theory paper C_3 introduced w.e.f 2019-20 in the place of project 150 marks.

15. project 50 marks in the place of cluster theory paper practicals w.e.f 2019-20

16. followed ratio 60:40 and it continued in third year.

17.it is resolved that B.Voc Pharmaceutical Chemistry course is restructured in B.Sc professional (Pharmaceutical chemistry) w.e.f 201-20. The proposal is put followed to academic council and general body meeting.

18. It is advised to allocate only 50 marks for project in VI semester(cluster VIII-C_3)

19.It is resolved to maintain status quo for same question paper pattern in I, II, III years.

The Following Paper Setter Are Recommended.

1). Dr. V. Sambasiva Rao, Govt,Arts College, Rajahmundry.

2). Dr.K.A.R.S.S. Prasad, VS Krishna College,Visakhapatnam.

3). Sri S.V. Ramana, Arts College, Rajahmundry.

4). Sri Machi Raju, Arts College, Rajahmundry.

5). Sri U. Satyanarayana , GDC, Tuni.

6). Sri R. Brahmaji, GDC, Ramachandrapuram.

7). Sri N.V. Sudhakar, GDC, Tuni.

New Courses

20. It is resolved to explore the possibility of introducing a new course in bsc analytical chemistry ,maths,chemistry as per the Govt./CCE order w.e.f 2018-2019.

21. Resolved to submit proposals to conduct a faculty development programme in instrumentation techiniques/ advanced topics with the assistance of the industry representatives and university representatives.

22. 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.

23.resolved to change the syllabus components in semester **I** to Semester **II** and vice versa. Sly semester **III** to **IV** and vice versa on par with the affiliating university.

24. it is proposed to give 33.3% weitage competitive exam questions pertaining to the syllabus prescribed

25. Resolved to reduce the intake of Bsc MPC TM students from 60 to 30 w.e.f from 2019-20.

26. Resolved to increase the intake of Bsc MPC EM students from 30 to 60 w.e.f. from 2019-20.

27. Resolved to take girls students also for admissions into Bsc MCPc w.e.f. from 2019-20.

Special Features of Chemistry Department

1. In the cluster system 85 students opted chemistry projects and they submitted projects to our college under the guideance of eminemt lecturers.

2.NAAC team visited our college chemistry department on 08-09-2017 and chairman commented **"chemistry department is very good"** in always.

3. CCB academic team visited our chemistry department on 21-03-2018 and team head was commented as **“ chemistry department is excellent”** always.

Modern Lecture Methods & New Techniquis

4.Power Point Presentation / LCD Teaching.

5.Virtual Class Teaching Methods.

6.Feedback on Teching Performance.

P.R.GOVERNMENT COLLEGE(A), KAKINADA

B.Sc. Chemistry Syllabus under CBCS

Structure of Chemistry Syllabus Under CBCS

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
I	I	I	Inorganic and Organic Chemistry	100	03
			Practical – I	50	02
	II	II	Physical and General Chemistry	100	03
			Practical – II	50	02
II	III	III	Inorganic and organic Chemistry	100	03
			Practical – III	50	02
	IV	IV	Spectroscopy and Physical Chemistry	100	03
			Practical – IV	50	02
III	V	V	Inorganic ,Organic and Physical Chemistry	100	03
			Practical – V	50	02
		VI	Inorganic ,Organic and Physical Chemistry	100	03
			Practical – VI	50	02
	* Any one Paper from VII A, B and C ** Any one cluster from VIII, A, B and C VI	VII (A)*	Elective	100	03
			Practical - VII A	50	02
		VII (B)*	Elective	100	03
			Practical - VII B	50	02
		VII (C)*	Elective	100	03
			Practical - VII C	50	02
		VIII (A)**	**Cluster Electives - I :**		
			VIII-A-1	100	03
			VIII-A-2	100	03
			VIII-A-3	100	03
			Practica l	50	02
			Practica l	50	02
			Project	50	02
		VIII (B)**	**Cluster Electives - II ::**		
			VIII-B-1	100	03
			VIII- B-2	100	03
			VIII-B-3	100	03
			Practica l	50	02
			Practica l	50	02
			Project	50	02
		VIII (C)**	**Cluster Electives - III ::**		
			VIII-C-1	100	03
			VIII-C-2	100	03
			VIII-C-3	100	03
			Practica l	50	02
			Practica l	50	02
			Project	50	02

OBJECTIVES

- **Objectives**
  The students can obtain the knowledge in the following topics and come to know how chemistry is essential in daily life.

1. Preparation, properties and applications of some special compounds of s and p block elements.
2. Structural theory of Organic compounds.
3. Preparation, properties and applications of alkenes, alkynes and cycloalkanes.
4. Benzene structure and its reactivity.
5. Identification of some cations and anions in the unknown salt.

- **By the end of II semester, each and every I degree chemistry student can obtain the knowledge in the following topics and come to know how chemistry is essential in daily life.**

1. Features involved in gaseous state, liquid state and solid state and their applications.
2. Importance of colloids and adsorption.
3. Chemical bonding between molecules through M.O. theory.
4. Identification of some cations and anions in the unknown mixture.
5. Basic knowledge and Importance of of Stereochemistry.

- **By the end of III semester, each and every II degree chemistry student can attain the knowledge in the following topicss and come to know their role in serving the society through chemistry.**

1. Properties of d and f block elements.
2. Boding nature of the metals.
3. Preparation, properties and applications of halogen compounds, hydroxyl compounds, carbonyl Compounds and carboxylic acids.
4. Importance and synthetic applications of active methylene compounds.
5. Estimation of Fe (II) and Cu (II) in the unknown material through practical.
6. Reactions of some functional groups like phenols, carboxylic acids, aldehydes, ketones, amines and Amides.

- **By the end of IV semester, each and every II degree chemistry student can attain the knowledge in the following topicss and come to know their role in serving the society through chemistry.**

1. Different types of Electronic transitions present in Organic molecules..
2. Identification of Functional groups using IR spectrum.
3. Analysis of Cr and Mn using spectrophotometer.
4. Structural identifications of organic compounds using H^1-NMR
5. Different aspects of electrochemistry.
6. Identification of functional group present in the given organic compound by IR spectral analysis.
7. Importance of conductometric techniques by doing strength of acids and bases.

- **By the end of V semester, each and every III degree chemistry student can obtain the knowledge in the following topics and come to know how to serve the society by becoming a chemist.**

1. Involved theories and properties of coordination compounds.
2. Preparation and properties of nitrogen compounds.
3. Importance, preparations, properties and medicinal uses of heterocyclic compounds.
4. Structural elucidation of glucose and fructose.
5. Importance of Amino acids and Proteins.
5. Determination of Rate of the reactions through chemical kinetics.
6. Some photochemical reactions photophysical processes.
7. Importance of thermodynamical aspects.
8. Identification of functional group present in the given organic compound by following organic qualitative analysis.
9. Determination of surface tension and viscosity of some liquids.

- **By the end of VI semester, each and every III degree chemistry student can get the knowledge in the following topics depending on their choice/interest and come to know how to serve the society by becoming a chemist.**

1. Various types of instrumental techniques like IR and NMR spectroscopies.
2. Different aspects of Environmental Chemistry.
3. Importance of green chemistry.
4. Analyses of drugs, dairy products
6. Importance of petrochemicals.
7. Preparation of some organic compounds.
8. Synthesis of organic compounds using green synthesis.

9. Hands on experience in operating colorimeters, pH meters and potentiometers.

10. Submission of a project work.

OUT COMES

After completion of B.Sc. course the students will be able to:

1. Acquire comprehensive knowledge in physical inorganic and organic chemistry.
2. Acquire experimental skills in chemical analysis.
3. Apply their knowledge and understanding in new situations.
4. Have industrial exposure by visiting near by industry plants.
5. Achieve good ranks in PG entrance examinations.
6. Acquire employable skills and become industry ready persons.
7. Get motivation for research by carrying out projects.
8. Gain leader ship quality by participation in extension programmes and group projects etc.

SEMESTER-V

Paper - V (INORGANIC, PHYSICAL & ORGANIC CHEMISTRY)

45 hrs (3 h / w)

OBJECTIVES:

1. Gains knowledge crystal field splitting energies.

2. Knowledge of spectral data of complexes.

3. Synthesis of Heterocyclic compounds.

4. Applications of Thermodynamics'.

INORGANIC CHEMISTRY

UNIT – I

Coordination Chemistry: 8h

IUPAC nomenclature - bonding theories - Review of Werner's theory and Sidgwick's concept of coordination - Valence bond theory - geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory - splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes - low spin and high spin complexes - factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

UNIT-II

1. Spectral and magnetic properties of metal complexes: 4h

Types of magnetic behaviour, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility-Gouy method.

ORGANIC CHEMISTRY

UNIT- III

Nitro hydrocarbons: 3h

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitro alkanes leading to aci and keto form, Preparation of Nitro alkanes, reactivity -halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Micheal addition and reduction.

UNIT – IV

Nitrogen compounds: 10h

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1°, 2°, 3° Amines and Quarternary ammonium compounds. Preparative methods – 1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). Reduction of Amides and

Schmidt reaction. Physical properties and basic character - Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline - comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophillic substitution of Aromatic amines – Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

Heterocyclic Compounds: **8h**

Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1,4,- di carbonyl compounds, Paul-Knorr synthesis. Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. Pyridine – Structure - Basicity - Aromaticity - Comparison with pyrrole - one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

PHYSICAL CHEMISTRY

UNIT- V

Thermodynamics: **12h**

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

List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam

2. Coordination Chemistry by Basalo and Johnson

3. Organic Chemistry by Mare loudan, Purdue Univ

4. Advanced Physical Chemistry by

5. Text book of physical chemistry by S Glasstone

6. Concise Inorganic Chemistry by J.D.Lee

7. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan

8. A Text Book of Organic Chemistry by Bahl and Arun bahl

9. A Text Book of Organic chemistry by I L Finar Vol I

10. Advanced physical chemistry by Gurudeep Raj

Weightage to Content
Fifth semester
Paper-V

S.No	Course Content	Long Answer	Short Answer(SA)
	Inorganic Chemistry		
1	Coordination Chemistry	3	2
2	Spectral and magnetic Properties		1
	Organic Chemistry		
1	Nitro hydro Carbons	1	
2	Nitrogen Compounds	1	1
3	Heterocyclic compounds	1	1
	Physical Chemistry		
1	Thermodyanamics	3	3

P.R.COLLEGE (A), KAKINADA

III YEAR BSC-(Examination at the end of V semester) model paper

(Inorganic, Organic & Physical chemistry)

Paper-V

Time: 2 1/2Hrs **Max.Marks:60**

Answer any FOUR questions choosing at least one question from each section

SECTION-I **4x10=40M**

1. What do you understand the by the term Crystal field splitting. Discuss the splitting of d-Orbitalsin case of tetrahedral complexes.

2. Explain the Formation of $[Fe(CN)_6]^{4-}$ and $[Fe(CN)_6]^{3-}$ on the basis of Valency bond theory.

3. What is stereo isomerism? Discuss the stereo isomerism exhibited by complex Compounds of coordination numbers 4 and 6.

SECTION-II

4. Write note on

a) Nef reaction b) Michael reaction c) Mannich reaction

5. What are Amines? How the primary amines are prepared. Give the separation of amines by Hinsberg Method.

6. Give any two methods of synthesis of pyrrole. Explain why electrophilic substitution in Furantakes place at 2-position rather than 3-position.

SECTION-III

7. State and explain 1st law of thermodynamics

8. Derive Kirchhoff's equation and mention its units.

9. Show that pv^{r}Constant

SECTION-IV

Answer any Five questions **4x5=20M**

10. Explain the factors affecting crystal field splitting energy.

11. Explain EAN rule with two examples.

12 What are low spin and high spin complexes- Give examples.

13 How is furan prepared? Give its Diel's – Alder reaction.

14. Write about alkylation and acylation reactions of aniline

15Prove that C_p-C_v=R

16. Write about Entropy

17. State and explain Joule- Thomson Effect

18. Discuss Chichibabin reaction.

DEPARTMENT OF CHEMISTRY SEMESTER-V

PAPER-III

QUESTION BANK

ESSAY QUESTIONS:

1. Explain the Geometry and Magnetic Properties of

a) [Co (NH3)6]+3 b) [Fe(CN)6]+3 C) [Fe(CN)6]-3 d) [Cr(NH3)6]+3 e) [Fe(CN)6]-4

f) [Zn(NH3)6]+2 g) [Ni(CO)4] h) [Cu(NH3)4]+2 i) [Ni(CN)4]-2 J) [CO F6]-3

Complex compounds based on valence Bond theory.

2. Discuss the salient features of crystal field theory. Explain the Crystal field splitting of d-orbitals in Octahedral, Tetrahedral and Square planar complexes.

3. Describe the geometrical isomerism in compounds with coordination number 4 & 6

4. Explain the different types of Structural isomerism exhibited by complexes with examples.

5. Preparation and properties of Nitro alkanes.

6. Write note on

a) Nef b) Michael C) Mannich d) Schmidt e) Gabriel phthalamide reaction.

7.Explain Hinsberg method of separation of primary, Secondary, Tertiary Amines.

8.Write about Hoffmann bromide reaction with mechanism.

9.Preparations and properties of Amines.

10.Preparations and properties of pyrrole, Furan, Thiophene

11.State and explain first law of thermodynamics.

12.State and explain Second law of thermodynamics.

13.State and explain third law of thermodynamics.

14.Explain Joule- Thomson effect

15.Show that PVR constant

16.Derive Kirchhoff's equation. Mention its applications.

17.Explain Carnot cycle.

18.Show that CP-CV=R

SHORTANSWERS:

1.Explain Werner theory of complex compounds.

2.Effective atomic number (EAN)

3.Explain High spin and Low spin complexes with examples.

4.What is a chelating? Give two examples.

5.What is meant by crystal field stabilization energy.

6.Explain the electronic absorption spectrum of [Ti(H2O)6]3+ ion

7.Preparation of Pyrrole, Furan, Thiophene(Pall-knorr synthesis)

8.Explain why electrophilic substitution reaction in furan takes place 2-position rather than 3-position.

9.Discuss the aromatic character of pyrrole, Furan, Thiophene

10.Write about a) Diels-Alder reaction b) Chichibabin reaction

11.Acidic and basic nature of pyrrole

12.Basic nature of pyridine.

13.Explain why pyridine is more basic than pyrrole.

14.Basic nature of amines.

15.What is entropy? What are its uses.

16.Write briefly about enthalpy.

17.Explain the concept of internal energy.

18.Carbyl amine test.

19.Furan exhibits acidity. Why?

20.Explain Diazotization reaction.

LABORATORY COURSE – V

Practical Paper – V Organic Chemistry

(at the end of semester V)

30 hrs (2 h / W)

Organic Qualitative Analysis: 50M

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives. Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic Primary Amines, Amides and Simple sugars.

SEMESTER-V

Paper - VI (INORGANIC, ORGANIC & PHYSICAL CHEMISTRY)

45 hrs (3 h / w)

OBJECTIVES:

1. Gains knowledge Labile and Inert complexes

2. Knowledge of Biological significance of inorganic elements.

3. Structure of Carbohydrates.

4. Synthesis of Amino acids.

INORGANIC CHEMISTRY

UNIT-I

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

Labile and inert complexes, ligand substitution reactions - SN1 and SN2, substitutionreactions ofSquare planar complexes - Trans effect and applications of Trans effect.

2. Stability of metal complexes: 4h

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

3. Bioinorganic chemistry:4h

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl-.

Metalloporphyrins – Structure and functions of haemoglobin, and Chlorophyll.

ORGANIC CHEMISTRY

UNIT-II

Carbohydrates:10h

Monosaccharides: (+) Glucose (aldo hexose) - Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) - Pyranose structure (Haworth formula and chair conformational formula). (-) Fructose (ketohexose) - Evidence of 2 - ketohexose structure (formation of pentaacetate, formation of cyanohydrin its hydrolysis and reduction by HI). Cyclic structure for fructose (Furanose structure and Haworth formula) - osazone formation from glucose and fructose – Definition of anomers with examples. Interconversion of Monosaccharides: Aldopentose to Aldohexose (Arabinose to D- Glucose, D-Mannose) (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to

Aldopentose (D-Glucose to D- Arabinose) by Ruff degradation. Aldohexose to Ketohexose [(+) Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose)

Amino acids and proteins **9h**

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis. Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point. Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

PHYSICAL CHEMISTRY

UNIT-III

1. Chemical kinetics **8h**

Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

2. Photochemistry **6h**

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

List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mare loudan, Purdue Univ
4. Advanced Physical Chemistry by Atkins
5. Text book of physical chemistry by S Glasstone
6. Instrumentation and Techniques by Chatwal and Anand
7. Essentials of Nano chemistry by Pradeep
8. A Textbook of Physical Chemistry by Puri and Sharma

9. Advanced physical chemistry by Gurudeep Raj

Weightage to Content
Fifth semester

S.No	Course Content	Long Answer	Short Answer(SA)
	Inorganic Chemistry		
1	Reactivity of Metal Complex	1	1
2	Stability of metal complexes	1	1
3	Bio inorganic Chemistry	1	1
	Organic Chemistry		
1	Carbohydrates	2	2
2	Amino Acids	1	1
	Physical Chemistry		
1	Chemical Kinetics	2	2
2	Photo Chemistry	1	1

P.R.COLLEGE (A), KAKINADA

III YEAR BSC-(Examination at the end of V semester) model paper

(Inorganic, Organic & Physical chemistry)

Paper-VI

Time: 2 1/2Hrs **Max.Marks:60M**

Answer any **FOUR** questions choosing at least one question from each section

SECTION-I **4x10=40M**

1. Explain SN^1 and SN^2 substitution reactions in Octahedral complexes.
2. Explain determination of the composition of metal complexes by job's method.
3. i) Explain the biological signification of Na,K

   ii) Explain the Structure of Chlorophyll

SECTION-II

4. Establish the Open chain structure of Glucose with relevant chemical equations.
5. Explain

   i) Killiani-Fischer synthesis ii) Ruff degradation

6. What are Amino Acids. Write the preparation of α –amino acids from

   i) Streckers synthesis ii) Malonic ester synthesis iii) Gabriel phthalamide synthesis

SECTION-III

7. a) Derive the rate constant equation for first order reaction.

   b) The rate constant for the certain first order reaction is $1x10^{-5\ sec-1}$. Calculate the time taken for the 20% completion of the reaction.

8. Define the terms 'order' and 'molecularity'.Explain any two methods for the determination of order of a reaction.
9. What is meant by quantum yield. State and explain laws of photochemistry.

SECTION-IV

Answer any **Five** questions 4x5=20M

10. Explain Chelate effect.

11. What is trans effect. Write any two applications of trans effect.
12. Explain mutarotation of Glucose.
13. Explain the formation of Glucozone.
14. Write a note on Isoelectric point.
15. Write a temparature effect on the rate of a reaction.
16. Discuss about Zero order reaction.
17. Explain Jablonski diagram.
18. What are labile and inert complexes.give examples?

PAPER-VI

QUESTION BANK

ESSAY QUESTIONS

1. Explain determination of composition of complex by job's method and mole ratio method.

2. Explain the factors effecting the stability of complexes.

3. Discuss the mechanism of SN^1 and SN^2 reactions in coordination complexes with examples.

4. Explain the mechanism of ligand substitution reactions of square planar complexes.

5. Explain the structure and function of Haemoglobin and chlorophyll

6. Explain open chain and ring structure of Glucose.

7. Explain 1) Killiani fisher synthesis 2) Ruff degradation 3) Glucose to Fructose

4) Fructose to Glucose

8. Explain the classifications of Amino Acids. Preparations and properties of amino acids.

9. Derive First order equation.

10. Derive second order equation.

11. Derive third order equation.

12. Define order of a reaction. Explain any three methods for the determination of order of a reaction.

13. Explain Jablanski diagram of various processes occurring in the excited state.

Short Answers

1. Trans effect and applications.

2. Chelating effect. Give example.

3. What are labile and Inert complexes. Give examples.

4. What is spectrochemical series. Explain.

5. Explain the absorption spectrum of $[Ti(H_2O)_6]^{+3}$ Ion

6. What are essential elements and importance of Na and K in biological systems.

7. Peptide bond.

8. Isoelectric point.

9. Zwitter ion.

10. Essential Amino acids.

11. Mutarotation.

12. Epimers and Anomers.

13. Lobry de bruyn van ekenstein rearrangement.

14. Osazones.

15. Zero order. example

16. Half-life.

17. Define molecularity and order of a reaction.

18. Quantum yield.

19. Photo sensitization.

20. Fluorescence, Phosphorescence, chemiluminiscence.

21. What are the metallophorphyrine.

22.Explain the chain mechanism of photo chemical reactions of H_2-Cl_2 and H_2-Br_2

23. Streicker synthesis.

24. Effect of temparature on rate of a reaction.

LABORATORY COURSE – VI

Practical Paper – VI Physical Chemistry

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

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