Pithapur Rajah's Government College (Autonomous)
Kakinada

Affiliated to Adikavi Nannaya University

NAAC Accredited with "A" Grade (3.17 CGPA)

DEPARTMENT OF CHEMISTRY

B. Sc. Chemistry Syllabus
Under CBCS

Board of Studies
2020 – 21

TABLE OF CONTENTS

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

Recommended Composition of the Board of Studies of Chemistry

And it's Functions of an Autonomous College

June-2020-21

I Composition

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

   Dr. T. Vara Prasad, M.Sc., M.Ed., M.Phil., Ph.D.

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

   1. Dr. D.Rama Rao, M.Sc., B. Ed., M.Phil., Ph.D.
   2. Sri V.Mallikarjuna Sarma,MSc, M.Phil,NET
   3. Dr.V.Narayana Rao M.Sc, Ph.D
   4. Sri U.Sai Krishna M.Sc,NET
   5. Sri. K Baburao M. Sc., M.Phil.
   6. Smt. S Swarna Latha M.Sc.

3. **ONE experts in the subject from outside the college to be nominated by the Academic Council**
   a. Dr. K. Jhansi Lakshmi, Principal, Ideal Degree College, Kakinada
4. **One expert to be nominated by the Vice-Chancellor from a panel of six recommended by The College Principal**
   a. Dr. K. Deepthi, Adikavi Nannaya University, Rajahmundry
5. **One representative from industry/ Corporate Sector/ allied area relating to Placement.**
   a. Dr. 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.
   a. Dr.K.Raghavachari M.Sc., M.Phil, Ph.D.

Term

The term of the nominated members shall be two years.

II. 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.

III. Functions

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

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

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

DEPARTMENT OF CHEMISTRY,

Minutes of board of studies (BOS) meeting 2020-21 on 20. 06. 2020 at 10.30 am

Agenda

- Online BOS.
- Approve Syllabus for III, IV, V and VI Semesters, Same Syllabus Will be Followed Intoto I and II Semester (I Year UG) After getting the APSHE Guidelines.
- Grant of Extra credits for Certain activities.
- Syllabus, Model Question Papers and Model Blue Prints for III, IV, V and VI Semesters.
- Internal and External Exams to be Assessed in the Ratio for III, IV, V and VI Semesters.
- Department action plan for 2020-21.
- Any Other Proposal with the Permission of the Chairman.

Resolutions:

The board of studies meeting was held online through Video Conference by Google Meet by the Chemistry Department on 20. 06. 2020 at 10.30 am 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 Lakshmi, Head in Chemistry and Principal, Ideal College, Kakinada and all members of the faculty of chemistry and student representatives attended the meeting. The following agenda items are discussed and resolutions are made.

1. It is resolved to continue choice-based credit system in the chemistry combination programmes as per the directions of the CCE, Hyderabad to the first year and second year and second year and final year students w.e.f. 2019-20.

2. Resolved to follow 60%-40% external 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 in accordance with APSCHE.

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

5. It is resolved to offer Subject Electives and clusters A, B and C in the V and VI Semester Respectively as per the guidelines of AKNU

6. It is resolved to implement the recommended pedagogy for the first semester 2020-21

7. Resolved to conduct practical examinations semester wise.

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

11. It is resolved to encourage students enroll in MOOCS Online Programmes and give extra credits for students after successful completion of the courses.

12. It is resolved that if there is any change in the syllabus in the first year as prescribed by APSCHE, Vijayawada in this academic year, the same syllabus will be adopted as such.

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

12. 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.

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% weightage competitive exam questions pertaining to the syllabus prescribed

- 20. Resolved to reduce the intake of B.Sc. MPC TM students from 60 to 30 w.e.f from 2019-20.
- 21. Resolved to increase the intake of B.Sc. MPC EM students from 30 to 60 w.e.f. from 2019-20
- Resolved to take girls students also for admissions into B.Sc. MCPC w.e.f. from 2019-20.

The Following Paper Setter Are Recommended..

1. Dr. G. Nagarjuna, SRR CVR GDC, Vijayawada.
2. Dr. B. Mallikarjun, Govt. College (A), Rajamahendravaram.
3. Dr. G. Venkatarao, GDC, Vijayawada
4. Shri B. Venkatarao, GDC, Ramachandrapuram
5. Dr. Ramachandra Rao, Y.N.College,Narasapuram
6. Dr. T. Narasimha Murthy, GDC, Mandapeta.
7. Smt. G. Tejaswini, SVD GDC (W), Nidadavole.
8. Dr. M. Trinadh, GDC (A), Rajahmundry.
9. Sri. M. Sudhakara Rao, ASNM Govt. College (A), Palakol.
10. Sri. V. Satyanarayana, Govt. Arts College, Rajahmundry.
11. Sri. V Rambabu, GDC, Perumallapuram
12. Sri V. Sanjeev Kumar, GDC, Mandapeta.
13. Dr. K. Ravindra Babu, Govt.Arts College, Rajahmundry.
14. Sri T. V. V. Satyanarayana, GDC, Ramachandrapuram
15. Sri V. Sridhar, GDC, Nidadavol

Signatures of the members who attended the

Board of studies in Chemistry on 20. 06. 2020 at 10.00am

Mode of Conduct of meeting: Online video conference through Google Meet

1. Dr. T. Vara Prasad	Chairman & Lecturer in Charge
2. Dr. K. Deepthi,	University representative 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
10. Sri K. Babu Rao	Member
11. Smt. S. Swarna Latha	Member
12. M.S.T.B.V.Ratnam	Member
13. G. Rama Lakshmi	Member
14. G. Sandhya	Member
15. P. K. M. S. Devi	Member
16. M. Siva Sankar	Member
17. T. S. S. Lakshmi	Member
18. T. Pavan Kumar	Member
19. S. Vijaya Lakshmi	Member
20. B. S. V. A. L. Jyothi Sree	Member
21. K. N. S. Swami	Member

22. P. Sai Kalyani — Member

23. B. Vijaya Durga, II MPC TM (Regd. No. 2190214) — Student member

24. K. Pushpa Kumari, II MPC TM (Regd. No. 2190229) — Student Member

25. Surimilli Kishore Kumar, II MCCS (Regd. No. 2191320) — Student Member

26. Akula Mounika, II MPC EM (Regd. No. 2190103) — Student Member

27. Bandaru Srinivasu, II MPC EM (Regd. No. 2190104) — Student Member

Signatures of the members who attended the

Board of studies in Chemistry on 20. 06. 2020 at 10.00am

Mode of Conduct of meeting: Online video conference through Google Meet

NAME	SIGNATURE	CONTACT NO.
Dr. T. Vara Prasad		
Dr. K. Deepthi,		
Dr.Ch. V. N. S. Vara Prasad		
Dr. K. Jhansi Lakshmi		
Dr. K. Raghavachari		
Dr. D. Rama Rao		
Sri V. Mallikarjuna Sarma		
Dr.V. Narayana Rao		
Sri U.Sai Krishna		

On line Video Conference Through Google Meet

Signatures of the members who attended the

Board of studies in Chemistry on 20-6-20 at 10.00am

1	Dr. T. Vara Prasad	Chairman & Lecturer in Charge
2.	Dr. K. Deepti,	University representative 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
10.	Dr.D.S.V.N.M.Rama Murthy	Member
11.	Sri K.Babu Rao	Member 20/6/2020
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
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 20. 06. 2020.

1. Department activities for 2020-21 academic year. Annexure I

Month	Activity proposed	Faculty member in charge
July-20	Departmental staff meeting to review results and class work allotment	Dr.T. Vara Prasad
July - 20	Preparation of curricular plans, time-tables etc.,	All Faculty Members
Aug - 20	Remedial coaching classes for II & III year supplementary exams	All Faculty Members
	Bridge classes for I year students	All Faculty Members
Aug-20	Student awareness programmes on ragging& eve teasing - consequences , self- discipline, career guidance, higher education opportunities etc.,	All Faculty Members
August-20	Conference on prospects in pharmaceutical Industries	Dr.T. Vara Prasad
	Study tour / Field trips	
Sept-20	Ozone day	All Faculty Members
Oct-20	MOLE Day	Dr. D.Ramarao
	Faculty development program	V.Mallikarjuna Sarma
Nov-20	National Education Day – Outreach Program to nearby school	
Dec-20	World AIDS Day	All Faculty Members
	Chemistry day & Chem fest	V.Mallikarjuna Sarma
Jan-21	10 days coaching for PG entrance examinations in chemistry Study tour / Field trips	V.Mallikarjuna Sarma
Feb-21	NATIONAL SCIENCE DAY	All Faculty Members
March-21	Consumer awareness day	Dr.T. Vara Prasad

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

(Mandatory for each Department)

i) Staff development program
ii) Training in the use of HPLC
iii) Awareness on OZONE protection
iv) National Chemistry day
v) Chem. fest
vi) National Science day 2021
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 programs, study tours, equipping laboratories, reference books& other necessary teaching-learning material with ICT enabled teaching.**

   I. Study visits to: Rs, 50,000

   1. Visakha Steel Plant, Visakhapatnam
   2. Hetero Laboratories, Nakkapally
   3. Dr. Reddy's Laboratories, Yanam.
   4. National Institute of 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

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

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

6. **Instituting of new medals/incentives/prizes etc., from alumni, philanthropists, parents, faculty etc., - Strategies to be recommended**
7. **Introduction of new programs –PG/UG/Diploma and certificate courses.**

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

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

9. **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. Dr. G. Nagarjuna, SRR CVR GDC, Vijayawada.
2. Dr. B. Mallikarjun, Govt. College (A), Rajamahendravaram.
3. Dr. G. Venkatarao, GDC, Vijayawada
4. Shri B. Venkatarao, GDC, Ramachandrapuram
5. Dr. Ramachandra Rao, Y.N.College,Narasapuram
6. Dr. T. Narasimha Murthy, GDC, Mandapeta.
7. Smt. G. Tejaswini, SVD GDC (W), Nidadavole.
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10. Sri. V. Satyanarayana, Govt. Arts College, Rajahmundry.
11. Sri. V Rambabu, GDC, Perumallapuram
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14. Sri T. V. V. Satyanarayana, GDC, Ramachandrapuram
15. Sri V. Sridhar, GDC, Nidadavol

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	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
	** Any one cluster from VIII, A, B and C	VIII (A)**	**Cluster Electives - I :**		
			VIII-A-1	100	03
			VIII-A-2	100	03
			VIII-A-3	100	03
			Practical	50	02
			Practical	50	02
			Project	50	02
	VI	VIII (B)**	**Cluster Electives - II ::**		
			VIII-B-1	100	03
			VIII- B-2	100	03
			VIII-B-3	100	03
			Practical	50	02
			Practical	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
			Practical	50	02
			Practical	50	02
			Project	50	02

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	**Cultural activity**	*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*

OBJECTIVES

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

CO 1. Preparation, properties and applications of some special compounds of s and p block elements.

CO 2. Structural theory of Organic compounds.

CO 3. Preparation, properties and applications of alkenes, alkynes and cycloalkanes.

CO 4. Benzene structure and its reactivity.

CO 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.**

CO 1. Features involved in gaseous state, liquid state and solid state and their applications.

CO 2. Importance of colloids and adsorption.

CO 3. Chemical bonding between molecules through M.O. theory.

CO 4. Identification of some cations and anions in the unknown mixture.

CO 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 topics and come to know their role in serving the society through chemistry.**

CO 1. Properties of d and f block elements.

CO 2. Boding nature of the metals.

CO 3. Preparation, properties and applications of halogen compounds, hydroxyl compounds, carbonyl Compounds and carboxylic acids.

CO 4. Importance and synthetic applications of active methylene compounds.

CO 5. Estimation of Fe (II) and Cu (II) in the unknown material through practical.

CO 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.**

CO 1. Different types of Electronic transitions present in Organic molecules..

CO 2. Identification of Functional groups using IR spectrum.

CO 3. Analysis of Cr and Mn using spectrophotometer.

CO 4. Structural identifications of organic compounds using H^1-NMR

CO 5. Different aspects of electrochemistry.

CO 6. Identification of functional group present in the given organic compound by IR spectral analysis.

CO 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.**

CO 1. Involved theories and properties of coordination compounds.

CO 2. Preparation and properties of nitrogen compounds.

CO 3. Importance, preparations, properties and medicinal uses of heterocyclic compounds.

CO 4. Structural elucidation of glucose and fructose.

CO 5. Importance of Amino acids and Proteins.

CO 5. Determination of Rate of the reactions through chemical kinetics.

CO 6. Some photochemical reactions photophysical processes.

CO 7. Importance of thermo dynamical aspects.

CO 8. Identification of functional group present in the given organic compound by following organic qualitative analysis.

CO 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.**

CO 1. Various types of instrumental techniques like IR and NMR spectroscopies.

CO 2. Different aspects of Environmental Chemistry.

CO 3. Importance of green chemistry.

CO 4. Analyses of drugs, dairy products

CO 6. Importance of petrochemicals.

CO 7. Preparation of some organic compounds.

CO 8. Synthesis of organic compounds using green synthesis.

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

CO 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 nearby 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 programs and group projects etc

P.R.GOVERNMENT COLLEGE (AUTONOMOUS)-KAKINADA
SECOND YEAR 2019-20
SEMESTER-III
Paper-III (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 30 hrs (2hrs/week)

UNIT-I

1. Chemistry of d-block elements: 9 hrs

Characteristics of d-block elements with special reference to electronic configuration, variable valences, 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, and explanation of conductors, semi-conductors and insulators.

UNIT-II

3. Metal carbonyls: 7hrs

EAN rule, classification of metal carbonyls, structures and shapes 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 compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3-dithianes, synthesis of ketones from nitriles and from carboxylic acids.

Physical properties: Reactivity of carbonyl group in aldehydes and ketones.
Chemical properties: 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 catalyzed 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 $NaBH_4$.
Identification of aldehydes and ketones: 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: 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

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	3	25
	TOTAL	**8**	**8**	**16**	**120**

SEMESTER-III Chemistry Model Question Paper 2019-20

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 and any **four** questions from Section-C.

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_N^2 reaction & (ii) Racemization in S_N^1 reaction
6. Give the mechanism of the following
   (i) Cannizaro reaction (ii) Aldol condensation
7. Explain the mechanism of ester hydrolysis in presence of acid.
8. Propose the preparation of malonic ester. Describe any two synthetic applications of it.

SECTION-C

4X5=20 M

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_N^1 & S_N^2 reactions.
14. Explain Acidity of phenols.
15. Discuss about the identification of Aldehydes and Ketones with equations.
16. Write briefly about Keto - enol tautomerism.

SEMESTER-III

Paper-III (INORGANIC & ORGANIC CHEMISTRY)

Question bank

d - Block Elements:

1. What are the transition elements? Explain the following properties of *d* – block elements
   a) Electronic Configurations b) Various Oxidation states
   c) Catalytic properties d) Complex compounds formation e) Magnetic behavior
2. Explain Free electron theory & Valence bond theory.
3. Explain Band theory of solids and explain Conductors, Semiconductors and Insulators based on band theory of solids.
4. Explain about n-type and p - type semiconductors.

Metal Carbonyls:

5. What are metal carbonyls and explain them?
6. Explain Effective Atomic Number with Examples.
7. Explain the structures of $Ni(CO)_4$, $Fe(CO)_5$, $CrCO_6$, $Fe_2(CO)_9$,$Co_2(CO)_8$

f - Block Elements:

8. What is lanthanide contraction? Explain its consequences?
9. Write the Comparison and differences between Lanthanides and Actinides?
10. What are the Inner transition elements?
11. Explain the properties
    a) Electronic configurations b) Oxidation states and c) Magnetic properties.

Halogen Compounds & Hydroxy Compounds

Essay questions:

1. Explain SN_1 & SN_2 reactions with mechanism?
2. Explain the following reaction mechanisms
   a) Reimer - Tiemann reaction b) Kolbe-Schmidt reaction
3. Explain the following reaction mechanisms
   a) Fries rearrangement b) Pinacol – Pinacalone rearrangement

Short answer questions:

1. Explain the following terms
   a) Walden inversion b) Racemic mixture
2. Write any two preparation methods of Alcohols?
3. Write any two preparation methods of phenols?
4. Explain the identification tests of Primary, Secondary & Tertiary alcohols.
5. Explain any two chemical properties of Alcohols?

Carbonyl Compounds:

Essay questions:

1. Explain the following reactions with mechanism
   a) Aldol condensation. b) Cannizaro reaction
2. Explain the following reactions with mechanism
   a) Perkin reaction. b) Benzoin condensation
3. Explain the following reactions:
   a) Haloform reaction b) knovenangel condensation c) Bayer - villeger oxidation

Short answer questions:

1. Write any two preparation methods of carbonyl compounds?
2. Explain the nucleophilic addition reactions of carbonyl compounds?
3. Explain the following reactions:
   a) Clemensen reduction. b) Wolf-Kishner reduction.
4. Write any two identification test of carbonyl compounds?

Carboxylic Acids and Active Methylene Compounds

Essay questions

1. Explain the mechanism of ester hydrolysis in presence of acids.
2. Explain the following reactions with mechanism
   a) Huns - diecker's reaction b) Schmidt reaction
3. Explain the following reactions with mechanism
   a) Arndt - Eistert reaction b) HVZ Reaction
4. Write the preparation methods of Acetoacetic ester and describe any two synthetic applications of it.
5. Write the preparation methods of malonic ester and describe any two synthetic applications

Short answer questions:

1. Write any two preparation methods of carboxylic acids?
2. Write any two chemical properties of carboxylic acids?
3. Explain hydrogen bonding in carboxylic acid
4. Explain about keto - enol tautomerism?
5. Explain Claisen condensation with mechanism?

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

Paper-III: SEMESTER-III

Titrimetric Analysis & Organic Functional Group Reactions

(At the end of Semester-III)

I. 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.
3. Preparation of Tetra ammine Copper (II) Sulphate.
4. Determination of Ni (II) using EDTA.
5. Determination of mixture of Ca and Mg present in the sample by using EDTA
6. Determination of carbonate and bicarbonate in a mixture.

II. Organic Functional Group Reactions:

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