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

DEPARTMENT OF CHEMISTRY

B. Sc Chemistry Syllabus under CBCS

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Board of Studies
2018-19

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

Recommended Composition of the Board of Studies of Chemistry

And it' s Functions of an Autonomous College

April-2018-19

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

   1. Dr. V .Sambasivarao, Lecturer in Chemistry, Arts College, Rajahmundry
   2. 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. Prof. 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. Sri. Nemani Ramam, M.Sc., M.Phil

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 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.

<u>Signatures of the members who attended the</u>

<u>Board of studies in Analytical Chemistry on 07.04.2018 at 2.00pm</u>

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. V. Sambasivarao, — Subject expert
   Lecturer in Chemistry,
   Govt. Arts College,
   Rajamahendravaram

5. Dr. K. Jhansi Lakshmi — Subject expert
   Lecturer in Chemistry,

Ideal Degree College, Kakinada

6. Sri. N. Ramam — Alumnus, Principal, Retd.
7. Sri D. Rama Rao — Member
8. Sri V. Mallikarjuna Sarma — Member

ACTION PLAN BOS MEETING -CHEMISTRY HELD ON 07 -04-2018.

1. Department activities for 2018-2019 academic year. Annexure I

Month	Activity proposed	Faculty member in charge
June-18	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-18	Student awareness programmes on ragging& eve teasing - consequences , self-discipline, career guidance, higher education opportunities etc.,	T.Vara prasad
August-18	Conference on prospects in pharmaceutical industries	T. Vara Prasad

	Study tour / Field trips	
Sept-18	Ozone day	
Oct-18	MOLE Day	D.Ramarao
	Faculty development programme	V.Mallikarjuna sarma
Nov-18	11th National Education Day – Out reach Programme to nearby school	
Dec-18	World AIDS Day	
	Chemistry day & Chem fest	V.Mallikarjuna sarma
Jan-19	10 days coaching for PG entrance examinations in chemistry Study tour / Field trips	V.Mallikarjuna sarma
Feb-19	NATIONAL SCIENCE DAY	V.Mallikarjuna sarma
March-19	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
xi)

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

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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	Technical assistants, Quality

		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.	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 propose to give 33.3% weitage for competitive exam questions pertaining to the syllabus prescribed.

10. **Suggest 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

Department of Chemistry BOS Meeting Dt.07 -04-2018

Resolutions:

Meeting of Board of studies in chemistry is convened on 07-04-18 in the guest room of the College. The Principal Dr. Chappidi Krishna, Dr.K.Deepthi , University Nominee , Ch. V. N. S. Vara Prasad, Managing partner, DAS Pharma Ltd, Kakinada, Dr.V.Sambasiva Rao , Subject Expert, Govt. Degree College, Tuni, Dr. . Jhansi Lakshmi, Lecturer in Chemistry, Ideal College, Kakinada. , all members of the faculty of Chemistry and student representatives attended the meeting. Agenda items are discussed and resolutions are made.

1. It is resolved to continue Choice based credit system in the Chemistry combination programmes as per the directions of the CCE, Hyderabad to the first year and second year and final year students w.e.f. 2018-19
2. Enhance the internal assessment component from 30% to 40% in theory to first year (admitted batch) extended to second year also.
3. It is resolved to allot project works for final year students who opt for project work in chemistry preferably industry based.
4. It is resolved to conduct departmental activities such as Ozone day, Chem fest, Chemistry day and Science day etc.
5. It is resolved to offer subject electives and skill based electives in the V and VI semesters respectively.
6. It is resolved to implement the recommended Pedagogy for the first semester 2018-19.
7. Resolved to conduct practical examinations semester wise.

   The following paper setters are recommended.

   i. Dr. V.Sambasiva Rao, Govt.Arts College, Rajahmundry.
   ii. K.A.R.S.S.Prasad, VS Krishna College, Visakhapatnam.
   iii. Sri S.V.Ramana , Arts College, Rajahmundry
   iv. Sri Machi Raju, Arts College, Rajahmundry.
   v. U. Satyanarayana, GDC, Tuni
   vi. R. Brahmaji, GDC, Ramachandrapuram
   vii. N. V. Sudhakar, GDC, Tuni
8. It is resolved to organize Guest lectures by eminent professors.
9. Resolved to implement pass minimum for internal assessment for CBSE pattern students as the pattern is learner oriented.
10. NEW COURSES:

    It is resolved to explore the possibility of introducing a new course in B.Sc Pharmaceuticals/Industrial Chemistry as Restructed course.

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

12. Resolve 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.
13. 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.
14. It is proposed to give 33.3% weitage for competitive exam questions pertaining to the syllabus prescribed.

New Courses

15. 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.
16. 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.
17. 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.
18. .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.
19. it is proposed to give 33.3% weitage competitive exam questions pertaining to the syllabus prescribed

Special Features of Chemistry Department

20. In the cluster system 74 students opted chemistry projrcts andthey were submitted projects to our college under the guideance of eminemt lecturers.
21. NAAC team visited our college chemistry department on 08-09-2017 and chairman was commented **" chemistry department is very good"** in always.
22. CCB academic team visited our chemistry department on 21-03-2018 and team head was commented as **" chemistry department is excellent"** in always.

Modern Lecture Methods & New Techniques

23. Power Point Presentation / LCD Teaching.
24. Virtual Class Teaching Methods.
25. Feedback on Teaching Performance.

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P.R.GOVERNMENT COLLEGE (AUTONOMOUS)-KAKINADA

SECOND YEAR 2018-19

SEMESTER-III

Paper-II (INORGANIC & ORGANIC CHEMISTRY) 60hrs(4hrs/week)

OBJECTIVES:

1. Understands the reason for characteristic properties of d- and f-block elements.
2. Appreciates the application of M.O.Theory to conductors, Semi-conductors and Insulators.
3. Gains knowledge of properties of hetero compounds with mechanism.
4. Able to apply principles of anion synthesis.

INORGANIC CHEMISTRY 30hrs(2hrs/week)

UNIT-I

1.Chemistry of d-block elements: 9 hrs

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

2.Theories of bonding in metals: 6 hrs

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

UNIT-II

3.Metal carbonyls: 7hrs

EAN rule, classification of metal carbonyls,structures and cshapes of metal carbonyls of V,Cr,Mn,Fe,Co and Ni.

4.Chemistry of f-block elements: 8hrs

Chemistry of lanthanides-electronic structure, oxidation states. Lanthanide contraction. consequences of lanthanide contraction, magnetic properties. Chemistry of actinides-electronic configuration, oxidation states, actinide contraction, comparison of lanthanides with actinides.

ORGANIC CHEMISTRY 30hrs(2hrs/week)

UNIT-III

1.Halogen compounds: 5hrs

Nomenclature and classification of alkyl (into primary, secondary, tertiary),aryl, aralkyl, allyl, vinyl, benzyl halides. Nucleophilic aliphatic substitution reaction-classification into SN^1 and SN^2 – reaction mechanism with examples- Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromo butane.

2.Hydroxy compounds: 5hrs

Nomenclature and classification of hydroxyl compounds.

Alcohols: Preparation with hydroboration reaction.Grignard synthesis of alcohols.

Phenols: Preparation i)from diazonium salt ii)from aryl sulphonates

iii)from cumene.

Physical properties : Hydrogen bonding (inter molecular and intra molecular). Effect of hydrogen bonding on boiling point and solubility in water.

Identification of alcohols by oxidation with $KMnO_4$, Ceric ammonium nitrate. Luca' s reagent and phenols by reaction with $FeCl_3$.

Chemical properties**:** a)Dehydration of alcohols b)Oxidation of alcohols by CrO_3, $KMnO_4$ c) Special reaction of phenols: Bromination. Kolbe-Schmidt reaction, Riemer-Tiemann reaction. Fries rearrangement, azo coupling, pinacole-pinacolone rearrangement.

UNIT-IV

Carbonyl compounds: 10hrs

Nomenclature of aliphatic and aromatic carbonyl compouns, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids.

Physical properties : Reactivity of carbonyl group in aldehydes and ketones.

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

Base catalysed reactions: a)Aldol condensation b)Cannizaro' s reaction c) Perkin reaction d) Benzoin condensation e)Haloform reaction f)Knoevangel reaction. Oxidation of aldehydes : Baeyer-Villiger oxidation of ketones.

Reduction: Clemensen reduction, Wolf-kishner reduction. MPV reduction , reduction with $LiAlH_4$ and $NaBH_4$. Analysis of aldehydes and ketones with

a)2,4-DNPH test b)Tollen' s test c)Fehling' s test d)Schiff' s test e) Haloform test (with equation)

UNIT-V

1.Carboxylic acids and derivatives: 6hrs

Nomenclature: classification and structure of carboxylic acids. Methods of preparation by a)Hydrolysis of nitriles, amides b)Hydrolysis of esters and bases with mechanism c) Carbonation of Grignard reagents. Special methods of preparation of aromatic acids by a)Oxidation of side chain b) Hydrolysis by benzo tri chlorides c) Kolbe reaction

Physical properties**:** Hydrogen bonding, dimeric association, acidity-strength of acids with examples of trimethyl acetic acid and tri-chloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids.

Chemical properties**:** Reactions involving H, OH and COOH groups - salt formation, anhydride formation, acid chloride formation, amide formation and esterification(with mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schmidt reaction. Arndt-Eistert synthesis, halogenations by Hell-Volhard-Zelinsky reaction.

2.Active methylene compounds: 4 hrs

Acetoacetic ester: Keto-enol tautomerism, preparation by Claisen condensation, Acid hydrolysis and ketonic hydrolysis. Preparation of a)mono carboxylic acids

b) Dicarboxylic acids c) Reaction with urea.

Malonic ester : preparation from acetic acid.

Synthetic applications: Preparation of a)mono carboxylic acids(propionic acid and n-butyric acid). B) Dicarboxylic acids (succinic acid and adipic acid)

c)α,β-unsaturated carboxylic acids (crotonic acid) d) Reaction with urea.

List of Reference Books

1.Selected topics in inorganic chemistry by W.D.Malik, G.D.Tuli, R.D.Madan

2.Inorganic Chemistry J.E Huheey, E.A.Keiter and R.L.Keiter

3.A Text Book of Organic Chemistry by Bahl and Arun Bahl

4.A Text Book of Organic Chemistry by I.L.Finar Vol.I

5.Organic Chemistry by Bruice

6.Organic Chemistry by Clayden

7.Advanced Inorganic Chemistry by Gurudeep Raj

8.Basic Inorganic Chemistry by Cotton and Wilkinson

9.Concise Inorganic Chemistry by J.D.Lee

III – SEMESTER CHEMISTRY Paper-III

Weightage to content

S.No	Course content	Essay	Short questions	Total no.of questions	Total No. of Marks allotted to each Unit
	INORGANIC CHEMISTRY				
1	UNIT-I	2	2	4	30
2	UNIT-II	2	2	4	30
	ORGANIC CHEMISTRY				

3	UNIT-III	1	2	3	20
4	UNIT-IV	1	1	2	15
5	UNIT-V	2	1	2	25
	TOTAL	**8**	**8**	**16**	**120**

SEMESTER-III Chemistry model question paper 2018-19

INORGANIC & ORGANIC CHEMISTRY

(Revised Question paper w.e.f.2018-19)

Time:2½ hrs Marks : 60

Answer **two** questions from SECTION-A, **two** questions from SECTION-B any **four** questions from Section-C. Each question carries 10 marks.

SECTION-A(INORGANIC CHEMISTRY) 2X10=20M

1. Explain the tendency of formation of complex compounds and catalytic properties of d-block elements.

2. Give a detailed account of Band theory of metals. How could you explain the properties of conductors, insulators and semi-conductors basing on this theory.

3. Explain the structures of $Fe(CO)_5$ and $Co_2(CO)_8$

4. Explain the following properties of f-block elements.i)Electronic configurations & ii)Oxidation states

SECTION-B(ORGANIC CHEMISTRY) 2X10=20M

5. Write the following with examples:(i)Walden inversion in S_N2 reaction & (ii)Racemisation in S_N1 reaction

6. Give the mechanism of the following (i)Cannizaro reaction & (ii) Aldol condensation

7. Explain the mechanism of ester hydrolysis in presence of acids and bases

8. Propose the preparation of malonic ester. Describe any two synthetic applications of it.

SECTION-C (4X5=20 marks)

Answer any **four** questions. Each question carries 5 marks.

9.What are transition elements? Explain the general properties with reference to magnetic properties.

10.Discuss about free electron theory.

11.What are metal carbonyls? Give their classification briefly.

12.What is lanthanide contraction? Write its consequences.

13.Write any four differences between S_N1 & S_N2 reactions.

14.Explain Acidity of phenols.

15.Discuss about the identification of Aldehydes and Ketones with equations.

16.Write briefly about Keto - enol tautomerism.

LABORATORY COURSE – III SEMESTER 30 hours.(2 hours / week)

Practical Paper-II SEMESTER-III

Titrimetric Analysis & Organic Functional Group Reactions

(At the end of Semester-III)

Titrimetric analysis:

1.Determination of Fe(II) using $KMnO_4$ with Oxalic acid as primary standard.

2.Determination of Cu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard.

Organic Functional Group Reactions:

3.Reactions of the following functional groups present in organic compounds

(at least four)

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids and Amides.

SCHEME OF VALUATION FOR III SEMESTER

CHEMISTRY LABORATORY COURSE

TITRIMETRIC ANALYSIS &

ORGANIC FUNCTIONAL GROUP REACTIONS

Time:3 hours Max. Marks : 50

For Record : 10 marks

For Viva-voce : 5 marks

For Practical : 35 marks

Splitting of Practical marks for titrimetric analysis :

i) Preparation of standard solution : 5 marks
ii) Standardization of intermediate solution : 5 marks
iii) Determination of the given compound : 10 marks

Error <1% : 10 marks

Error 1-1.5% : 8 marks

Error >2% : 5 marks (Minimum marks)

iv) Correct calculation : 3 marks

Splitting of Practical marks for Organic compound functional group reactions:

Any **FOUR** reactions of the given functional group : (4x3)=12 marks

SEMESTER-IV

CHEMISTRY PAPER-II

SPECTROSCOPY & PHYSICAL CHEMISTRY 60hrs(4hrs/week)

OBJECTIVES:

1.Understands heterogeneous equilibria and the application of phase rule

2.Gains knowledge of principles of electrolysis and galvanic cells.

3.Understands the application of colligative properties in the determination of molecular weight.

4.Understands the application of spectrophotometry and spectroscopic interpretations.

SPECTROSCOPY 6 hrs

UNIT-I