BHARATHIDASAN GOVT. COLLEGE FOR WOMEN
(AUTONOMOUS)
PUDUCHERRY-605003

Programme: B.Sc. Chemistry

Curriculum & Syllabus
(Choice Based Credit System)

Effective from the Academic Year 2022

GOVERNMENT OF PUDUCHERRY
BHARATHIDASAN COLLEGE FOR WOMEN (AUTONOMOUS)
PUDUCHERRY

Minutes of the meeting of Committee members
Curriculum Restructure – (Effective From year July 2021)

The Department of Chemistry has proposed to restructure and redesign the curriculum to enable the syllabus of B.Sc. Chemistry efficient and useful by focusing broadly on advanced topics in Organic chemistry, Physical Chemistry, application of molecular modeling, polymer chemistry and Green chemistry.

A Course Restructure Committee is constituted with the internal members of Department of Chemistry, BGCW focusing at Restructuring and Redesigning the B.Sc. Chemistry Syllabus. The Total Credits of B.Sc. Chemistry is now 120.

A Meeting was held on 12-5-2022 with Mrs. G. Thirupurasundari as the Chairperson and Mrs. N. Couppammalle, Mrs. C. Uma, Dr. K.S. Prakash, Dr. C. Sairam Sundaram, Dr. S. Sofiya Lawrence Mary, Dr. P. Vinoth as Internal Members.

The following Recommendations were made by Course Restructure Committee

1. In Second Year, (SEC-I) Analytical Chemistry – I (Course Code D – 0309) and (DSC-VI) Physical Chemistry – II (Course Code D – 0314) were made Optional in Semester – IV.
2. In Third Year, (SEC-II) Analytical Chemistry – II (Course Code D – 0315) and (DSC-IX) Physical Chemistry – III (Course Code D – 0321) were made Optional in Semester – V.
3. In Third Year, Main Practical Gravimetric Analysis (DSC-X) (Course Code D - 0322 and Physical Experiments (DSC-XII) (Paper code – D – 0328) were made Optional in Semester – VI.
4. A Generic Elective paper (GE)– Nano Chemistry is GE Paper offered to Other Course Students

Each Main Theory Paper is evaluated for 100 marks.
The Components are

(i)Internal Component - 25 marks
(ii) External component – 75 Marks.

Internal Component:

Assignment - 5 Marks,
CIA - 5 Marks,
Model – 10 Marks,
Attendance - 5 Marks
The External Component is 75 Marks

The question Paper Pattern is as follows

Section – A - 10 Question out of 12 each carries 2 Marks 10 X 2 = 20 Marks
Section – B – 5 Questions out of 8 each carries 5 Marks 5 X 8 = 40 Marks
Section C – 3 Questions out of 5 each carries 10 marks 3 X 10 = 30 Marks

The Question Pattern and Scheme of Valuation of Theory and Practical Papers is Unchanged.

The B.Sc. Chemistry Main and Allied Syllabus and Curriculum will be placed before Academic Council and General Body Meeting for further approval

Signed by the Following Committee Internal Members

1. Mrs. G. Thirupurasundari

2. Mrs. N. Couppammalle

3. Mrs. C. Uma

4. Dr. K. S. Prakash

5. Dr. C. Sairam Sundaram

6. S. Sofiya Lawrence Mary

7. Dr. P. Vinoth

GOVERNMENT OF PUDUCHERRY
BHARATHIDASAN GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)
PUDUCHERRY

Minutes of the meeting of Committee Members
Curriculum Restructure- July 2019

Due to the migration of paper bearing the title "Introduction to Public Administration" (D 9701) (AECC-1)from Semester IV to Semester I, the department of Chemistry with the approval of Committee members constituted based on the requirement of restructuring the syllabus. The Original version of Chemistry Syllabus (U.G.) framed and approved during BOS, 25-01- 2018. A Committee is constituted with the department staff member's .After constituting a committee for restructuring of course structure few papers have been rearranged within semesters without changing the content of the syllabus framed on 25-1-2018. This restructured syllabus is effective from July 2019 Onwards.

The following members of the department of Chemistry, BGCW were formed a committee to frame on restructuring and redesigning the Chemistry Syllabus (U.G) on July 2019.

The Committee was formed constituting Dr. V. Pouchaname as Chairman, the members include Mrs. G. Thirupurasundari, Mrs. N. Couppammalle, Mrs. C. Uma and Dr. K.S. Prakash.

The Chairman and Members of the committee restructured the CBCS Syllabus for B.Sc. Chemistry Main and Allied which was in effect from 2016-2017.

1. Ability Enhancement Compulsory Course (AECC-1) Introduction of Public Administration was shifted from Semester-IV to Semester I
2. Organic Chemistry -I (D 0302) was shifted from Semester-I to Semester-II.
3. Volumetric Analysis Practicals (D-0311) was shifted from Semester-III to Semester-II vide. Semi-micro Inorganic Analysis (D-0306) was shifted from Semester-II to Semester-III.
4. Inorganic Chemistry-II(D-0305) was shifted from Semester-II to Semester-III.
5. Food Chemistry (D-0310) was shifted from Semester-III to Semester- V.
6. Analytical Chemistry-I (D-0309) was shifted from Semester-III to Semester-IV.
7. Analytical Chemistry-II (D-0315) was shifted from Semester-IV to Semester-V.
8. Gravimetric Analysis (D-0322) was shifted from Semester-V to Semester-VI.
9. Pharmaceutical Chemistry (D-0324) was shifted from Semester-V to Semester-VI.
10. Experiments of Industrial Importance were removed from Semester-VI.

The Syllabus of B.Sc. Chemistry Main and Allied was placed before Academic Council and for General Body Meeting for further Approval.

1. **Dr. V. Pouchaname**

2. **Mrs. G. Thirupurasundari**

3. **Mrs. N. Couppammalle**

4. **Mrs.C.Uma**

5. **Dr. K.S. Prakash**

GOVERNMENT OF PUDUCHERRY

BHARATHIDASAN GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)

PUDUCHERRY

DEPARTMENT OF CHEMISTRY

Minutes of the meeting of Board of Studies

The meeting of Board of Studies in Chemistry was held on 25-01-2018 at 10a.m in the Department of Chemistry, BGCW, Puducherry. The following members were present.

1. Dr.K.Subramani H.O.D chemistry, BGCW, Puducherry.	Chairman
2. Dr.V.Pouchaname, Associate Professor, BGCW, Puducherry.	Member
3. Dr. A. Tinabaye, Associate Professor, BGCW, Puducherry.	Member
4. Mrs. G. Thirupurasundari, Associate Professor, BGCW, Puducherry	Member
5. Dr. M. Bakthadoss, Professor of Chemistry, Pondicherry University.	Member -VC Nominee
6. Dr. K.R.Sankaran, Professor and H.O.D of Chemistry, Annamalai University, Chidambaram,	Member- AC Nominee
7. Dr.C. Shiyamala, Asst. Professor of Chemistry, Thiru Kolanjiappar Govt. College, Vriddhachalam.	Member AC Nominee
8. Mr. K. Sivaram Alva, Managing Director, Alva Plast, Puducherry.	Member- Industrialist
9. Dr. R. Kanemani, H.O.D, Govt. Womens Polytechnic, Puducherry.	Member- Alumni

The Chair person welcomed the members, presented the details of CBCS Syllabus for B.Sc. Chemistry Main and Allied including practicals from 2016-2017 onwards and also requested the members to offer valuable suggestions in improving the syllabus.

Dr. M. Bakthadoss, Professor of chemistry, Pondicherry University, had not attended the meeting as he was preoccupied with viva-voce examination at Chennai, hence the minutes of the meeting was shown to him by circulation and got signed.

The Board of Studies members were engaged in fruitful discussions on the contents of the syllabi and the following recommendations were made.

1. The contents of all the papers of B.Sc. Main and Allied were discussed. The Modification and realignment of some topics were made into effect so as to make them more relevant to the topics in other units.
2. Some of the experiments in the practicals were removed and new experiments were included.
3. Ability Enhancement Compulsory Course-1Environmental Science is introduced in the First year and Course-2-Public Administration is introduced in the second year.
4. In Third year the Discipline Specific Elective Papers-Pharmaceutical chemistry in Semester V and Nano chemistry in Semester VI are introduced.
5. A Generic Elective Paper– Chemistry in Health Care is offered to other course students(Expect B.Sc., Chemistry Major students).
6. B.Sc. Main Theory – each paper 100 marks is allotted. They were divided into Internal component – 25 marks and External component - 75 marks. Again the internal marks is subdivided as follows,

Assignment/Seminar	-	5 Marks
CIA	-	5 Marks
Model	-	10 Marks
Attendance	-	5 Marks

The External component is 75 Marks.

The Question Paper pattern is as follows,

Section A - 10 Questions Out of 12 each carries 2 Marks.
Section B - 5 Questions Out of 8 each carries 5 Marks.
Section C - 3 Questions Out of 5 each carries 10 Marks.

7. For B.Sc. Allied Theory Chemistry - total of 75 Marks was allotted. The Internal component is 15 marks. The External component is 60 marks. Again the internal component is divided as follows,

Assignment/Seminar	-	2 Marks
CIA	-	5 Marks
Model	-	5 Marks
Attendance	-	3 Marks

The External component is 60 Marks.

The Question Paper pattern is as follows,

Section A - 8 Questions Out of 10 each carries 2 Marks.
Section B - 5 Questions Out of 7 each carries 4 Marks.

Section C - 3 Questions Out of 5 each carries 10 Marks.

7. For B.Sc. Allied Theory Chemistry - total of 75 Marks was allotted. The Internal component is 15 marks. The External component is 60 marks. Again the internal component is divided as follows,

Assignment/Seminar	-	2 Marks
CIA	-	5 Marks
Model	-	5 Marks
Attendance	-	3 Marks

The External component is 60 Marks.
The Question Paper pattern is as follows,

Section A - 8 Questions Out of 10 each carries 2 Marks.
Section B - 5 Questions Out of 7 each carries 4 Marks.
Section C - 3 Questions Out of 5 each carries 8 Marks.

The overall credit arrived at 138 is approved by BOS. The syllabi of B.Sc. Chemistry Main and Allied papers were also approved and maybe placed before academic council and for general body meeting for further approval.

1. Dr. K. Subramani
2. Dr. V. Pouchaname
3. Dr. A. Tinabaye
4. Mrs. G. Thirupurasundari
5. Dr. M. Bhaktadoss
6. Dr. K.R. Sankaran
7. Dr. C. Shiyamala
8. Mr. K. Sivaram Alva
9. Mrs. R. Kanemady

Programme

B.Sc. CHEMISTRY

Department of Chemistry

Programme Outcome

In the scope of its subject, Chemistry lies somewhere at the intermediate position among various other branches of science. Chemistry Programme provides a foundation for understanding both the basis and applied scientific disciplines at a fundamental and Entrepreneur level. Scope of Chemistry as a Career Option is immense in India. Candidates can pursue Degree, Diploma and Certificate courses in Chemistry at Post Graduate (PG) and Doctoral Levels. The Bachelor of Science Degree in Chemistry prepares students for careers as professional chemists and serves as a foundation for careers in other fields such as Medicine, Engineering and Geosciences. Analytical chemist, Biotechnologist, Chemical engineer, Healthcare scientist, Forensic scientist, Nanotechnologist, Pharmacologist, Toxicologist, Medicines work for effective treatment, Research scientist, Design and develop a diverse range of products Provide scientific evidences to be used as evidences in court proceeding are some of the job profiles suitable for degree holders in chemistry.

B.Sc. Chemistry Programme lays the foundation for a student to pursue M.Sc. Chemistry under Specialized Programmes like Pharmaceutical Chemistry, Industrial Chemistry, Petrochemical chemistry, Applied Chemistry, Bio- chemistry, Polymer Chemistry, Nano Technology and Green Chemistry. The Programme caters Students to enter into Research and development labs in Scientific Establishments like CFTRI, CLRI, BARC, CIPET, TIFR. The curriculum offers a thorough fundamental knowledge of the major fields of chemistry, covering the general areas of inorganic, organic, and physical chemistry. Students gain laboratory experience in inorganic and organic synthesis, analytical methods, physical chemical measurements, spectroscopy, biochemical engineering, and chemical methods in nuclear technology.

2. Course Outcome

Category	Semester	COURSE TITLE	COURSE OUTCOME
DSC	I	Inorganic Chemistry-I	❖ *Compare the trends in the properties of main group elements.* ❖ *Examine and apply the structural arrangement in metals, ionic, covalent compounds and inorganic solids.*
AECC	I	An Introduzction to Public Administration	❖ *Understand the concepts of public administration, Indian administration, NitiAyog, RTI, CBI.* ❖ *Develop the skill related to the administrative system.*
DSC	I	Practical - Analytical Techniques	❖ *Develop the skill of nanomaterial synthesis* ❖ *Analyze the concepts of separation, preparation and melting point of substances.*
DSC	II	Physical Chemistry - I	❖ *Understand the properties of liquids and ideal gases.* ❖ *Examine the mathematical concepts involved in chemistry.*
DSC	II	Organic Chemistry-I	❖ *Recall the fundamental principles of organic reactions.* ❖ *Understand the concepts related to nomenclature, isomerism and stereochemistry.* ❖ *Compare the chemistry of alkanes, alkenes and alkynes.*
AECC	II	Environmental Science – Chemistry	❖ *Understand the environment and its surroundings.* ❖ *Justify about biotic interaction with humans.* ❖ *Explore the knowledge about environmental laws.*
DSC	II	Practical - Volumetric analysis	❖ *Apply standard addition method in titrimetric analysis.* ❖ *Analyze constituents in materials using volumetric techniques*
DSC	III	Inorganic Chemistry-II	❖ *Compare the trends in the properties of main group elements and discuss the chemistry of B, C, N and O- based compounds* ❖ *Understand the basic principles of nuclear chemistry.*
DSC	III	Organic Chemistry-II	❖ *Understand the chemistry of aromatic compounds.* ❖ *Compare the carbonyl compounds, alcohols and phenols*
DSC	III	Practical - Semi Micro Inorganic Qualitative analysis	❖ *Understand and apply the principle of analysis of salt mixture.* ❖ *Design a methodology for real time sample analysis.*
DSC	IV	Physical Chemistry - II	❖ *Explain the laws of thermodynamics and evaluate the problems.* ❖ *Understand the concepts of thermochemistry and chemical equilibrium.*

DSC	**IV**	**Analytical Chemistry-I**	❖ ***Analyze different errors using statistical methods in Chemical analysis.*** ❖ ***Analyze different constituents through instrumental methods of analysis.*** ❖ ***Understand the concepts of calibration of Instruments, Apparatus, Errors.***
DSC	**IV**	**Practical - Applied Analysis**	❖ ***Analyze various techniques in determination of quantity of chemical substances.***
GE	**V**	**Food Chemistry**	❖ ***Recall the occurrence, composition and properties of fats and lipids*** ❖ ***Analyse of food additives, milk & milk products.*** ❖ ***Recognize the composition, Pigments of vegetables and fruits.***
SEC	**V**	**Analytical Chemistry-II**	❖ ***Analyze different techniques Colorimetry, polarography, over voltage and Chromatography.*** ❖ ***Analyze thermal behavior of different organic and inorganic materials using TGA, DTA and DSC.***
DSC	**V**	**Inorganic Chemistry-III**	❖ ***Recall the knowledge about chemistry of Halogens, Lanthanides & Actinides.*** ❖ ***Understand the basic principles Solid state chemistry.***
DSC	**V**	**Organic Chemistry-III**	❖ ***Understand the chemistry of heterocyclic compounds, carbohydrates, amino acids, proteins.*** ❖ ***Explore the knowledge about the reactions of synthetic polymers, fats, detergents and synthetic dyes.***
DSC	**V**	**Physical Chemistry - III**	❖ ***Examine the reaction rates and pathways of various chemical reactions.*** ❖ ***Explore the knowledge about various photochemical process in the chemical systems.***
DSC	**V**	**Practical - Organic analysis & Preparation**	❖ ***Recall the importance of the analysis of organic molecules and evaluate the properties of synthesized organic products and their derivatives.*** ❖ ***Understand the qualitative analysis of mixtures, the functions of various reagents and reaction mechanisms.***
DSC	**VI**	**Inorganic Chemistry-IV**	❖ ***Understand the principle of complex synthesis.*** ❖ ***Understand and differentiate different theories of coordination chemistry*** ❖ ***Discuss the concepts of organometallic complex.***
DSC	**VI**	**Organic Chemistry-IV**	❖ ***Evaluate the organic reactions based on the influence of the substituents on substrate molecules and nature of solvent and the NMR spectral analysis.*** ❖ ***Understand the concepts related to synthesis, mechanisms and the functions of various reagents or catalysts*** ❖ ***Design new organic reactions in order to achieve the required product(s).***

DSC	**VI**	**Physical Chemistry - IV**	❖ ***Apply electrochemical methods for Analysis of electroactive species.*** ❖ ***Recall the knowledge about the concepts of spectroscopy.***
SEC	**VI**	**Pharmaceutical Chemistry**	❖ ***Recall the importance and methods of analyzes in a pharmaceutical industry*** ❖ ***Understand the knowledge about various diseases and their treatment.***
GE	**VI**	**Nano Chemistry**	❖ ***Define different types of nanomaterials based on dimensionality and structure.*** ❖ ***Analyze nanomaterials using characterization techniques.*** ❖ ***Explain the structural and chemical properties of carbon based nanomaterials.***
DSC	**VI**	**Practical - Gravimetric analysis**	❖ ***Analyze quantitatively the amount of element from a substance based on gravimetric Procedure.*** ❖ ***Understand the technique of incineration of Silica Crucible.***
DSC	**VI**	**Practical - Physical Chemistry Experiments**	❖ ***Design experiments in Physical Chemistry and Analytical Chemistry using potentiometry, conductometry, simple eutectic system and kinetics.*** ❖ ***Apply concepts to verify concepts in Physical Chemistry through experimentation.***
DSE	**III**	**Chemistry - I**	❖ ***Understand the concepts related to nomenclature, isomerism and stereochemistry*** ❖ ***Analyze the basic principles in chemical kinetics, chromatography and nuclear chemistry.***
DSE	**III**	**Chemistry Practical - I**	❖ ***Apply standard addition method in titrimetric analysis.*** ❖ ***Analyze the technique of melting point of organic substances.***
DSE	**IV**	**Chemistry - II**	❖ ***Recall the principles of chemical kinetics, catalysis.*** ❖ ***Explore the knowledge about carbohydrate, nucleic acids and proteins.*** ❖ ***Understand different types of dyes and polymers.***
DSE	**IV**	**Chemistry Practical - II**	❖ ***Recall the importance of the analysis of organic molecules*** ❖ ***Analyze the single functional group organic substance through qualitative analysis.***

4.1 Course Distribution

The Choice Based Credit System (CBCS) is being implemented in the college from the Academic Year 2016 – 2017. The Scheme was prepared on the model of the CBCS Scheme Proposed by UGC.

CATEGORY	No. of Papers	Credits	Total Credits
Part I (Language)	4	3	12
Part I (English)	4	3	12
DSC – A (Discipline Specific Course)	4	6	24
	2	7	14
	1	4	4
DSC - B	5	4	20
DSE (Discipline Specific Elective)	4	6	24
SEC(Skill Enhancement course)	1	2	2
AECC(Ability Enhancement course)	2	2	2 + 2
GE (Generic Elective)	2	2	2 + 2
Total	31		120

4.2 Course Distribution Semester -Wise

B.Sc. CHEMISTRY

Semester	Part I Language	Part II English	DSC	DSE	SEC	AECC	GE
I	01	01	01	01		01	
II	01	01	02	01		01	
III	01	01	02	01			
IV	01	01	01	01	01		
V			03		01		01
VI			03		01		01
Total	04	04	12	04	03	02	02

Total No. of papers = 31

4.3 Credits for Each Semester

Semester	Credits
I	20
II	24
III	22
IV	18
V	17
VI	19
Total	120

4.4 COURSE STRUCTURE

SEMESTER – I

Sl. No.	Course Category	Course Code	Title of the Course	Credits	Lecture/ Practical Hours
1	Part I	D 9201	Tamil - I	3	3+ 3
2	Part II	D 9001	English - I	3	3 +3
3	DSC I	D 0301	Inorganic Chemistry – I	4	4
		D0303	Analytical Techniques	2	2+2
4	DSE I	D 0104/ D 0704/ D 0705	InterDisciplinary Chemistry Students – Zoology/Maths	6	4 + 2
5	AECC I	D 9701	Introduction to Public Administration	2	2+2
			Total Credits	20	30

SEMESTER – II

Sl.No.	Course Category	Course Code	Title of the Course	Credits	Lecture/ Practical Hours
1	Part I	D 9202	Tamil - II	3	3+ 3
2	Part II	D 9002	English - II	3	3 +3
3	DSC II	D 0302	Organic Chemistry – I	4	4
4	DSC III	D 0304	Physical Chemistry – I	4	4
		D 0311	Volumetric Analysis	2	2
5	DSE II	D 0110/ D 0709/ D 0710	InterDisciplinary Course Chemistry Students – Zoology/Maths - II	6	4 + 2
6	AECC II	D 9601	Environmental Studies	2	2
			Total Credits	24	30

SEMESTER – III

Sl. No.	Course Category	Course Code	Title of the Course	Credits	Lecture/ Practical Hours
1	Part I	D 9203	Tamil - III	3	3+ 3
2	Part II	D 9003	English - III	3	3 +3
3	DSC IV	D 0305	Inorganic Chemistry – II	4	4
		D 0306	Semi - Micro Inorganic Analysis	2	2+2
4	DSC V	D 0308	Organic Chemistry – II	4	4
5	DSE III	D 0210/ D 0211/ D 0312/ D 0313	Inter Disciplinary Course Chemistry Students-Physics – I Physics Practicals-I Physics/Zoology/Botany/ CND Students – Chemistry -I Chemistry Practicals- I	6	4 + 2
			Total Credits	22	30

SEMESTER – IV

Sl. No.	Course Category	Course Code	Title of the Course	Credits	Lecture/ Practical Hours
1	Part I	D 9204	Tamil - IV	3	3+ 3
2	Part II	D 9004	English - IV	3	3 +3
3	DSC VI/ SEC - I	D 0314 / D 0309	Physical Chemistry – II / Analytical Chemistry - I	4	4+2
		D 0316	Applied Analysis	2	4+2
4	DSE IV	D 0215/ D 0216/ D 0317/ D 0318	Inter Disciplinary Course Chemistry Students– Physics - II Physics Practicals-II Physics/Zoology/Botany/ CND Students – Chemistry -II Chemistry Practicals- II	6	4 + 2
			Total Credits	18	30

SEMESTER – V

Sl. No.	Course Category	Course Code	Title of the Course	Credits	Lecture/ Practical Hours
1	DSC VII	D 0319	Inorganic Chemistry – III	4	4+2
2	DSC VIII	D 0320	Organic Chemistry – III	4	4+2
		D 0323	Organic Analysis	3	3 + 3
3	DSC IX / SEC - II	D 0321/ D 0315	Physical Chemistry – III / Analytical Chemistry - II	4	4+2
4	GE - I	D 0310	Food Chemistry	2	4+2
			Total Credits	17	30

SEMESTER – VI

Sl. No.	Course Category	Course Code	Title of the Course	Credits	Lecture/ Practical Hours
1	DSC X	D 0325	Inorganic Chemistry – IV	4	4+1
2	DSC XI	D 0326	Organic Chemistry – IV	4	4+1
3	DSC XII/ DSC X	D 0327	Physical Chemistry – IV	4	4+1
		D 0328 / D 0322	Physical Chemistry Experiments / Gravimetric Analysis	3	6 + 3
4	SEC - III	D 0324	Pharmaceutical Chemistry	4	4
5	GE - II	D 0330	Nano Chemistry	2	2
			Total Credits	19	30

Total Credits of all Semesters = 120

DSC = Discipline Specific Elective
DSE - Discipline SpecificElective
SEC = Skill Enhancement Course

BHARATHIDASAN GOVERNMENT COLLEGE FOR WOMEN
(AUTONOMOUS), PUDUCHERRY

DEPARTMENT OF CHEMISTRY

B.Sc. CHEMISTRY COURSE (MAIN & ALLIED)

CHOICE BASED CREDIT SYSTEM

7	D0306	SEMIMICRO ANALYSIS	2	28
8	D0210	ALLIED PHYSICS – I	4	
9	D0211	ALLIED PHYSICS PRACTICAL – I	2	
SEMESTER – IV				
1	D9204	FC: TAMIL – IV	3	
2	D9304	FC: FRENCH – IV	3	
3	D9504	FC: HINDI – IV	3	
4	D9004	FC: ENGLISH – IV	3	
5	D0314	PHYSICAL CHEMISTRY – II	4	29
6	D0309	ANALYTICAL CHEMISTRY – I	4	31
7	D0316	APPLIED ANALYSIS	2	33
8	D0215	ALLIED PHYSICS – II	4	
9	D0216	ALLIED PHYSICS PRACTICAL – II	2	
SEMESTER – V				
1	D0319	INORGANIC CHEMISTRY – III	4	34
2	D0320	ORGANIC CHEMISTRY – III	4	36
3	D0321	PHYSICAL CHEMISTRY – III	4	38
4	D0315	ANALYTICAL CHEMISTRY – II	4	40
5	D0310	FOOD CHEMISTRY	2	42
6	D0323	ORGANIC ANALYSIS	3	44
SEMESTER – VI				
1	D0325	INORGANIC CHEMISTRY – IV	4	45
2	D0326	ORGANIC CHEMISTRY – IV	4	47
3	D0327	PHYSICAL CHEMISTRY – IV	4	49
4	D0324	PHARMACEUTICAL CHEMISTRY	2	51
5	D0330	NANO CHEMISTRY	2	52
6	D0322	GRAVIMETRIC ANALYSIS PRACTICAL	3	53
7	D0328	PHYSICAL EXPERIMENTS PRACTICAL	3	54

ALLIED CHEMISTRY for B.Sc. (PHYSICS, CND, BOTANY & ZOOLOGY)

Sl. No.	Course Code	Course Title	Credits	Page No.
SEMESTER – III				
1	D0312	CHEMISTRY – I	4	55
2	D0313	CHEMISTRY PRACTICAL – I	2	57
SEMESTER – IV				
1	D0317	CHEMISTRY – II	4	59
2	D0318	CHEMISTRY PRACTICAL – II	2	61

Bharathidasan Government College for Women (Autonomous), Puducherry
Department of Chemistry
Choice Based Credit System

Course:	**I -B. Sc. Chemistry**	**Semester : I**
Course Category :	**DSC-I**	**Maximum Marks**
Course Title:	**Inorganic Chemistry – I**	**CIA: 25 Marks**
Course Code:	**D0301**	**ESE: 75 Marks**
Hour of Instruction:	**4 Hours per week**	**Total: 100 Marks**

No. of Credits – 4 60 Hours

Objectives:

1. To learn principles involved in atomic structure.
2. To learn the chemistry of alkali & alkaline earth metals.
3. To learn the principles in the qualitative inorganic analysis.

UNIT-I ATOMIC STRUCTURE (12 Hrs)

Idea of de Broglie matter waves, Heisenberg's uncertainty principle, Atomic orbitals, Schrodinger wave equation, Significance of ψ and ψ^2. Quantum Numbers, Shapes of s, p, and d orbitals. Aufbau and the Pauli exclusion principles, Hund's multiplicity rules, Electronic configuration of the elements. Atomic and Ionic Radii, Ionization Energy, Electron Affinity and Electronegativity – definition, trends in the periodic table , Pauling's Scale of Electronegativity.

UNIT-II NOBLE GASES (12 Hrs)

Chemistry of Noble Gases: Position in the periodic table, isolation and separation of Noble gases from atmosphere. Physical properties of Noble gases - Fluorides, Oxyfluorides and Oxides of Xenon (Preparation, properties and Structure). Applications of Noble gases.

UNIT-III CHEMICAL BONDING (12 Hrs)

Ionic solids- Ionic structures, radius ratio effect. limitations of radius ratio rule, lattice energy and Born-Haber cycle, solvation energy, polarizing power and polarizability of ions-Fajan's rules.

Valence Bond Theory – Directional characteristics of covalent bonds, various types of Hybridization, and shapes of some inorganic molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) Theory and its application to $BeCl_2$, BF_3, $SiCl_4$, PCl_5 SF_6 IF_7, XeF_6, NH_3, H_2O, XeF_2, SF_4, ClF_3, ICl_2^- and H_3O^+

UNIT – IV ALKALI & ALKALINE EARTH METALS (12 Hrs)

Alkali metals: Halides, oxides and hydroxides, Aqueous solution chemistry.
Alkaline Earth metals: Halides, oxides and hydroxides, aqueous solution chemistry.

UNIT-V PRINCIPLES OF QUALITATIVE INORGANIC ANALYSIS (12 Hrs.)

Principles of solubility and solubility product, Common ion effect. Separation of metal ions based on solubility differences. Applications of solubility product principle in qualitative and quantitative analysis. Standard semi micro procedure of identifying common anions and cations in a mixture containing two salts. Spot tests for common cations.

Text Books & References:

1. Fundamental inorganic chemistry by PL Sony,
2. Modern inorganic chemistry by Shukla PR,
3. Advanced inorganic chemistry by Agarwal SK & Keemtilal
4. College Practical Chemistry-V.K. Ahluwalia
5. Principles of Inorganic chemistry, B.R. Puri & L.R. Sharma

Bharathidasan Government College for Women (Autonomous), Puducherry
Department of Chemistry
Choice Based Credit System

INTRODUCTION TO PUBLIC ADMINISTRATION

Course:	**I -B. Sc. Chemistry**	**Semester : I**
Course Category :	**Ability Enhancement Compulsory Course (AECC) - 1**	**Maximum Marks**
Course Title:	**Introduction to Public Administration**	**CIA: 25 Marks**
Course Code:	**D9604**	**ESE: 75 Marks**
Hour of Instruction:	**2 Hours per week**	**Total: 100 Marks**

No. of Credits – 2 **60 Hrs.**

INTRODUCTION TO PUBLIC ADMINISTRATION

Course Rationale

This course introduces the students to the elements of Public administration. This would help them obtain a suitable conceptual perspective on Public Administration. In addition, the course introduces to students, the growth of such institution devices as to meet the need of changing times. The course also aims to instill and emphasize the need of ethical seriousness in contemporary Indian public administration within the Constitutional framework.

1. **Introduction:**
   Meaning, nature and scope of public Administration and its relationship with other disciplines- Evolution of public administration as a discip0line- Woodrow Wilson, Henry Fayol, Max Weber and others – Evolution of Public Administration in India- Arthashastra – Colonial Administration up to 1947.

2. **Public Administration in India**
   Enactment of Indian Constitution- Union government – The Cabinet- Central Secretariat – All India Services- Training of Civil Servants – UPSC- Niti Ayog- Statutory Bodies: The Central Vigilance commission- CBI- National Human Rights Commission-National Women's Commission- CAG.

3. **State and union Territory Administration**
   Differential Administrative systems in Union Territories compared to States Organization of Secretariat: - Position of chief Secretary, Functions and Structure of

Departments, Directorates- Ministry of Home Affairs supervision of union territory Administration – Position of Lt. Governor in UT – Government of Union Territories Act 1963 – Changing trend in UT Administration in Puducherry and Andaman and Nicobar island

4.Emerging Issues in Indian Public Administration

Changing Role of District Collector – Civil Servants- Politicians relationship – Citizens character- Public Grievance Redressal mechanisms- The RTI Act 2005- Social Auditing and Decentralization- Public Private partnership.

References:

1.R. Tyagi, Public Administration, Atman ram sons, New Delhi, 1983.Appleby P.H, Policy and Administration, the University of Alabama Press, Alabama, 1949.
2.Avasthi and Maheshwari, Public Administration in India, Agra: Lakshmi
3.Gerald.E. Caden. Public Administration. Publica's Publishers, California, 1982.
http://cic.gov.in/http://rti.gov.in/
4.R.B. JAIN, Public Administration in India, 21st Century Challenges for Good Governance, New Delhi: Deep and Deep, 2002.
5.Ramesh K Arora, Public administration, New Delhi: Vishwa Prakash an

6.Ramesh K Arora, Public administration, fresh perspective. Alek publishers, Jaipur.
7.Rumki Basa, Public Administration: Concept and Theories, New Delhi:

Bharathidasan Government College for Women (Autonomous), Puducherry
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Choice Based Credit System

Course:	**I -B. Sc. Chemistry**	**Semester : I**
Course Category :	**DSC-I**	**Maximum Marks**
Course Title:	**Practical -Analytical Technique**	**CIA: 10 Marks**
Course Code:	**D0303**	**ESE: 40 Marks**
Hour of Instruction:	**4 Hours per week**	**Total: 50 Marks**

Hrs. of Instruction: 4 **No. of Credits - 2**

1. **Separation of any one of the following mixtures**:
    a. Naphthalene & Benzoic acid
    b. Benzoic acid & Glucose
    c. Naphthalene & Glucose

2. **Preparation of the following complexes**:
    a. Lead Thio urea complex
    b. Tetraamine copper (II) sulphate complex
    c. Potassium TriOxalato chromate (III) complex

3. Determination of melting point of organic compounds (ranging 60 to 100°C)

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Course:	**I -B. Sc. Chemistry**	**Semester : I**
Course Category :	**DSC-I**	**Maximum Marks**
Course Title:	**Practical -Analytical Technique**	**CIA: 10 Marks**
Course Code:	**D0303**	**ESE: 40 Marks**
Hour of Instruction:	**4 Hours per week**	**Total: 50 Marks**

Scheme for Evaluation

Time: 3 Hrs. **ESE = 40 Marks**

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1. **Separate the given mixture, consisting of and Submit the crude and recrystallized samples for evaluation. (10 marks)**
2. **Prepare a sample of and submit the crude and recrystallized product for evaluation. (10 marks)**
3. **Determine the m.pt / b.pt of the given organic substance. (5 marks)**

RECORD - 10 marks

Viva - 5 marks

Total - 40 marks

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Course:	**I- B. Sc. Chemistry**	**Semester : II**
Course Category :	**DSC-II**	**Maximum Marks**
Course Title:	**Organic Chemistry- I**	**CIA: 25 Marks**
Course Code:	**D0302**	**ESE: 75 Marks**
Hour of Instruction:	**4hrs / week**	**Total: 100 Marks**

No. of Credits - 4 **60 Hours**

OBJECTIVES

1. **To learn methods of naming organic compounds.**
2. **To learn the representation of bond cleavage and bond formation**
3. **To learn the stereo chemistry of organic compounds**
4. **To learn the chemistry of alkanes and its applications**

UNIT- I

Classification and IUPAC nomenclature of organic compounds - structure and bonding, concept of hybridization, bond length, and bond angles, bond energy, localized and delocalized chemical bond, polar and non-polar bonds – inductive, inductomeric, mesomeric and electromeric effects – vander Waals interaction, resonance, hyperconjugation, aromaticity.

UNIT- II:Mechanism of Organic Reactions

Curved arrow notation, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking, types of reagents - electrophiles and nucleophiles - Types of organic reactions - Energy considerations. Reaction intermediates, carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species.

UNIT- III: Stereochemistry of Organic Compounds: Concept of Isomerism – Stereoisomerism in carbon compounds. ***Geometrical isomerism:*** Isomerism in Maleic and Fumaric acids - determination of configuration of geometrical isomers - E & Z system of nomenclature.

Conformational analysis of ethane and n-butane, conformations of cyclohexane and its derivatives (mono and di-substituted), Newman projection and Sawhorse formulae.

UNIT - IV:

Alkanes: Nomenclature - Isomerism in alkanes, sources and methods, of formation with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids, physical properties and chemical reactions of Alkanes – Mechanism of free radical halogenation of alkanes: Orientation, reactivity and selectivity. Nitration, Sulphonation, Oxidation ,Pyrolysis, Isomerization and aromatization. Industrial applications of methane and Ethane.

UNIT - V :

Alkenes : Nomenclature of alkenes, methods of formation, mechanism of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration - The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes Chemical reactions of alkenes- mechanisms involved in hydrogenation, electrophilic and free radical additions - Markownikoff's Rule - hydration, hydro halogenation, hydroboration – Oxidation, Kharasch peroxide effect - HBr addition in the presence of peroxide, Oxidation with $KMnO_4$, air, periodic acid and lead tetraacetate (mechanism not required), Ozonolysis, and polymerization of alkenes, substitution at the allylic and vinylic positions of alkenes**.**
Dienes: Nomenclature and classification of dienes: Isolated, conjugated and cumulated dienes - Structure of Allenes and Butadiene, methods of formation, polymerization. Chemical reactions - 1, 2 and 1, 4-additions - Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding in alkynes-Methods of formation, chemical reactions of alkynes, acidity of alkyne. Mechanism of electrophilic and nucleophilic addition reactions, Hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.

Text Books & references:

1. "Organic Chemistry' by Morrison and Boyd.
2. "Advanced Organic Chemistry" - Reactions, mechanisms and structures by Jerry March.
3. "Organic Chemistry" by I. L. Finar Vol. I & II.
4. "Advanced Organic Chemistry" by B.S. Bahl and Arun Bahl.
5. "Organic Chemistry" by Singh, Mukherji and Kapoor Vol. I, II & III.

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Course:	**I -B. Sc. Chemistry**	**Semester : II**
Course Category :	**DSC-III**	**Maximum Marks**
Course Title:	**Physical chemistry -I**	**CIA: 25 Marks**
Course Code:	**D0304**	**ESE: 75 Marks**
Hour of Instruction:	**4hrs / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hours**

OBJECTIVES:

1. To learn mathematical concepts involved in chemistry.
2. To learn the properties of liquids and their determination.
3. To learn the behavior of ideal gases.
4. To understand the crystal structure of ionic compounds.

UNIT-I:

Mathematical Concepts: Logarithmic relations, differentiation of kx, e^x, sin x and log x – partial differentiation and integration.

States of Matter: Five different states of matters (solid, liquid, vitreous, gas and plasma) – Definition and example

Liquid State: Properties of liquids - surface tension, osmosis, vapor pressure, viscosity, Dipole moment, Trouton's Rule. The applications of properties in determining the structure of molecules. Surface active agents (detergents) and reverse osmosis.

Colloids: Applications of colloidal chemistry in water treatment, industrial, pharmaceutical, biological raining, electrophoresis, medical science -dialysis and photography.

UNIT- II:

Gaseous State - I:

Postulates of kinetic theory of gases – derivation for pressure of an ideal gas –derivation of gas laws from ideal gas equation (Boyle's law, Charles's law, Avogadro's law, Dalton's law, Graham's law.)

Behavior of real gases – van der Waal's equation – critical phenomenon –experimental determination of critical constants.

UNIT – III Gaseous State - II: Relation between critical constants and van der Waals constants – Reduced equation of state. Distribution of molecular velocities – average, most probable and root mean square velocity – collision number, collision diameter, collision frequency and mean free path.

UNIT- IV Solid State – I: Crystalline and amorphous solids–Ionic, molecular, metallic and covalent crystals - Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystal and crystal classes – Unit cell –seven crystal systems.

UNIT - V: Solid State – II: Lattice Planes-Weiss indices, Miller Indices and Space Lattice. Types of cubic unit cells – distance between (100) planes, (110) planes and (111) planes –X-ray diffraction -– derivation of Bragg equation –Measurement of diffraction angle. Determination of crystal structure of NaCl, KCl, and CsCl.

Text Books & References:

1. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of physical chemistry, Vishal
2. Dr. R.L. Madan, G.D. Tuli," S. Chands Success Guides to Physical Chemistry".
3. J.N. Gurtu, Advanced physical chemistry, Pragati Prakashan.

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Choice Based Credit System

Course:	**I -B. Sc. Chemistry**	**Semester : II**
Course Category :	**DSC-III**	**Maximum Marks**
Course Title:	**Practical - Volumetric Analysis**	**CIA: 15 Marks**
Course Code:	**D0311**	**ESE: 60 Marks**
Hour of Instruction:	**4 Hours per week**	**Total: 75 Marks**

Hrs. of Instruction: 4 **No. of Credits - 2**

1. Determination of Hydrochloric Acid using Borax.
2. Determination of Sodium carbonate and sodium hydroxide in a mixture by selective indicator method.
3. Determination of Fe (II) in a mixture using potassium permanganate and standard oxalic acid
3. Determination of Fe (II) and Fe (III) in a mixture using Potassium Permanganate.
4. Determination of potassium dichromate by iodometric method.
6. Determination of copper by iodometric method.
7. Determination of magnesium using EDTA.
8. Determination of Zinc using EDTA.

Key and Scheme of Valuation:

1. Anyone of the experiments quoted in the lab work must be given for the exam.
2. Candidates shall write the brief procedure in a separate paper and submit the same within ten minutes.
3. After collecting the brief procedure, the correct procedure for Question shall be provided to the students.

Scheme of valuation

Brief Procedure	: 10 marks
Experiment	: 35 marks
Viva	: 5 marks
Record	: 10 marks
Total	: 60 marks

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Course:	**I- B. Sc. Chemistry**	**Semester : II**
Course Category :	**AECC - II**	**Maximum Marks**
Course Title:	**Environmental studies**	**CIA: 25 Marks**
Course Code:	**D9601**	**ESE: 75 Marks**
Hour of Instruction:	**2hrs / week**	**Total: 100 Marks**

No. of Credits – 2 **60 Hours**

Objectives:
To acquaint students with

- The physical environment, its components and the major issues
- The impact of human activities on environment, environmental problems, hazards and risks

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UNIT – I : Introduction to Environmental Studies and Ecosystem (12 Hours)
Multidisciplinary nature of environmental studies – Scope and importance – Concept of sustainability and sustainable development. Ecosystem – Structure and function of ecosystem – food chains, food webs and ecological succession – forest ecosystem – grassland ecosystem – desert ecosystem – aquatic ecosystems.

UNIT- II: Natural Resources (14 Hours)
Land resources - land degradation – soil erosion and desertification – causes and impacts due to mining, dam building on environment – use and over-exploitation of surface and ground water – floods, droughts – conflicts over water – energy resources – Renewable and non-renewable energy sources – use of alternate energy sources, growing energy needs.

UNIT-III: Biodiversity and Conservation (14 Hours)
Genetic, species and ecosystem diversity – biodiversity patterns and global biodiversity hot spots – India as a mega-biodiversity nation – endangered and endemic species of India – habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions – conservation of biodiversity – nature reserves, tribal populations and rights.

UNIT-IV: Environmental Pollution (10 Hours)
Environmental pollution types – causes, effects and control of pollution – air, water, soil and noise pollution – nuclear hazards and human health risks – solid waste management – control measures of urban and industrial waste.

UNIT – V: Environmental Policies (10 Hours)

Climate change – global warming – ozone layer depletion – acid rain and impacts on human communities and agriculture. Environment Protection Act – Wildlife Protection Act – Forest Conservation Act – Montreal and Kyoto protocols and convention on Biological Diversity.

BOOKS FOR STUDY:

1. Environmental Studies, Erach Bharucha, 1st Ed., Universities Press, 2005.
2. Environmental and Ecology, Anil K. De and Arnab K. De, 1st Ed., New Age International, 2009.
3. Environmental science and Engineering, Anubha Kaushik, 5th Ed., New Age International, 2016.
4. Essentials of Ecology and Environmental Science, Rana, 5th Ed., PHI, 2013.

BOOKS FOR REFEREMCE:

1. Fundamental of Ecology, Eugene P. Odum and W. B. Saunders, 1st Ed., London, 1971.
2. Environmental Science, Tyler Miller, 14th Ed., Cengage, 2014.
3. Environmental Science, Betkin and Keller, 8th Ed., Wiley, India, 2012.
4. Environmental Studies: From Crisis to Cure, Rajagopalan, 3rd Ed., Oxford University Press, 2015.

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Course:	**II-B. Sc. Chemistry**	**Semester : III**
Course Category :	**DSC-IV**	**Maximum Marks**
Course Title:	**Inorganic chemistry-II**	**CIA: 25 Marks**
Course Code:	**D0305**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 100 Marks**

No. of Credits – 4 60 Hours

Objectives:

1. To learn the chemistry of B, C, N and O groups
2. To learn the general characteristics of first transition series.
3. To learn the general characteristic second and third transition series.
4. To learn the basic principles of nuclear chemistry.

UNIT-I P-BLOCK ELEMENTS –I BORONAND CARBON GROUP(12 Hrs.)

General characteristics of Boron group elements- Detailed study of Hydrides, halides and oxides- Diagonal relationship between B and Si. Hydrides of Boron – Diborane, preparation, properties and uses - valence bond and molecular orbital theories explaining the structure of Diborane. Boron Nitride, Borazine.

General characteristics of carbon group elements – Allotropy of carbon, structure of Diamond and Graphite, comparative study of hydrides and halides of carbon group elements. Silicates-structure and classification in detail.

UNIT-II P-BLOCK ELEMENTS –II NITROGEN AND OXYGEN GROUP (12 Hrs.)

General characteristics of Nitrogen group elements. Allotropy of phosphorus. Oxyacid's of nitrogen and phosphorus, preparation, properties, structure and uses of Hydrazine, Hydrazoic acid, Hydroxylamine.

General characteristics of Oxygen group elements. Allotropy of Sulphur –Nitrides of Sulphur - Tetra Sulphur tetranitride and Di Sulphur dinitride. Oxoacids of Sulphur. Per Sulphuric acids, Thio Sulphuric acid -structure, preparation and properties.

UNIT-III: CHEMISTRY OF d-BLOCK ELEMENTS - First transition series (12 Hrs.)

General characteristics of d-block elements. Properties of the elements of the first transition series, Magnetic Behavior, Oxidation states and their relative Stabilities

Metallurgy of Ti, Mn, Cr, Fe, Co, Ni, Cu and their uses.

UNIT-IV:CHEMISTRY OF d-BLOCK ELEMENTS –II & III transition series(12 Hrs.)

General characteristics – Comparative treatment with their 3d analogues in respect of ionic radii, Oxidation states, Magnetic behavior, Metallurgy of silver, gold, platinum and palladium.

UNIT-V: NUCLEAR CHEMISTRY (12 Hrs.)

Mass defect and binding energy of the nucleus. Stability of Nuclei. Nuclear reactions - Nuclear fission and Nuclear fusion. Radio activity. Rate of radio activity disintegration - Half-life period - Group displacement law - Radioactive decay series. Isotopes - Separation of isotopes. Applications of isotopes in Analytical chemistry, Medicine, Agricultural studies and in reaction mechanism. Nuclear Reactors – Types – importance of Thorium in India's nuclear energy production.

Text Books & References:

1. D. Banerjee, "Fundamental principles of inorganic chemistry", S. Chand.

2. S.K. Agarwal and Keertilal" Advanced inorganic chemistry" Pragati Prakashan

3. B.R. Puri L.R. Sharma, K.C. Kalia Principles of Inorganic Chemistry, Milestone publishers.

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Course:	**II- B. Sc. Chemistry**	**Semester : III**
Course Category :	**DSC-V**	**Maximum Marks**
Course Title:	**Organic chemistry-II**	**CIA: 25 Marks**
Course Code:	**D0308**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hours**

OBJECTIVES:

1. To learn the chemistry of aromatic compounds.
2. To learn the chemistry of arenes and aryl halides.
3. To learn the chemistry of carbonyl compounds.
4. To learn the chemistry of alcohols.
5. To learn the chemistry of phenols.

UNIT- I: AROMATICITY (12 Hrs.)

Nomenclature of benzene derivatives – The aryl group – Aromatic nucleus and side chain. Structure of benzene, molecular formula and Kekule structure. Stability and carbon-carbon bond length of benzene, resonance structure and M.O picture.

The Huckel rule, aromatic ions. Aromatic electrophilic substitution: General pattern of the mechanism – Role of sigma and pi complexes – Mechanism of Nitration, Halogenation, Sulphonation and Friedel-Crafts reactions.

UNIT-II: Arenes and Aryl Halides (12 Hrs.)

Arenes: Activating and deactivating substituents. Orientation and ortho / para ratio. Energy profile diagrams Side chain reactions of benzene derivatives. Birch reduction.

Aryl Halides: Methods of formation of aryl halides – nuclear and side chain reactions. The addition – elimination and elimination – addition of nucleophilic aromatic substitution reactions.

UNIT-III: ALDEHYDES & KETONES: (12 Hrs)

Structure of the carbonyl group. Synthesis of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on Benzoin, Aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig

reaction, Mannich reaction, Cannizaro reaction, MPV reduction, Clemmensen, Wolf Kishner, $LiAlH_4$, $NaBH_4$ reduction.

UNIT-IV: ALCOHOLS: **(12 Hrs.)**

Classification and nomenclature: monohydric alcohols –methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reactions of alcohols. Dihydric alcohols – nomenclature, methods of formation, chemical reactions of vicinal diols (glycols), oxidative cleavage by SeO_2 , $Pb(OAc)_4$ and $HI0_4$. - Glycerol - preparation and reactions

UNIT-V: PHENOLS: **(12 Hrs)**

Nomenclature, classification and preparation of phenol, comparative strength of alcohol and phenol. Properties of phenols: Acidic character of phenols, effect of substituents on the acidity of phenols, Aromatic electrophilic substitution reaction with respect to Sulphonation, halogenations and nitration. Color complexes with ferric chloride, coupling reaction. Mechanism of Kolbe's reaction and Reimer-Tiemann reaction.

Text Books & References:

1. R.M. Morrison and R.N. Boyd "Organic chemistry", Pearson, 2011.
2. Jerry March," Advanced Organic chemistry- Reactions, mechanisms and structures", WE.
3. I.L. Finar, Vol. I & II ", Organic chemistry", Pearson Education.
4. B.S. Bahl & Arun Bahl, "Advanced organic chemistry", Chand
5. S.M. Mukherji, S.P. Singh and R.P. Kapoor, "Organic Chemistry",

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Course:	**II- B. Sc. Chemistry**	**Semester : III**
Course Category :	**DSC-IV**	**Maximum Marks**
Course Title:	**Practical- Semi Micro Inorganic Analysis**	**CIA: 10 Marks**
Course Code:	**D0306**	**ESE: 40 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 50 Marks**

Hrs. of Instruction: 4 **No. of Credits - 2**

1.Semimicro analysis of inorganic salt mixture containing two cations and two anions (one of the anions should be an interfering one) from the following:

Cations: Lead, Copper, Cadmium, Bismuth, Ferrous, Aluminum, Manganese, Zinc, Cobalt, Nickel, Calcium, Strontium, Barium, Magnesium and Ammonium.
Anions: Carbonate, Sulphate, Nitrate, Fluoride, Chloride, Bromide, Borate, Oxalate and Phosphate**.**

(Combination of mixtures forming insoluble salts shall be avoided)

Scheme of Valuation for Inorganic Qualitative Analysis

Hours of Instruction: 4 Hours per Week

Max Marks:
CIA - 10 Marks
ESE - 40 Marks
Total - 50 Marks

1. Analyze the given mixture containing two cations and two anions. Write the systematic procedure as and when you perform the Experiments 25 Marks
2. Record 10 Marks
3. Viva 5 Marks
4. Total 40 Marks

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Course:	**II- B. Sc. Chemistry**	**Semester: IV**
Course Category :	**DSC -VI**	**Maximum Marks**
Course Title:	**Physical Chemistry- II**	**CIA: 25 Marks**
Course Code:	**D0314**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hours**

OBJECTIVES

1. To understand the concept of Thermodynamics.
2. To learn the principles of Thermochemistry.
3. To learn the principles of colligative properties.

UNIT – I

First Law of Thermodynamics

Definition of Thermodynamic terms: system and surroundings – State Functions – intensive and extensive properties- Thermodynamic process- concept of heat and work. First Law of thermodynamics: statement – internal energy – enthalpy – heat capacities of gases at constant volume (Cv)and pressure (Cp) and their relationship –calculation of w, q, dE and dH for the reversible expansion of ideal gases under isothermal and adiabatic conditions.

UNIT – II

Second Law of Thermodynamics - I

Need for the law – different statements of the law – Carnot's cycle and its efficiency – Carnot's theorem - Concept of entropy –Entropy as a state function, Entropy as a function of volume and temperature – Entropy as a function of pressure and Temperature. Entropy change in physical changes and phase changes.

UNIT – III

a) **Second law of thermodynamics -II**

Concept of free energy-Concept of Gibb's free energy (G) and Helmholtz free energy-Variation of A and G with P, V and T.- Gibb's-Helmholtz equation and its application. G and A as criteria for thermodynamic equilibrium and spontaneity

b) **Third Law of Thermodynamics**: -Nernst heat theorem. Statement of Third Law-Statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data.

UNIT-IV Thermochemistry and chemical equilibrium

a) Thermochemistry: Standard states – Hess's Law of constant heat summation and its application –Heat of reaction at constant pressure and constant volume. - Bond dissociation energy and its calculation –Temperature dependence of enthalpy –Kirchhoff's equation.

b) Chemical Equilibrium:

Equilibrium constant and free energy change – Thermodynamic derivation of law of mass action –Equilibrium constants in terms of pressure and concentration – NH_3 and PCl_5.Thermodynamis interpretation of Lechateliers principle – Van't Hoff reaction isotherm.

UNIT – V Solutions, Dilute solutions and Colligative properties:

Ideal and non- ideal solutions. Dilute Solutions, Colligative properties, Raoult's Law. Relative lowering of vapor pressure, molecular weight determination, Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point

Textbooks and References:

1. B.R. Puri L.R. Sharma and M.S. Pathania," Principle of Physical chemistry", Vishal.
2. K.L. Kapoor "A Textbook of Physical chemistry (Vol.1,2 & 3)" Mac Millan
3. P.W. Atkins," Physical chemistry", Oxford University Press
4." Elements of Physical chemistry", B.R. Puri, L.R. Sharma, M.S. Pathania, Vishal
5. "Advanced Physical chemistry ", J.N. Gurtu, Pragati Prakashan, Meerut
6. "Textbook of Physical Chemistry", P.L. Sony & O.P. Dharmarha

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Course:	**II -B. Sc. Chemistry**	**Semester : IV**
Course Category :	**SEC-I**	**Maximum Marks**
Course Title:	**Analytical Chemistry- I**	**CIA: 25 Marks**
Course Code:	**D0309**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hours**

Objectives

1. To learn Calibration of Instruments, Apparatus, Errors
2. To learn Principle in Titrations

UNIT- I

Laboratory Glassware:

Types, maintenance and cleaning.

Calibration of burette, pipette and standard flask.

Laboratory first aids.

Analytical Balance:

Principles of analytical balance – rules for handling the balance, errors in Weighing and calibration of weights. Single pan balance – principle, operation and advantages.

UNIT-II

Statistical Evaluation of Analytical Data: Mean, median and mode – Accuracy and precision – ways of expressing accuracy and precision – Errors – types – determinate, indeterminate and gross errors – minimization of errors – methods of reporting data – significant figures– confidence limits.

UNIT-III: Principles of Titrimetric (Volumetric) Analysis:

Definition of terms — primary standard — secondary standard solutions — Equivalence point and end point of titrations, — Types of titrations — Calculations involving volumetric titrations.

Acid - Base Titrations: Derivation of titration curves for strong acid Vs strong base and weak acid Vs strong base titrations — Theory of acid-base indicators.

UNIT – IV: Redox and complexometric titrations

Redox Titrations: Nernst equation — Theory of redox indicators — Types of Redox indicators. Complex Formation Titrations: Chelating agents – EDTA- Theory of metallochromic indicators – Titrations involving EDTA – Types of EDTA titrations.

UNIT-V: Thermo Analytical Methods:

Principles of TGA and DTA – Hondas balance – precautions in using thermo Balance – Outlines of Instrumentation (block diagram only) – Application in $CaC_2O_4.H_2O$ and $(CH_3COO)_{2Ca.H2O}$ - Thermometric titration – Principle and instrumentation – Conditions for Thermometric Titration – Titration of HCl Vs NaOH– Applications of thermometric titration

Text Books & References:

1) R. Gopalan. Subramanian & K. Nagarajan, Elements of Analytical Chemistry S. Chand
2) Willard, Merritt, Dean & Settle, Instrumental Methods of chemical Analysis.
3) D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Fundamentals of Physical Chemistry,
4) B.I. Bhatt, S.M. Vora," Stoichiometry", T.M.H.

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Course:	**II -B. Sc. Chemistry**	**Semester : IV**
Course Category :	**SEC-I**	**Maximum Marks**
Course Title:	**Practical – Applied Analysis**	**CIA:15 Marks**
Course Code:	**D0316**	**ESE: 60 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 75 Marks**

Hours : 4 **No. of Credits – 2**

1. Determination of acetic acid in commercial vinegar using NaOH.
2. Determination of hydroxide content of an antacid tablet using HCl.
3. Determination of Acetylsalicylic acid in aspirin tablet.
4. Determination of calcium content in chalk as Calcium Oxalate by Permanganates.
5. Determination of Ascorbic acid (vitamin-C) using standard Iodine solution.
6. Analysis of oils – Determination of Iodine value and Saponification value.
7. Determination of Glucose.

Key and Scheme of Valuation:

1. Any one of the experiments quoted in the lab work.
2. Candidates shall write the brief procedure in a separate paper and submit the same within ten minutes.
3. After collecting the brief procedure, the correct procedure for question (1) shall be provided to the students.

Scheme of Valuation:

Brief procedure: 10 marks
Experiment: 35 marks (Error Upto5% : 35 marks
Upto 10% : 30 marks
Up to 15% : 25 marks
20 % & above : 20 marks]
(For wrong calculation reduce 2 marks)
Viva – 5 marks
Record – 10 marks

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Course:	**III-B. Sc. Chemistry**	**Semester : V**
Course Category :	**DSC-VII**	**Maximum Marks**
Course Title:	**Inorganic Chemistry - III**	**CIA: 25 Marks**
Course Code:	**D0319**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 4 60 Hours

Objectives:

1. To learn the chemistry of Halogens.
2. To learn the chemistry of Lanthanides & Actinides
3. To learn the principles of Redox chemistry.
4. To learn the different concepts of acids and bases and HSAB theory.
5. To learn the basic principles Solid state chemistry.

UNIT I: **Halogen Family** **(12 Hrs.)**

a. General characteristics of halogens-Anomalous behavior of fluorine. Oxides & oxyacid of halogens - preparation, properties, structure & stability. The binary compounds of halogens with oxygen –Preparation, properties, reactions, stability & structure of OF_2, O_2F_2, Cl_2O, ClO_2, Cl_2O_7.

b. Pseudo halogens –preparation &properties, positive oxidation state of iodine

c. . Interhalogen Compounds –Preparation, Properties & Structure.

Unit II: Lanthanides & Actinides **(12 Hrs.)**

a. Lanthanides: Position of lanthanides in the periodic table. General characteristics of lanthanides. Occurrence, electronic configuration, oxidation states, atomic & ionic radii, lanthanide contraction – causes & consequences – colour, magnetic properties & complex formation. Extraction of lanthanides from monazite sand & separation of lanthanide elements by ion exchange method. Uses of lanthanides & its compounds.

b. Actinides: Position of actinides in the periodic table. General characteristics of actinides: occurrence, electronic configuration, oxidation states, ionic radii of tri positive & tetra

positive cations, cause of actinide contraction – color of M^{3+}& M^{4+} cations, magnetic properties & complex formation. Comparison between lanthanides & actinides & U.

UNIT-III: Acids, Bases & Non-Aqueous Solvents (12 Hrs.)

Acids and Bases- Bronsted acids and bases: Lewis acids and bases: Definitions, strengths. Hard & soft acids & bases: (HSAB): Classification, Pearson's HSAB concept, hardness and softness, theoretical basis of hardness and softness, Electronegativity and hardness and softness.

a. Physical properties of a solvent, Types of solvents and their general characteristics. Reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

UNIT IV: Solid State Chemistry (12 Hrs.)

General properties of metals - Metallic bonding - Free electron theory, VB theory, band theory. Application of band theory to conductors, semiconductors & insulators. Crystal defects – Stoichiometric defects & Non-stoichiometric defects & their consequences. Alloys-classification – Hume Rothery ratio. Superconductors – definition only. High temperature super conductors and their applications.

UNIT - V Co-ordination Chemistry – I (12 hours)

Definition of co-ordination compounds. Types of Isomerism's in co-ordination compounds with illustrations. Werner's co-ordination theory.

Classification of ligands, stability constant of co-ordination compounds – stepwise and cumulative (determination not required). Chelates – factors affecting stability of Chelates. IUPAC system of nomenclature of co-ordination compounds.

Text books and References:

1. B.R. Puri L.R. Sharma K.C. Kalia, Principles of Inorganic chemistry, S. Chand.

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Course:	**III-B. Sc. Chemistry**	**Semester : V**
Course Category :	**DSC-VIII**	**Maximum Marks**
Course Title:	**Organic Chemistry - III**	**CIA: 25 Marks**
Course Code:	**D0320**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 4 60Hours

Objectives: To learn the chemistry of optical isomerism, heterocyclic compounds, acids, amino acids and proteins & polymers,

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UNIT - I: **(12 Hrs.)**

Optical isomerism: Optical activity, chiral carbon, chirality, elements of symmetry, enantiomers, diastereomers, molecular dissymmetry, relative and absolute configuration. Cahn-Ingold-Prelog rules, assignment of configuration – R and S (open chain compounds), racemic modification, resolution of racemic mixture, asymmetric synthesis, Walden inversion. Chiral compounds containing nitrogen and Sulphur – atropoisomeric – diphenyl's, Allenes and spiranes.

UNIT - II: **(12 Hrs.)**

Heterocyclic compounds -I: Introduction: Molecular orbital picture and aromatic characteristics of Pyrrole, Furan, Thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocycles. preparation and reactions of indole, quinoline and Is quinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler–Napieralski synthesis. Mechanism of electrophilic substitution of indole, quinoline and is quinoline.

UNIT- III : (12 Hrs.)

Carboxylic acids: Synthesis and properties of aliphatic and aromatic, mono, dicarboxylic acids and unsaturated acids. Acidity of carboxylic acids - strength of acids- inductive and Mesomeric effects. Mechanism of ester hydrolysis and esterification involving acyl-oxygen cleavage $A_{AC}2$ mechanism and $B_{AC}2$ mechanism.

Fats oils and Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. saponification value, iodine value, acid value, Soaps synthetic detergents alkyl and aryl Sulphonates.

UNIT –IV: (12 Hrs.)

Amino acids, peptides and proteins: Classification, structure and stereochemistry of amino acids, isoelectric point, preparation and reactions of α-amino acids, peptides -structure and nomenclature, synthesis of polypeptides (general methods), solid-phase peptide synthesis-structure determination of polypeptides-end group analysis. classification of protein, structure of proteins (details of determination of structure are not included), protein denaturation, renaturation. Nucleic acids - constituents of nucleic acid, RNA and DNA, structure of DNA.

UNIT –V:

Synthetic polymers: Addition or chain growth polymerization. Free radical Vinyl polymerization, Ionic vinyl polymerization. Condensation or step growth polymerization, PE, PVC, Teflon, Polyesters, polyamides, phenol-formaldehyde resins, urea – formaldehyde resins.

Advances in polymer; bio-polymer, biomaterials, polymer in medical field, high temperature and fire resistance polymer – silicones.

Text Books & references:

1. Robert Thornton Morrison & Robert Neilson Boyd, Organic chemistry, Pearson
2. Jerry March, Advanced organic chemistry - Reactions, mechanisms and structures, WE
3. I.L. Final Vol. I & II, Organic chemistry. Pearson's education, 2011.
4. B. S. Bahl & Arun Bahl, Advanced organic chemistry,
5. S.M. Mukherji, S.K. Singh & R.P. Kapoor, "Organic chemistry" by Vol1,2,3

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Course:	**III- B. Sc. Chemistry**	**Semester : V**
Course Category :	**DSC-IX**	**Maximum Marks**
Course Title:	**Physical Chemistry - III**	**CIA: 25 Marks**
Course Code:	**D0321**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 4 **60Hours**

Objectives:

1. To know the reaction rates and kinetics.
2. To relate the theories of reaction rates.
3. To know the various photochemical process in the chemical systems.

UNIT – I CHEMICAL KINETICS I (12 Hrs)

Rate of chemical reaction. Factors influencing rates of chemical reaction. Order and molecularity. Rate equation of zero order, first order and second order reaction. Half-life period. Method of determination of order of a reaction. Experimental methods of determination of rate constant of a reaction- Volumetric and polarimetry.

UNIT II CHEMICAL KINETICS II (12 Hrs)

Effect of temperature on reaction rate - concept of activation energy, energy barrier, Arrhenius equation. Theories of reaction rates- Collision theory- Limitations of collision theory. Transition State Theory.

UNIT III CATALYSIS (12 Hrs)

Catalysis- Definition and Characteristics - Types of Catalysis: Homogenous, Heterogeneous, induced, Auto, positive and negative catalysis., catalytic poisons and catalytic promoters.
Enzyme catalysis - Michaelis-Menten equation and Michaelis-Menten law.

UNIT IV PHOTOCHEMISTRY (12 Hrs)

Interaction of Light and matter -Differences between thermal and photochemical process. Laws of photochemistry: Lambert's Beer Law, The Grothus - Draper law and the Stark-Einstein law. Jablonski Diagram depicting various process in Excited state- Internal conversion, Intersystem crossing. Qualitative description of Fluorescence, Phosphorescence, Chemiluminescence.

Lasers and uses of Lasers. Quantum yield– photosensitized reactions.

UNIT V PHASE EQUILIBRIA (12 Hrs)

Phase rule: Concepts of Phase, component and degrees of freedom with example. Thermodynamic Derivation of Gibbs Phase rule. Clapeyron and Clausius- Clapeyron equation and their application to equilibrium in phase transitions. Phase Equilibria of one component system - Example - water and sulfur system. Phase Equilibria of two component system: Example: - lead-silver system, Desilverisation of Lead.

Textbooks and References

1. B.R. Puri L.R. Sharma," Principle of Physical Chemistry", Vishal
2. S.K. Dogra and S. Dogra," Physical Chemistry through Problems", New age
3. P.W. Atkins," Physical Chemistry", Oxford University Press
4. "Advanced Physical Chemistry ", J.N. Gurtu, PP, Meerut
5. B.S. Bahl, Arun Bahl and G.D. Tuli, 'Essentials of Physical Chemistry "S. Chand

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Course:	**III- B. Sc. Chemistry**	**Semester : V**
Course Category :	**SEC-II**	**Maximum Marks**
Course Title:	**Analytical Chemistry- II**	**CIA: 25 Marks**
Course Code:	**D0315**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hours**

UNIT-I Gravimetric Methods of Analysis (12 Hrs)

Principles of gravimetric analysis – Gravimetric factor – calculations involved – Conditions for precipitation – Theory of precipitation – Types of precipitants - organic precipitants & advantages – Purity of precipitates – Co-precipitation and post-precipitation – Precipitation from homogeneous solution; Crucibles – types and maintenance – washing of the precipitates – Drying and ignition of precipitates.

UNIT-II Colorimetric Methods of Analysis (12Hrs)

Quantitative aspects of absorption of radiation – Beer-Lambert's Law – Methods of Colorimetric Analysis – Standard series method, colorimetric titration, Dubos colorimeter, Photo electric colorimeter and Spectro photometric method – instrumentation, single beam and double beam instruments, construction of calibration plots for quantitative analysis – Applications of colorimetry : Molar composition of complexes by Job's method – Determination of Iron and Manganese compounds – Simultaneous determination of metal ions (Cr and Mn).

UNIT-III Polarography (12 Hrs)

Basic principles – DME – advantages and disadvantages – Diffusion current – The Ilkovic equation (derivation not required), Half-wave potential – Experimental set up – Applications – Determination of copper and zinc in brass.

Unit – IV Solvent Extraction Techniques (12 Hrs)

Principles- techniques of solvent extraction – Batch extraction, continuous extraction – continuous extraction of liquids and solids – Soxhlet extraction – counter-current extraction – Factors favoring solvent extraction of inorganic species – Application of Solvent extraction.

UNIT-V Chromatographic methods: (12 Hrs)

Theory and principles of following chromatographic methods:

a. Column Chromatography: Principles and experimental procedures – Applications.

b. Thin layer chromatography: Principles and experimental procedures – Rf values - Applications – Separation of dyes.

C. Paper Chromatography: Principles – ascending and descending techniques – R_f values – Applications – Separation of Amino acid.

Textbooks and References

1.R. Gopalan, P.S. Subramanian & K. Nagarajan, "Elements of Analytical Chemistry"

2. Dr. Alka Gupta, Analytical Chemistry, Pragati Prakash an.

3.Willard Merritt Dean & Settle, Instrumental Methods of chemical Analysis.

4.D.A. Skoog, D.M. West" Fundamentals of Physical Chemistry', Cengage learning

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Course:	**III- B. Sc. Chemistry**	**Semester : V**
Course Category :	**GE-I**	**Maximum Marks**
Course Title:	**Food Chemistry**	**CIA: 25 Marks**
Course Code:	**D0310**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 2 **60 Hours**

Objectives:

1 To learn occurrence, composition and properties of fats and lipids.
2 To learn the role of food additives, types and health hazards.
3 To learn the analysis of milk and milk products and flavoring agents.
4 To learn the composition, classification, pigments and some reactions in vegetables and fruits.

UNIT-I: Fats and other Lipids (15 Hrs)

Occurrence in foods and composition, Edible fats and oils, fatty acids, identification of natural fats and oils, physical properties: melting point, softening point, slipping point, Shot melting point, Specific gravity, Refractive index, Smoke, Flash and Fire points, Turbidity point (only definitions). Chemical properties: Definition of Reichert –Meissal number Saponification number, Iodine umber and acetyl value. Flavor changes in fats and oils: rancidity and reversion.

The Technology of Edible fats and oils: Rendering, Pressing, Solvent extraction,

Refining (Steam, alkali and bleaching) and hydrogenation (only brief procedure). Importance in diet.

UNIT-II: Food Additives (15 Hrs)

Intentional and Unintentional Additives-Types of Food Additives: 1. Preservatives, 2.Antioxidants, 3.Sequesterants, 4.Acidulants &Alkalis, 5.Stabilisers & Thickeners, 6.Colourants, 7.Chelating agents, 8.Curing agents, 9.Emulsions-Health Hazards of using food

additives- Sources of unintentional additives-Radioactive fallout- Agriculture contaminants-Animal additives.

UNIT-III: Analysis of Milk (15Hrs)

Analysis of milk and milk products: Acidity, total solids, fat, total nitrogen, protamine's, lactose, phosphate activity, casein, chloride. Analysis of food materials- Preservatives: Sodium carbonate, sodium benzoate, sorbic acid, Coloring matters- Brilliant blue FCF, fast green FCF, Tartrazine, erythrosine, sunset yellow FCF.

Flavoring agents - Flavors & Flavor enhancers, Vanilla, diacetyl, isoamyl acetate, limonene, ethyl propionate, allyl hexanoate and Adulterants in rice and wheat, wheat flour, sago, coconut oil, coffee powder, tea powder, milk.

UNIT-IV: Vegetables and Fruits (15 Hrs)

Definition, role in diet, chemical composition. Classification Pigments in fruits and Vegetables: Definitions and examples - Carotenoids, Chlorophylls, Flavonoids, Anthocyanins. Tannins- Definition and examples.

Reactions in vegetables and fruits: The Browning reaction –enzymatic browning and non-enzymatic browning-(Definition and examples)

Text Books & references:

1. Food Chemistry Lilian Hoagland Meyer, CBS publisher.
2. Food Science by K. Sri Lakshmi, New Age Publishers.
3. Bailey. A.E." Industrial oils and Fat products'' Inter science Publishers.
4. Dryden's "Outlines of chemical Technology", M. Gopal Rao & Sitting, EWP

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Course:	**III- B. Sc. Chemistry**	**Semester : V**
Course Category :	**DSC-VIII**	**Maximum Marks**
Course Title:	**Practical- Organic Analysis**	**CIA: 40 Marks**
Course Code:	**D0323**	**ESE: 60 Marks**
Hour of Instruction:	**6 hrs / week**	**Total: 100 Marks**

No. of Credits – 3 **6 Hrs/ week**

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1. Identification of nitrogen, Sulphur and halogens.
2. Tests to find whether saturated or unsaturated
3. Tests to find whether aromatic or aliphatic
4. Analysis of the following functional groups:

Phenols, esters, carboxylic acids, carbohydrates, amines, aldehydes, ketones, amides, diamides, anilids' and nitro compounds.

Confirmation of functional groups by preparation of derivatives.

Organic Preparations:

1. Acetylation of salicylic acid.
2. Benzoylation of aniline
3. Preparation of benzoic acid from toluene / benzaldehyde.

Scheme of Valuation:

Analysis of the organic substance: 25 marks [Saturated/unsaturated – 2 marks
Aromatic/aliphatic – 2 marks
Elements present/absent – 6 marks
Functional group – 12 marks
Confirmation by correct derivative–3

Preparation: 15 marks
[Yield –7 marks; Crude – 3 marks; Recrystallized – 5marks]

Viva – 10

Record – 10

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Course:	**III B. Sc. Chemistry**	**Semester : VI**
Course Category :	**DSC-X**	**Maximum Marks**
Course Title:	**Inorganic Chemistry -IV**	**CIA: 25 Marks**
Course Code:	**D0325**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hrs**

Objectives:

1. To learn the naming and isomerism in co-ordination compounds.
2. To learn the chemistry of metal-carbonyl complexes.
3. To learn the chemistry of oregano-metallic complexes.
4. To learn the principles of the stability of complexes

UNIT – I: CO-ORDINATION CHEMISTRY –II (12 hours)

The Valence Bond theory (VBT) of co-ordination compounds. Its successes and limitations. Classification as inner orbital and outer orbital complexes. Stabilization of unusual oxidation states. The crystal field theory (CFT). d-orbital splitting pattern in octahedral, tetrahedral and square planar fields.

Crystal field stabilization energy (CFSE) , its calculation and importance. Evidences for covalent interaction between metal and ligands in complexes (d-d transitions, nephelauxetic effect).

UNIT – II: CO-ORDINATION CHEMISTRY – III (12 hours)

Basic principles of Molecular Orbital theory. The molecular orbital theory (MOT) of co-ordination compounds as applied to octahedral complexes without pi-bonding and its MO correlation diagram of $[Co\ (NH_3)_6]^{3+}$. The adjusted crystal field theory (ACFT) or the ligand field theory (LFT). Types of magnetic behavior. Methods of determination of magnetic susceptibility and magnetic moments (Guoy's balance method only). The electronic spectrum of $[Ti\ (H._2O)_6]^{3+}$ ion in solution. The spectrochemical series.

UNIT – III Spectral Behavior of Complexes (12 hours).

Term Symbols – LS Coupling Scheme – Splitting of d-orbital's in octahedral, Tetrahedral and Square planar Geometries –Selection Rules for Electronic Transitions in Complexes with d^{1-9} Configuration –Orgel Diagram –Electronic Spectra Cr(III) –Octahedral, Co(II) Octahedral, Co(II)Tetrahedral , Ni(II) Octahedral.

UNIT – IV: CO-ORDINATION CHEMISTRY – IV (12 hours).

A brief survey of metal ethylene complexes. Preparation, properties, uses and bonding in alkyl lithium and lead tetra ethyl. Preparation, properties and uses of Ni $(CO)_4$, Fe $(CO)_5$, $Cr(CO)_6$. Back bonding in mononuclear carbonyls and its importance. Their structures based on VB theory. Complexes of biological importance – Chlorophyll, Hemoglobin and Cyanocobalamin, their role and important structural features. (Detailed structure not expected).

UNIT -V: ORGANO METALLICS & STABILITY OF COMPLEXES (12 hours)

The Thermodynamic versus kinetic stability of complexes, classification as inert and labile complexes. Factors affecting the stability of the complexes. Substitution in square planar complexes – The Trans effect. Synthesis of cis and trans diamine di chloro platinum(II) complex. An outline of the mechanism of substitution in octahedral complexes – complexometric titration involving EDTA. Applications of coordination compounds in qualitative and quantitative analyses. Application in industry and medicine.

Text Books and References:

1. R.D. Madan," Modern Inorganic chemistry. Chand.
2. B.R. Puri & L.R. Sharma, "Principles of inorganic Chemistry".
3. Alan G. Sharpe," Inorganic chemistry', Pearson Education.
4. J.D. Lee, "A New Concise Inorganic Chemistry", ELBS, 2012.
5. Douglas "Concepts and Models of Inorganic Chemistry".

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Course:	**III-B. Sc. Chemistry**	**Semester : VI**
Course Category :	**DSC-XI**	**Maximum Marks**
Course Title:	**Organic Chemistry -IV**	**CIA: 25 Marks**
Course Code:	**D0326**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hrs**

OBJECTIVES

1. To learn the importance of molecular rearrangements.
2. To learn the chemistry of terpenoids and alkaloids
3. To learn the chemistry of carbohydrates.
4. To learn the spectroscopic applications on organic compounds and dyes

UNIT - I: (12 hours)

Molecular Rearrangement reaction: Pinacol-pinacolone rearrangement, Hoffmann rearrangement, Beckmann's rearrangement, Wolf rearrangement, Benzil-Benzylic acid rearrangement, Fries rearrangement, Claisen rearrangement, Benzidine rearrangement and Curtius rearrangement

UNIT - II: (12 hours)

Organic synthesis via Enolates: Acidity of α-hydrogens, alkylation of diethylmalonate and ethyl acetoacetate, synthesis and synthetic application of malonic esters and acetoacetic ester, Keto-enol tautomerism of ethyl acetoacetate.

UNIT - III: (12 hours)

Terpenoids and Alkaloids: Terpenoids: Classification, nomenclature, occurrence, isolation, general method of structure determination, isoprene rule, structure determination of α-terpineol, menthol along with synthesis.

Alkaloids: Definition, occurrence, isolation, general method of structure elucidation of alkaloids, structure elucidation of Coniine, Nicotine and confirmation by synthesis.

UNIT - IV: **(12 hours)**

Carbohydrates: Definition, classification: monosaccharides (Glucose, Fructose) mechanism of Osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Objections to open chain structure of glucose and fructose, Mutarotation, structure of monosaccharides (glucose, fructose), determination of ring size in glucose and fructose, disaccharides-sucrose and maltose-determination of structure and polysaccharides (starch and cellulose) without involving structure determination.

UNIT - V **(12 hours)**

Spectroscopy: Instrumentation, block diagram of UV-Visible, IR and NMR spectroscopy-Theory of electronic spectroscopy-chromophore and auxo chrome- theory of NMR spectroscopy. Applications in determining the structures of simple organic compounds.

Dyes: Colour and constitution, electronic concept – Classification, chemistry and synthesis of methyl orange, Congo red, malachite green, alizarin and indigo.

Text Books & references:

1. Robert T. Morrison & Robert N. Boyd, "Organic chemistry" Eight edition,2011.
2. Jerry March, "Advanced organic chemistry - Reactions, mechanisms and structures "
3. I.L. Finar, Vol. I &II, Organic Chemistry, "The Fundamental Principles", Eighth edition, Pearson education,2 011.
4. B.S. Bahl & Arun Bahl. "Advanced Organic Chemistry", S.Chand .
5. Y.R. Sharma, "Elementary Organic Spectroscopy, Principles & chemical applications", S. Chand, Fourth edition, Reprint,2012.

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Course:	**III-B. Sc. Chemistry**	**Semester : VI**
Course Category :	**DSC-XII**	**Maximum Marks**
Course Title:	**Physical Chemistry -IV**	**CIA: 25 Marks**
Course Code:	**D0327**	**ESE: 75 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 100 Marks**

No. of Credits – 4 **60 Hrs.**

Objectives

1. To learn the principles of Electrochemistry
2. To learn working of Galvanic Cell and Reversible Electrodes.
3. To learn the application of EMF Measurements
4. To learn the Principles of UV, IR, Raman and NMR spectra.

Unit I ELECTROCHEMISTRY I

1.**1Electrical transport** - Specific conductance and equivalent conductance. Variation of equivalent and specific conductance with dilution. Ostwald's dilution law

1.2**. Debye-Huckel Onsager** equation of strong electrolytes**. (elementary treatment only).** Kohlrausch Law and its applications. Migration of Ions – Ionic Mobility - Transport number: Definition and determination by Hittorf method and Moving boundary method.

1.3 Applications of Conductivity measurements: Determination of Degree of Dissociation, Determination of Solubility Product of a Sparingly Soluble Salt.

Unit II ELECTROCHEMISTRY - II

2.1 **Electromotive Force** - Electrolytic and Galvanic cell - Daniel cell, Standard Weston Cadmium cell. Conventional representation of electrochemical cells. Galvanic cell - EMF of a cell and its measurement. Computation of Cell E.M.F. Nernst Equation.

2.2 **Types of reversible electrodes** – Metal - Metal ion and Redox electrodes. Single Electrode Potential and its determination, Standard Hydrogen Electrode (SHE), Reference electrode – Calomel Electrode, Standard Electrode Potential.

Unit III ELECTROCHEMISTRY - III

3.1 **Cells** - Types – Concentration Cells with Transference, Liquid Junction potential.

3.2 **Applications of EMF measurements** – Potentiometric Titration - Determination of pH using Hydrogen, Quinhydrone and Glass Electrodes

Unit IV SPECTROSCOPY I

4.1 Electromagnetic Spectrum- UV – VIS spectra:

Interaction of low energy radiation with matter: Electromagnetic spectrum, electronic, vibration, rotational energy levels. UV – VIS spectroscopy and its Criteria – Franck Condon Principle.

4.2 Infrared spectroscopy:

Principle, Types of Stretching and Bending vibrations, Vibration frequencies, instrumentation, Block diagram, Source, monochromatic, Cell Sampling techniques, detector and recorders, identification of organic molecules from characteristic absorption bands. Criteria for molecule to be active in the IR region, Selection Rules for Vibrational Transition, Finger print region, Fundamental bands, Overtones.

Unit V SPECTROSCOPY II

5.1Raman Spectra:

Raleigh and Raman scattering: stokes and ant stokes line, instrumentation, block diagram, Comparison of IR and Raman spectroscopy, Rule of mutual exclusion.

5.2 Nuclear Magnetic Resonance:

Principle of nuclear magnetic resonance, basic instrumentation, shielding mechanism, chemical shift, number of NMR signals, spin-spin coupling and coupling constants.

Textbooks and References:

1. S.H. Maron and J.B. Lindo, Fundamentals of Physical Chemistry,

B.R. Puri, L.R. Sharma and M.S. Parthenia, Principles of Physical Chemistry,

2. P.S. Kalsi," Organic spectroscopy", New Age,
3. Jag Mohan, Organic spectroscopy, Narosa Publishing house.
4. B.S. Bahl & Arun, G.D. Tuli," Essentials of Physical Chemistry", S. Chand
5. C. Ban well "Fundamentals of Molecular Spectroscopy "McGraw-Hill.
6. R.S. Drago," Physical Methods in Inorganic Chemistry "EWP.
7. Y.R. Sharma, "Elementary Organic Spectroscopy", S. Chand
8. Singh & Dikshit, Molecular Spectroscopy,

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Course:	**III-B. Sc. Chemistry**	**Semester : VI**
Course Category :	**SEC-III**	**Maximum Marks**
Course Title:	**Pharmaceutical Chemistry**	**CIA: 15 Marks**
Course Code:	**D0324**	**ESE: 60 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 75 Marks**

No. of Credits – 4 **4 hrs. / week**

PHARMACEUTICAL CHEMISTRY

Objective:

- To effectively impart knowledge about various diseases and their treatment.
- To learn about the importance of Indian medicinal plants.
- To know about the different types of drugs

UNIT-I

1.1 Definition of the following terms: drug, Pharmacology, Pharmacopeia, bacteria, virus, chemotherapy and vaccine.

1.2 Causes, symptoms and drug for jaundice, cholera, malaria and filarial. First Aid for accidents. Causes detection and control of anemias and diabetics.

UNIT-II

Antibacterial: Sulpha drugs- examples and actions- prontosil, Sulphathiazole, Sulphafurazole Antibiotics- definition and action of Penicillin, Streptomycin, Chloramphenicol- SAR of chloramphenicol only.

Antiseptics and disinfectants- definition - phenolic compounds, Choro compounds, and cationic surfactant.

UNIT-III

Analgesics, antipyretics and anti-inflammatory agents; Definition and actions- Narcotic and Non-Narcotic- Morphine and its derivatives, pethidine and methadone- Salicylic derivative, paracetamol, Ibuprofen- disadvantages and uses.

Reference books:

1. Jayashree Ghosh" A Text book of Pharmaceutical Chemistry ", S. Chand.
2. S. Lakshmi," Pharmaceutical Chemistry", S. Chand.
3. Ashutosh kart,": Medicinal Chemistry "New Age.
4. O. D. Tyagi," A Text Book of Synthetic Drugs' –Ammiol publishers.
5. Ambika's "Text book of Biochemistry".
6. A.L. Levinger "Biochemistry".

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Course:	**III-B. Sc. Chemistry**	**Semester : VI**
Course Category :	**GE-II**	**Maximum Marks**
Course Title:	**Nano Chemistry**	**CIA: 15 Marks**
Course Code:	**D0330**	**ESE: 60 Marks**
Hour of Instruction:	**2 hrs. / week**	**Total: 75 Marks**

No. of Credits -2 **Duration:30 Hrs.**

Objective:

- To introduce the basics of nanotechnology.
- To learn the instrumental techniques used in characterization of nano materials.

UNIT – I Basics of Nano Chemistry:
Introduction – Definition – length scales – Importance of nanoscale and its technology – self-assembly of materials – self-assembly of Molecules – Porous Solids, Nanowires, Nanomachines and Quantum dots.

UNIT – II Nano materials:
Introduction – Types of Nano particles – Preparations, Properties and Uses of Gold, Silver, Alumina and Titania Nano Particles.

UNIT – III Synthetic Techniques:
Techniques to Synthesize Nanoparticles – Top Down approaches-Bottom up approaches Common Growth Methods – Any Two methods

UNIT – IV Nano Materials:
Preparation, Properties and Applications of Carbon Nano Tubes and Nano fibers.

Textbooks and References:

1) "Nanotechnology", S. Shanmugam, MJP Publishers, Chennai (2010)
2) "A Handbook on Nano chemistry", Patrick Solomon, Dominant Publishers N. Delhi
3) "Nano Biotechnology", S. Balaji, MJP Publishers, Chennai (2010)
4) "The Chemistry of Nano Materials – Synthesis, Properties and applications ", Vol. I & II, CNR Rao, Springe Publications.
5) "Nanotechnology- Basic Science and Emerging Technologies", Mick Wilson
6) "Nano Chemistry", G.B. Segre eve, Elsevier

Bharathidasan Government College for Women (Autonomous), Puducherry
Department of Chemistry
Choice based Credit System

Course:	**III-B. Sc. Chemistry**	**Semester : VI**
Course Category :	**DSC-X**	**Maximum Marks**
Course Title:	**Practical-Gravimetric Analysis**	**CIA: 40 Marks**
Course Code:	**D0322**	**ESE: 60 Marks**
Hour of Instruction:	**6 hrs. / week**	**Total: 100 Marks**

No. of Credits – 3 **6 hrs. / week**

1. Determination of water of hydration.
2. Determination of Lead as Lead chromate.
3. Determination of Zinc (or Magnesium) as Oxinate.
4. Determination of Nickel as Nickel dimethyl Glyoximate.
5. Determination of Barium as Barium sulphate.

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Key and Scheme of Valuation:

1. Any one of the experiments quoted in the lab work.

2. Candidates shall write the brief procedure in a separate paper and submit the same within ten minutes.

3. After collecting the brief procedure, the correct procedure for question (1) shall be provided to the students.

Scheme of Valuation:

Brief procedure: 10 marks

Experiment: 30 marks [Error Upto2%: 30 marks
Up to 3%: 25 marks
up to 4%: 20 marks
up to 5%: 15 marks
5 % & above: 10 marks]
(For wrong calculation reduce 2 marks)

Viva – 10 marks

Record – 10 marks

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Course:	**III-B. Sc. Chemistry**	**Semester : VI**
Course Category :	**DSC-XII**	**Maximum Marks**
Course Title:	**Practical- Physical Chemistry Experiments**	**CIA: 40 Marks**
Course Code:	**D0328**	**ESE: 60 Marks**
Hour of Instruction:	**6 hrs. / week**	**Total: 100 Marks**

No. of Credits – 3 **Hrs. of Instruction: 6 Hrs./week**

OBJECTIVES:

1. To enable the students to acquire analytical (both qualitative and quantitative) and psychomotor skills.
2. At the end of the course the students should be able to plan the experimental projects and execute them.
3. To acquire practical knowledge in the determination of solubility of sparingly soluble salt, conductometric titrations.

List of Physical Chemistry Experiments

1. Determination of rate constant of the acid catalyzed hydrolysis of ester.
2. Construction of phase diagram of simple eutectic system.
3. Phase diagrams Phenol-Water system and effect of impurities on CST.
4. Determination of molecular weight by Rast method.
5. Determination of cell constant of the conductivity cell and equivalent conductance of KCl
6. Conductometric titration of: (a) Strong acid Vs Strong base
   (b) Weak acid Vs Strong base
7. Determination of solubility and solubility product using conductometric method

Scheme of Valuation - Physical Chemistry Experiments

Any one of the above experiments to be given to each student by lot

(Time: 3 Hrs & Max. marks: 60)

Candidates shall write the formula to be used

Formula and tabular column: 5 marks

Experiment : 35 marks

Viva : 10 marks

Record : 10 marks

Total ----------

60 Marks

Bharathidasan Government College for Women (Autonomous), Puducherry
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Choice Based Credit System

Course:	**II-B. Sc. (Physics, CND, Zoo & Botany)**	**Semester : III**
Course Category :	**DSE**	**Maximum Marks**
Course Title:	**Chemistry - I**	**CIA: 15 Marks**
Course Code:	**D0312**	**ESE: 60 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 75 Marks**

No. of Credits – 4 **60 Hrs**

OBJECTIVES

1. To learn the IUPAC system of nomenclature.
2. To learn the basis of Stereochemistry
3. To learn basic principles of chromatography.
4. To learn the natural products and nuclear chemistry.

UNIT-I: Nomenclature of Organic Compounds:(12Hrs)

Nomenclature of organic compounds - Rules of IUPAC system of nomenclature– Aliphatic alcohols, aldehydes, Ketones and carboxylic acid.

Types of chemical Bonding- ionic and covalent– Types with two examples each.

UNIT – II: Stereoisomerism (12Hrs)

Geometrical Isomerism –Criteria, principle and properties of Maleic Acid and Fumaric Acid

Optical Isomerism – Definition of optical isomers, enantiomers. Principle of optical isomerism Example: Discussion of optical isomerism in Lactic acid and Tartaric Acid. Definition of Racemization and resolution.

UNIT – III Principles and applications of Chromatography: **(12 Hrs.)**

(a) Paper chromatography - Principles and applications to separate any two compounds

(b) Thin layer chromatography – Principles and applications in the separation of any two compounds

(c) Column Chromatography- Principle ad its application in separation of any two compounds

UNIT – IV **(12 Hrs.)**

a) **Environmental Chemistry**: Sources and control of Pollution (Pesticides, Nuclear & Industrial).

b) **Natural Products**: Definition, sources and application of the following compounds:

(i) Alkaloids – Nicotine and Quinine.
(ii) Terpenoids – Citral and Menthol
(iii) Anthocyanin – Cyanine.

c) Production of Ethanol by industrial method using fermentation process.

UNIT – V: Nuclear Chemistry (12 Hrs.)

Natural Radioactivity – properties of - α-rays, β-rays and ϒ-rays. Group displacement law-rate of radioactive disintegration – Half – life period – Nuclear fission – Nuclear fusion – fertile and fissile isotope – calculation of Q value and energy release in nuclear fission – Radioactive isotopes – Application in medicine, industry and plant Science- Radiocarbon dating.

Textbooks and References

1. B.S. Bahl and Arun Bahl," A Textbook of organic chemistry "S. Chand.
2. B.S. Bahl and Arun Bahl "Textbook of Physical Chemistry" S. Chand
3. B.R. Puri & L.R. Sharma "Textbook of Inorganic Chemistry", S. Chand
4. R. Gopalan, P.S. Subramanian &K. Rengarajan," Elements of Analytical Chemistry.
5. Chemistry of Natural Products, Gurdeep Chatwal, HPH

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Choice Based Credit System

Course:	**II-B. Sc. (Physics, CND, Zoo & Botany)**	**Semester : III**
Course Category :	**DSE**	**Maximum Marks**
Course Title:	**Chemistry Practical – I- Volumetric Analysis**	**CIA: 05 Marks**
Course Code:	**D0313**	**ESE: 20 Marks**
Hour of Instruction:	**2 hrs. / week**	**Total: 25 Marks**

No. of Credits - 1 **Hours of Instruction: 2 Hrs./week**

Volumetric Analysis

1. Determination of Sodium Hydroxide and Sodium Carbonate in a mixture using selective Indicator Method.
2. Analysis of Aspirin using standard oxalic acid and sodium hydroxide as link.
3. Determination of Mohr's salt using standard ferrous sulphate and potassium permanganate as link solution.
4. Determination of oxalic acid using standard ferrous ammonium sulphate and potassium permanganate as link solution.
5. Determination of Mg^{2+} using standard $MgSO_4$ solution and EDTA as link.
6. Determination of hardness of water by EDTA method.

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Choice Based Credit System

Course:	**II-B. Sc. (Physics, CND, Zoo & Botany)**	**Semester : III**
Course Category :	**DSE**	**Maximum Marks**
Course Title:	**Chemistry Practical – I- Volumetric Analysis**	**CIA: 05 Marks**
Course Code:	**D0313**	**ESE: 20 Marks**
Hour of Instruction:	**2 hrs. / week**	**Total: 25 Marks**

Examination: Scheme of Valuation

Time: 3 Hrs. ESE: 20 Marks

1. Anyone of the experiment quoted in the syllabus (Lab work).
2. Candidates shall write the brief procedure in a separate paper and submit the same within ten minutes which is to be valued by the examiners.
3. After collecting the brief procedure, the correct procedure for Question – 1 shall be dictated to the students.

4. Model Question: Determine the amount of crystalline ----------present in the whole of the given solution. You are provided with ----- N solution and a suitable link solution.

Scheme of valuation:

Brief Procedure - 3 marks
Experiment ---- 12 marks
Record - 5 marks
Total - 20 marks

Calculation of Error

Up to 2% -- 12 marks
Up to 3 % -- 10 marks
UP to 4 % - 8 marks
5% and above - 2 marks (For wrong calculation reduce 1 mark)

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Choice Based Credit System

Course:	**II-B. Sc. (Physics, CND, Zoo & Botany)**	**Semester : IV**
Course Category :	**DSE**	**Maximum Marks**
Course Title:	**Chemistry –II**	**CIA: 15 Marks**
Course Code:	**D0317**	**ESE: 60 Marks**
Hour of Instruction:	**4 hrs. / week**	**Total: 75 Marks**

No. of Credits – 4 **Duration: 60 Hrs**

Objectives:

1. To learn the principles of chemical kinetics, catalysis.
2. To learn about carbohydrate, nucleic acids, organic polymers and proteins.
3. To learn about different types of dyes and important medicines.

UNIT –I

Chemical kinetics (12 Hrs.)

Scope of chemical kinetics – order and molecularity of reactions – rate law and rate constant – determination of order of reaction (any two methods) – Half-life of Zero and first order reaction.

Photochemistry: Laws of photochemistry – Grothus law, Stark-Einstein –law of photochemical equivalence. Chemiluminescence, Fluorescence and Phosphorescence.

Catalysis: Types, characteristics of catalysis –mechanism of catalysis.

UNIT – II (12 Hrs.)

Carbohydrates: Classification – preparation and reactions of glucose, fructose. Structure of sucrose and Maltose. – Derivatives of starch and cellulose.

Nucleic acids: DNA and RNA – composition and structure of DNA and RNA– differences between DNA and RNA.

UNIT – III (12 Hrs.)

Organic Polymers:

Classification of Polymers-preparation and uses of Nylon 6,6, Polythene, Polystyrene and PVC – synthetic rubber – Buna – S and Neoprene rubber – preparation and uses.

Proteins – Classification of proteins – 1^o, 2^o, 3^o and 4^o structures of protein – tests for proteins.

UNIT – IV **(12 Hrs.)**

Color and Constitution: Theories of color and constitution.

Dyes: Classification – nitro and nitroso dyes – azo dyes – Phthalein dyes - triphenylmethane dyes – anthraquinone dyes – indigo dyes.

UNIT - V **(12 Hrs.)**

Pharmaceuticals:

Classification of Drugs – analgesics – antipyretics – antimalarials – antiseptics – antibiotics - Penicillin and Chloromycetin (Structural elucidation and synthesis not required).

Fuels – Types of coal and uses – Petroleum fractions including LPG – conversion of biomasses into fuels.

Textbooks and References

1. B.S. Bahl and Arun Bahl , 'A Textbook of Organic Chemistry' S. Chand
2. M.K. Jain and S.C. Sharma," Modern organic Chemistry"
3. B.R. Puri & Sharma," Essentials of Physical Chemistry "Vishal

Bharathidasan Government College for Women (Autonomous), Puducherry
Department of Chemistry
Choice Based Credit System

Course:	**II-B. Sc. (Physics, CND, Zoo & Botany)**	**Semester : IV**
Course Category :	**DSE**	**Maximum Marks**
Course Title:	**Chemistry Practical – II- Organic Qualitative Analysis**	**CIA: 05 Marks**
Course Code:	**D0318**	**ESE: 20 Marks**
Hour of Instruction:	**2 hrs. / week**	**Total: 25 Marks**

No. of Credits - 1

Organic Qualitative analysis of compounds containing single functional group

1. Phenols
2. Carboxylic Acids (mono and di)
3. Aldehydes
4. Ketones
5. Aromatic Primary amines
6. Reducing Sugars
7. Urea

(a) Other Experiments:

(b) Determination of melting point of organic compounds (M.Pt. 100 ^{o} C)

1. Determination of viscosity of a given liquid using Ostwald's Viscometer
2. Crystallization of Organic compounds
3. Chromatographic separation of mixture (Paper Chromatography- For Demonstration only)

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Course:	**II-B. Sc. (Physics, CND, Zoo & Botany)**	**Semester : IV**
Course Category :	**DSE**	**Maximum Marks**
Course Title:	**Chemistry Practical – II- Organic Qualitative Analysis**	**CIA: 05 Marks**
Course Code:	**D0318**	**ESE: 20 Marks**
Hour of Instruction:	**2 hrs. / week**	**Total: 25 Marks**

Scheme of valuation

Time: 3 Hours **ESE: 20 Marks**

1. Analyze systematically the given organic substance and report for the following:
   (a) Saturated /Unsaturated:
   (b) Aromatic / Aliphatic:
   (c) Elements present /absent:
   (d) Functional Group: (10 marks)
2. Determine the m.pt. of the given organic substances. (5 marks)
3. Record (5 marks)

Scheme of Valuation:

1. Organic Analysis: Anyone of the organic substances given in the syllabus (lab work) containing only one functional group shall be given.

   (a) Saturated /Unsaturated - 2 marks (Spotting without procedure – 1)

   (b) Aromatic / Aliphatic - 2 marks (Spotting without procedure - 1)

   (c) Elements present /Absent - 3 marks (Spotting without procedure – 2)

2. Any one of the experiments quoted in (b) of the lab work shall be give (Chromatographic separation to be avoided)
   a. M. Pt. determination - Full mark up to + 5 ^{o} C (Beyond + 5 ^{o} C, for every 5^{O} C reduce 1 Mark)
   b. For Determination of Viscosity - Full mark for error up to + 10%

5. Regulation

5.1 Eligibility for Admission

H.Sc., (+2) or its equivalent with 55% marks in Physics, Chemistry, Mathematics or Physics, Chemistry, Biology Proficiency in English Communication.

5.2 Duration of the Programme

The Programme duration is Three Academic years, containing Six Semesters.

5.3 Medium of Instruction

The Medium of Instruction is English

5.4 Scheme of Examination

The End-Semester Examination (ESE) for each course carries a maximum of 75 Marks and the Continuous Internal Assessment (CIA) is for 25 Marks.

The practical Examination scheme has four components in it.

a) Performing the Experiment
b) Writing Principle / formula / Unit / Table / Terms involved in it
c) Record
d) Viva

5.5 Components of Internal Assessments:-

Announced / Unannounced Tests	-	5 Marks
Assignment	-	5 Marks
Attendance	-	5 Marks
Model Examination	-	10 Marks
Total	-	25 Marks

5.6 Attendance Scale

96% to 100%	-	5
91% to 95%	-	4
86% to 90%	-	3
81% to 85%	-	2
76% to 80%	-	1
Below 75%	-	Admissible for the Examination with Condonation Fee.
Below 60%	-	Not admissible to appear for the Examination.

5.7 Criteria for 'Pass Mark'

Minimum Pass Mark	-	40

No Minimum Pass Mark for Internal Assessment

Minimum Pass Mark for ESE	-	30