



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
(AUTONOMOUS)**

(Affiliated to Bharathidasan University, Tiruchirappalli)
Accredited by NAAC-An ISO 9001:2015 Certified Institution
SUNDARAKKOTTAI, MANNARGUDI-614016.
TAMILNADU, INDIA.

B.Sc., CHEMISTRY
CHOICE BASED CREDIT SYSTEM- LEARNING OUTCOMES BASED
CURRICULUM FRAME WORK (CBCS-LOCF)
(For the candidates admitted in the academic year 2023-2024)

CHOICE BASED CREDIT SYSTEM

The credit-based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice-based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning. Our college has moved to CBCS and implemented the grading system.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications are awarded on the basis of demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study. The expected learning outcomes are used as reference points that would help to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general guidance for articulating the essential learnings associated with programmes of study and courses within a programme, maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility and provide higher education institutions an important point of

reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

Some important aspects of the Outcome Based Education Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally, three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation.

POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs): PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC) A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE) Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

Generic Elective Courses An elective course chosen generally from an **unrelated discipline/subject**, with an intention to seek exposure is called a Generic Elective. Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Non Major Elective (NME). A student shall choose at least two Non – major Elective Courses (NME) from outside his /her department. Non –Major Elective I – Those who choose Tamil in Part

I can choose a non –major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level or b) Special Tamil if Tamil language was studied up to 10th & 12th std.

Skill Enhancement Courses (SECs) These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Undergraduate Programme:

Programme Pattern: The Under Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part -I: Languages (Tamil / Hindi / French / Sanskrit)

Part-II: General English

Part-III: Core Course (Theory, Practicals, Generic Elective courses, Discipline Specific Elective courses, Compulsory and Optional Allied courses, Project)

Part-IV: Non-Major Elective, Foundation Course, Value Education, Environmental studies, Skill Enhancement Courses/ Soft Skills, Internship / field visit / industrial visit/ Case Study), Professional Competency Course

Part –V

Extension activity, Gender studies

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks

Passing Minimum: 40 %

Assignment-3	=	30%
Test-3 (Best 2 out of 3)	=	50%
Seminar	=	10%
Attendance	=	10%

Question Paper Pattern

Part A:

Part A 1 (10X1=10 marks)

One word question/ Fill in/ Match the following/True or False/ Multiple Choice Questions
Two Questions from Each unit

Part A 2 (5X2=10 marks)

Short Answers

One question from Each unit

Total Marks – 20

Part B: (5X5=25 marks)

Paragraph Answers

Either/ or type, One Question from each unit

Part C: (10X3=30)

Essay Type Answers

Answer 3 out of 5 Questions

One Question from each unit

Part A: K1 Level

Part B: K2, K3 and K4 Level

Part C: K5 and K6 Level

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/ Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K- LEVELS →	Lower Order Thinking			Higher Order Thinking			Total
	K1	K2	K3	K4	K5	K6	
END SEMESTER EXAMINATIONS (ESE)	20	25			30		75
Continuous Internal Assessment (CIA)	20	25			30		75
QUESTION PATTERN FOR END SEMESTER EXAMINATION/Continuous Internal Assessment							
PART							MARKS
PART –A I. (No choice, One Mark) TWO questions from each unit					(10x1 =10)		20
II. (No choice, Two Mark) ONE question from each unit					(5x2 =10)		
PART -B (Either/ or type ,5-Marks) ONE questions from each unit					(5x5 =25)		25
PART -C (3 out of 5) (10 Marks) ONE question from each unit					(3x10 =30)		30
Total							75

BLUE PRINT OF QUESTION PAPER FOR END SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.				Max Mark : 75			
K- LEVELS	K1	K2	K3	K4	K5	K6	Total Marks
PART							
PART –A (One Mark, No choice) (10x1 =10)	10						10
(2-Marks, No choice) (5x2=10)	10						10
PART –B (5- Marks) (Either/or type) (5x5=25)		5	10	10			25
PART -C (10 Marks) (3 out of 5) (3x10=30)							
Courses having only K5, K6 levels, K5 level- 3 Questions, K6 level- 2 Questions (One K6 level question is compulsory)					20	10	30
Total	20	05	10	10	20	10	75

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

Grade Point Average (GPA) will be calculated from the first semester onwards for all semester. From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), respectively. These two are calculated by the following formulae:

$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$	$\text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^n C_i M_i}{\sum_{i=1}^n C_i}$
<p>Where,</p> <p style="margin-left: 40px;">C_i is the Credit earned for the Course i G_i is the Grade Point obtained by the student for the Course i M_i is the marks obtained for the course i and n is the number of Courses Passed in that semester.</p>	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

1. For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.
2. For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management as Outstanding/Excellent/Very Good/Good/Above Average/Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in the all the Five parts of the Programme.
3. Grade in Part –IV and Part-V shall be shown separately and it shall not be taken into account for classification.
4. A Pass in PART- V will be mandatory although the marks will not count for the calculation of the CGPA.
5. Absence from an examination shall not be taken an attempt.

Table-1: Grading of the Courses - UG

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
40 and above and below 50	5	C
Below 40	NA	RA

The candidate's performance in every current semester is indicated by **Semester Grade Point Average (SGPA)** and from the second semester onwards, the continuous performance including previous semester /s is indicated by **Cumulative Grade Point Average (CGPA)**.

Table-3: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re-appearance

The candidates who have passed in the first appearance and within the prescribed duration of the UG programme are eligible. If the candidate's Grade is O/A+ with more than one attempt, the performance is fixed as "Very Good".

VISION

To Empower the women students by providing excellent theoretical, practical and research skills in Chemistry to meet the global needs.

MISSION

- Providing quality education in the principles, theory and practice of Chemistry
- Making the students to cope up with the requirements of industry and service sectors
- Excelling in teaching, research, knowledge transfer and to serve the social, cultural and economic needs of the nation.

PROGRAMME OUTCOMES FOR B.Sc.,DEGREE PROGRAMME

PO No.	Programme Outcomes (Upon completion of the B.Sc. Degree Programme, the Undergraduate will be able to)
PO-1	Disciplinary knowledge: Demonstrate comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate program of study in Bachelor of Science.
PO-2	Critical thinking, Problem Solving and Reflective thinking: think critically about the issues and identify, critically analyze and solve problems from the disciplines of concern using appropriate tools and techniques and the knowledge, skills and attitudes acquired and extrapolate the same to real life situations; show critical sensibility to life experiences, with self-awareness and reflexivity of both self and society.
PO-3	Analytical & Scientific Reasoning: evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints; critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.
PO-4	Research-related Skills: develop a sense of capability for relevant/appropriate inquiry and asking questions, synthesize, articulate and report results and to recognize and predict cause and effect relationships, define problems, formulate and establish hypothesis, analyze and interpret and draw conclusions from data, execute and report the results of an experiment or investigation.
PO-5	Digital literacy and Effective Communication: use ICT in a variety of learning situations and speak, read, write and listen clearly in person and through electronic media in English and in one or more Indian languages, and make meaning of the world by connecting people, ideas ,books, media and technology; efficiently communicate thoughts and ideas in a clear and concise manner.
PO-6	Individual and Team Work: effectively accomplish tasks individually as well as work effectively and respectfully as member or leader with diverse teams, facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interest so for a common cause and work efficiently as a member of a team.
PO-7	Multicultural Competence and Social Interaction: understand the values and beliefs of multiple cultures, global perspectives, engage and interact respectfully with diverse groups and elicit views of others, mediate disagreements and help reach conclusions in group settings.
PO-8	Awareness of Ethical issues, Human values and Gender Issues: embrace moral/ethical values in conducting one’s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work and understand the value of relationship between self and the community and aware of the various issues concerning women and society.
PO-9	Awareness of Environment and Sustainability: understand the impacts of technology and business practices in societal and environmental contexts, and sustainable development.
PO-10	Self-directed and Lifelong learning: acquire knowledge and skills, including learning “how to learn”, that are necessary for participating in learning activities throughout life and to engage in independent and life-long learning in the broadest context of socio-technological changes.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc. Chemistry

PSO No.	Programme Specific Outcomes <i>(Upon completion of the Course, the Student will be able to)</i>
PSO-1	Acquire in-depth knowledge of the fundamental concepts in all disciplines of Chemistry.
PSO-2	Disseminate the basics of chemistry and advanced topics and analytical Skills in Organic, Inorganic and Physical Chemistry.
PSO-3	Develop creativity in academics and research.
PSO-4	Apply digital tools to collect, analyze and interpret data and present scientific findings
PSO-5	Gain competence to pursue higher education and career opportunities in chemistry and allied fields
PSO-6	Exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities
PSO-7	Apply the concepts of Chemistry to solve problems in the community, entrepreneurial and research pursuits
PSO-8	Exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community



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**B. Sc CHEMISTRY COURSE STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM-
LEARNING OUTCOMES BASED CURRICULUM (CBCS-LOCF)**

(For the candidates admitted from the academic year 2023-2024)

ELIGIBILITY: A Pass in 10+2 with Chemistry and Maths / Biology or Botany / Zoology as two of the core subjects.

Sem	Part	Nature of the Course	Course Code	Title of the course	T.In. Hrs/ Week	Ins. Hours/ Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
I	I	Language Course- I	U23LC101	Pothu Tamil-I	6	5	1	-	-	3	3	25	75	100
	II	English Language Course-I	U23ELC101	General English-I	6	5	1	-	-	3	3	25	75	100
		Core Course-I	U23CH101	General Chemistry-I	5	4	1	-	-	5	3	25	75	100
		Core Practical-I	U23CH102P	Quantitative Inorganic estimation and inorganic preparations(P)	4	-	-	4	-	4	3	25	75	100
	III	Allied Course-I	U23AMM101/ U23ABO101	Mathematics – I (Calculus) / Allied Botany – I	3	2	1	-	-	2	3	25	75	100
		Allied Course-II/ Allied Practical-I	U23AMM102/ U23ABO102P	Mathematics – II (Algebra and Analytical Geometry)/ Allied Botany Practical	2	2	-	-	-	-	-	-	-	-
		Non-Major Elective-I	U23NMECH11		2	2	-	-	-	2	3	25	75	100
	IV	Foundation Course-I	U23FCCH11	Fundamentals of Chemistry	2	2	-	-	-	2	3	25	75	100
TOTAL					30	20	4	6	-	21	-	-	-	700
II	I	Language Course- II	U23LC202	Pothu Tamil-II	6	5	1	-	-	3	3	25	75	100
	II	English Language Course – II	U23ELC202	General English-II	6	5	1	-	-	3	3	25	75	100

Sem	Part	Nature of the Course	Course Code	Title of the course	T.In. Hrs/ Week	Ins. Hours/ Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
	III	Core Course-II	U23CH203	General Chemistry–II	5	4	1	-	-	5	3	25	75	100
		Core Practical-II	U23CH204P	Qualitative Organic Analysis and Preparation of Organic Compounds(P)	4	-	-	4	-	4	3	25	75	100
		Allied Course-II/ Allied Practical-I	U23AMM102/ U23ABO102P	Mathematics-II (Algebra and Analytical Geometry) / Allied Botany Practical	2 2	2 -	- -	- 2	- -	2 2	3	25	75	100
	Allied Course – III	U23AMM203/ U23ABO203	Mathematics – III (Trigonometry and Fourier Series) /Allied Botany II	3	2	1	-	-	2	3	25	75	100	
	Non-Major Elective-II	U23NMECH22		2	2	-	-	-	2	3	25	75	100	
	IV	Skill Enhancement Course-I	U23SECCH21	Cosmetics and Personal Grooming	2	2	-	-	-	2	3	25	75	100
	TOTAL					30	20	4	6	-	23	-	-	-
III	I	Language Course– III		Pothu Tamil-III	6	5	1	-	-	3	3	25	75	100
	II	English Language Course – III		General English-III	6	5	1	-	-	3	3	25	75	100
	III	Core Course-III		General Chemistry–III	5	4	1	-	-	5	3	25	75	100
		Core Practical -III		Qualitative Inorganic Analysis(P)	4	-	-	4	-	4	3	25	75	100
	Allied Course-IV		Allied Physics- I	3	2	1	-	-	2	3	25	75	100	
	Allied Practical -V		Allied Physics Practical	2	-	-	2	-	--	--	--	--	--	
	IV	Skill Enhancement Course-II		Entrepreneurial Skills in Chemistry	2	-	-	2	-	2	3	25	75	100
Skill Enhancement Course—III			Pesticide Chemistry	2	2	-	-	-	2	3	25	75	100	
TOTAL					30	18	4	8	-	21	-	-	-	700
	I	Language Course– IV		Pothu Tamil-IV	6	5	1	-	-	3	3	25	75	100
	II	English Language Course		General English-IV	6	5	1	-	-	3	3	25	75	100

Sem	Part	Nature of the Course	Course Code	Title of the course	T.In. Hrs/ Week	Ins. Hours/ Week				Credit	Exam Hours	Marks		Total
						L	T	P	S			CIA	ESE	
						IV		- IV						
III		Core Course -IV		General Chemistry–IV	5	4	1	-	-	5	3	25	75	100
		Core Practical- IV		Physical Chemistry Practical-I	4	-	-	4	-	4	3	25	75	100
		Allied Practical-V		Allied Physics Practical	2	-	-	2	-	2	3	25	75	100
		Allied Course -VI		Allied Physics -II	3	2	1	-	-	2	3	25	75	100
		Skill Enhancement Course -IV		Instrumental Methods of Chemical Analysis	2	2	-	-	-	2	3	25	75	100
IV		Skill Enhancement Course -V		Forensic Science	2	2	-	-	-	2	3	25	75	100
		TOTAL			30	20	4	6	-	23	-	-	-	800
V		Core Course –V		Organic Chemistry-I	5	4	1	-	-	5	3	25	75	100
		Core Course –VI		Inorganic Chemistry	5	4	1	-	-	4	3	25	75	100
		Core Course-VII		Physical Chemistry–I	6	5	1	-	-	5	3	25	75	100
		Core Practical- V		Physical Chemistry Practical-II	4	-	-	4	-	4	3	25	75	100
		Elective Course-I		Biochemistry	4	3	1	-	-	3	3	25	75	100
		Elective Course -II		Industrial Chemistry	4	3	1	-	-	3	3	25	75	100
		Environmental Studies		Environmental Studies	2	2	-	-	-	2	3	25	75	100
IV		Internship/ Industrial visit/ Field visit		Internship/ Industrial visit/ Field visit	-	-	-	-	-	2	-	-	-	-
		TOTAL			30	21	5	4	-	28		-	-	700
VI	III	Core Course-VIII		Organic Chemistry – II	6	5	1	-	-	4	3	25	75	100
		Core Course—IX		Physical Chemistry -II	6	5	1	-	-	4	3	25	75	100
		Core Project- X		Group Project with viva voce /Research Topics	5	1	-	4	-	5	3	25	75	100
		Elective Course-III		Fundamentals of Spectroscopy	4	3	1	-	-	3	3	25	75	100

Sem	Part	Nature of the Course	Course Code	Title of the course	T.In. Hrs/Week	Ins. Hours/Week				Credit	Exam Hours	Marks		Total	
						L	T	P	S			CIA	ESE		
								Elective Course-IV				Polymer Science	4		3
IV		Value Education		Value Education	2	2	-	-	-	2	3	25	75	100	
		Professional Competency Course		Training for Competitive Examinations	2	2	-	-	-	2	3	25	75	100	
V		Extension activity		Extension activity	-	-	-	-	-	1	-	-	-	-	
		Gender Studies		Gender Studies	1	1	-	-	-	1	3	25	75	100	
TOTAL					30	22	4	4	-	25	-	-	-	800	
Grand Total					180	121	25	34	-	141	-	-	-	4500	
Extra Credit					MOOC/SWAYAM/NPTEL (At least one per year)						2	-	-	-	-
					Value added Courses (At least one per year)								2	-	-

L-Lecture

T- Tutorial

P-Practical

S-Seminar

Credit Distribution for UG PROGRAMME: CHEMISTRY

S. No	Part	Subject	No. of Courses	Total Credits
1	I	Language Course	4	12
2	II	English Language Course	4	12
3	III	Core Course	9	42
4		Core Practical	5	20
5		Core Project	1	05
6		Allied Course	4	08
7		Allied Practical	2	04
8		Elective Course	4	12
9	IV	Non-Major Elective	2	04
10		Foundation Course – FC	1	02
12		Skill Enhancement Course	5	10
13		Internship/ Industrial visit/ Field visit	1	02
14		Environmental Studies	1	02
15		Value Education	1	02
16		Professional Competency Skill	1	02
17	V	Extension Activity	1	01
		Gender Studies	1	01
Total			47	141

Note:

	CIA	ESE
1 Theory	25	75
2 Practical	25	75
3 Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

NONMAJOR ELECTIVE (NME) OFFERED BY**THE DEPARTMENT**

Semester	Part	Course	Course code	Title of the Course
I	IV	NME-I	U23NMECH11	Food Chemistry
II	IV	NME- II	U23NMECH22	Diary Chemistry

EXTRA CREDIT COURSE-VALUE ADDED COURSE**OFFERED E DEPARTMENT**

Semester	Course	Course Code	Title of the Course
I	VAC-I	U23CHVA1	Agricultural Chemistry
II	VAC-II	U23CHVA2	Applied Chemistry

SEMESTER I

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(For the Candidates admitted in the academic year 2023 – 2024)



DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: I-CC-I: General Chemistry-I

Ins. Hrs. /Week: 5

Course Credit: 5

Course Code: U23CH101

UNIT I: ATOMIC STRUCTURE AND PERIODIC TRENDS

(12 Lectures)

Development and History of atom (J. J. Thomson, Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter- De- Broglie wavelength-Davisson and Germer experiment Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions- Hund's rule, Pauli 'exclusion principle and Aufbau principle; Hund's rule of maximum multiplicity – electronic configuration. Stability associated with half-filled and completely filled orbitals. Inert Pair effect.

UNIT II: INTRODUCTION TO QUANTUM MECHANICS

(14 Lectures)

Classical mechanics:

Wave mechanical model of atom, distinction between a Bohr orbit and Orbital; Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation - Probability and electron density-visualizing the orbitals -Probability density and significance of Ψ and Ψ^2 .

Modern Periodic Table

Cause of periodicity;

Features of the periodic table; classification of elements – Periodic trends for atomic size- atomic radii, Ionic, crystal and Covalent radii; ionization energy, electron affinity, electronegativity-electronegativity scales, applications of electronegativity. Problems involving the core concept

UNIT III: STRUCTURE AND BONDING - I

(14 Lectures)

Ionic bond:

Lewis dot structure of ionic compounds; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies, Madelung constant; relative effect of lattice energy and solvation energy; Ion polarization- polarizing power and polarizability; Fajans' rules - effects of polarization on properties of compounds; problems involving the core concepts

Covalent bond:

Shapes of orbitals, overlap of orbitals – σ and Π bonds- directed valency, hybridization; VSEPR theory - shapes of molecules of the type AB₂, AB₃, AB₄, AB₅, AB₆ and AB₇

UNIT-IV: STRUCTURE AND BONDING – II

(14 Lectures)

VB theory – application to hydrogen molecule; concept of resonance resonance structures of some inorganic species – CO₂, NO₂, CO₃²⁻, NO₃⁻; limitations of VBT; MO theory - bonding, antibonding and nonbonding orbitals, bond order; MO diagrams of H₂, C₂, O₂, O₂⁺, O₂⁻, O₂²⁻, N₂, NO, HF, CO₂; magnetic characteristics, comparison of VB and MO theories.

Coordinate bond:

Definition, Formation of BF₃, NH₃, NH₄⁺, H₃O⁺ properties, Metallic bond-electron sea model, VB model; Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors

Weak Chemical Forces - Vander Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions. Repulsive forces; Hydrogen bonding – Types, special properties of water, ice, stability of DNA; Effects of chemical force, melting and boiling points.

UNIT-V: BASIC CONCEPTS IN ORGANIC CHEMISTRY AND ELECTRONIC

EFFECTS

(12 Lectures)

Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates; types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrenes.

Inductive effect - reactivity of alkyl halides, acidity of halo acids, basicity of amines; inductomeric and electrometric effects. Resonance – resonance energy, conditions for resonance - acidity of

phenols, basicity of aromatic amines, stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, bond lengths; steric inhibition to resonance.

Hyperconjugation - stability of alkenes, bond length, orienting effect of methyl group, dipole moment of aldehydes and nitromethane. Types of organic reactions- addition, substitution, elimination and rearrangement.

Total lecture Hours: 75

COURSE OUTCOME

The students should be able to

CO1: Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds

CO2: Classify the elements in the periodic table, types of bonds, reaction intermediates electronic effects in organic compounds, types of reagents.

CO3: Apply the theories of atomic structure, bonding, to calculate energy of a spectral transition, electronegativity, percentage ionic character and bond order.

CO4: Evaluate the relationship existing between electronic configuration, bonding, geometry of molecules and reactions; structure reactivity and electronic effects

CO5: Construct MO diagrams, predict trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanism

TEXT BOOKS

1. Madan, R. D. and Sathya Prakash, Modern Inorganic Chemistry, 2nd ed.; S.Chand and Company: New Delhi, 2003.
2. Rao, C.N. R. University General Chemistry, Macmillan Publication: New Delhi, 2000.
3. Puri, B. R. and Sharma, L. R. Principles of Physical Chemistry, 38th ed.; Vishal Publishing Company: Jalandhar, 2002.
4. Bruce, P. Y. and Prasad K. J. R. *Essential Organic Chemistry*, Pearson Education: New Delhi, 5. 2008.
6. Dash UN, Dharmarha OP, Soni P.L. Textbook of Physical Chemistry,

Sultan Chand & Sons: New Delhi, 2016.

7. Glasstone Lewis, D. Elements of Physical Chemistry, London, Mac Millan & Co Ltd.
8. Puri, B.R, Sharma LR, Pathania MS. 2013. Principles of Physical Chemistry, 35th edition, New Delhi: Shoban Lal Naginchand and Co.
9. Banerjee, S.P. Advanced Inorganic Chemistry 2nd edn, Vol-1, Arunabha Sen, Books and Allied (P) Ltd., Kolkata, 2017.
10. Puri, B.R, Sharma, L.R and Pathania, 2017. M.S. Principles of Physical chemistry. 47th edn, Vishal Publishing Co
10. Kundu, N. and Jain, S.K. 2000 Physical Chemistry, S. Chand & Company Ltd.

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2. Jerry March, 2013. "Advanced Organic Chemistry, Reaction, Mechanism and Structure", 7th Edition, Wiley Inter Science
3. Lee, J.D, 2000. 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons.
4. Madan, R Maron, S. H. and Prutton C. P. Principles of Physical Chemistry, 4th ed.; The Macmillan Company: New York, 1972.
5. Lee, J. D. Concise Inorganic Chemistry, 4th ed.; ELBS William Heinemann: London, 1991.
6. Gurdeep Raj, Advanced Inorganic Chemistry, 26th ed.; Goel Publishing House: Meerut, 2001.
7. Atkins, P.W. & Paula, J. Physical Chemistry, 10th ed.; Oxford University Press: New York, 2014.
8. Hughey, J. E. Inorganic Chemistry: Principles of Structure and Reactivity,
9. Mathan .D. 2000. "Modern Inorganic Chemistry", 2nd edition, Chand .S & Company Ltd
10. Morrison, R.T and Boyd, Bhattacharjee .R. N, S.K. 2011. Organic Chemistry (7th edition), Pearson, India.

E-RESOURCES

1. <https://www.acs.org/content/acs/en/education/whatischemistry/periodictable/educational-resources-for-ages-15-18.html>
2. [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_\(Inorganic_Chemistry\)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements)
3. <https://onlinecourses.nptel.ac.in>
4. http://www.ias.ac.in/initiat/sci_ed/resources/chemistry/Inorganic.html
5. <https://swayam.gov.in/course/64-atomic-structure-and-chemical-bonding>



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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: I-CP-I: Quantitative Inorganic Estimation (titrimetry) and Inorganic Preparations(P)

Ins. Hrs. /Week: 4

Course Credit: 4

Course Code: U23CH102P

UNIT I: Chemical Laboratory Safety in Academic Institutions (10 hours)

Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.

Common Apparatus Used in Quantitative Estimation (Volumetric)

Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.

Principle of Quantitative Estimation (Volumetric)

Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations; indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.

UNIT II (30 hours)

Quantitative Estimation (Volumetric)

Preparation of standard solution, dilution from stock solution

1. Permanganometry

Estimation of sodium oxalate using standard ferrous ammonium sulphate.

2. Dichrometry

Estimation of ferric alum using standard dichromate (external indicator)

Estimation of ferric alum using standard dichromate (internal indicator)

3. Iodometry

Estimation of copper in copper sulphate using standard dichromate

4. Argentimetry

Estimation of chloride in barium chloride using standard sodium chloride/

Estimation of chloride in sodium chloride (Volhard's method)

UNIT III: Complexometry (20Hours)

1. Estimation of hardness of water using EDTA

2. Estimation of iron in iron tablets

3. Estimation of ascorbic acid.

4. Preparation of Inorganic compounds-

1. Potash alum

2. Tetraammine copper (II) sulphate

3. Hexammincobalt (III) chloride

4. Mohr's Salt

Total Hours: 60 hours

Scheme of Valuation: Max. Marks

Record 10 (Marks)

Procedure Writing 10(Marks)

Results

<1% - 45 Marks

1-2% -35 Marks

2-3% -25 Marks

3- 4% - 15 Marks

>4% - 10 Marks

Preparation - 10 Marks

Total Marks: 75 Marks

COURSE OUTCOME

The student should able to

- CO1:** Explain the basic principles involved in titrimetric analysis and inorganic preparations
- CO2:** Compare the methodologies of different titrimetric analysis.
- CO3:** Calculate the concentrations of unknown solutions in different ways and develop the skill and estimate the amount of a substance present in a given solution.
- CO4:** Assess the yield of different inorganic preparations and identify the end point of various Titrations.
- CO5;** Handling the glassware and chemicals in a safety manner.

TEXT BOOKS

1. Venkateswaran ,V.Veerassamy ,R. Kulandaivelu ,A.R. 2006. Basic principles of Physical Chemistry Second edition, Sultan Chand & Sons, New Delhi.
2. Henry. W. Schimpf, A Text Book of Volumetric Analysis.
3. Gopalan, R. 2000. Elements of analytical chemistry, S. Chand, New Delhi.
4. Gnanapragasam, N,S,Ramamurthy , G. 1998. Organic Chemistry Lab Manual, Viswanathan, S. and Co. Pvt. Ltd. Chennai.
5. McPherson Peter , Practical Volumetric Analysis

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1. Peter McPherson. 2014. Practical Volumetric Analysis, Royal Society of chemistry.
2. Vogel's Text Book of Qualitative Chemical Analysis, 5th edn. ELBS/ Longman England.
3. Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.;
4. Vogel's Textbook of Quantitative Chemical Analysis, 6th ed.; Pearson Education Ltd: New Delhi, 2000.
5. Nad, A. K.; Mahapatra, B.; Ghoshal, A.; *An advanced course in Practical Chemistry*, 3rd ed.; New Central Book Agency: Kolkata, 2007.

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1. <https://www.accessengineeringlibrary.com/content/book/9780071745925/chapter/chapter25>
2. <https://chemistryvce.weebly.com/volumetric-analysis.html>
3. [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Quantifying_Nature/Volumetric_Chemical_Analysis_\(Shiundu\)/14.2%3A_Learning_Activity](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.2%3A_Learning_Activity)
4. <https://byjus.com/chemistry/volumetric-analysis/>
5. https://www.researchgate.net/publication/344658899_Volumetric_Analysis_-_Titration_for_Beginners

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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: I-NME-I: Food Chemistry-I

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: U23NMECH11

UNIT I: FOOD ADULTERATION

(8 Lecture)

Sources of food, types, advantages and disadvantages. Food adulteration – Contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.

UNIT -II: FOOD POISON

(4 Lecture)

Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) -Chemical poisons - First aid for poison consumed victims.

UNIT-III: FOOD ADDITIVES

(8 Lecture)

Food additives -artificial sweeteners – Saccharin - Cyclamate and Aspartate Food flavors - esters, aldehydes and heterocyclic compounds – Food colors– Emulsifying agents – preservatives -leavening agents. Baking powder –yeast – tastemakers – MSG - vinegar.

UNIT -IV: BEVERAGES

(4 Lecture)

Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addiction to alcohol– diseases of liver and social problems

UNIT-V: EDIBLE OILS

(6 Lecture)

Fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heart diseases- determination of iodine value, RM value, saponification value -Definition and determination and their significance

COURSE OUTCOME

The student should able to

- CO1:** Learn about Food adulteration - contamination of Wheat, Rice, Milk, Butter.
- CO2:** Get an awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion
- CO3:** Get an exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and Aspartate in the food industries.
- CO4:** Acquire knowledge on beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.
- CO5:** Study about fats and oils - Sources of oils - production of refined vegetable oils – preservation. Saturated and unsaturated fats –MUFA and PUFA.

TEXT BOOKS

1. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.
3. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010.
4. Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022.
5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi,

REFERENCES

1. H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4th Edition, 2009
2. M. Swaminathan, Food Science and Experimental Foods, Ganesh and Company, 1979.
3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and their applications Springer New York 2nd ed. 2008.
4. Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourth revised

and extended edition, 2009

5. Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.

E-RESOURCES

1. https://www.slideserve.com/adamma/foodchemistry/?utm_source=slideserve&utm_medium=website&utm_campaign=auto+related+load
2. <https://courseware.cutm.ac.in/courses/food-chemistry/>
3. <https://www.agrimoon.com/wp-content/uploads/Food-Chemistry.pdf>
4. <https://basicknowledge101.com/pdf/Food%20chemistry.pdf>
5. <https://testbook.com/learn/everyday-applications-of-chemistry-in-the-food-and-food-industry/>

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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: I-FC-I: Fundamentals of Chemistry

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: U23FCCH11

UNIT I: PERIODIC TABLE AND ORBITAL, HYBRIDISATION AND QUANTUM NUMBERS (6 Hours)

Symbols, Atomic number, atomic mass, Molecular mass, Elements – Groups, Periods – Shell - K, L, M, N and O – Orbitals s, p, d and f block elements – Halogens, Inert gases – Transition elements, Lanthanides, Actinides.

Shapes of orbitals – s, p, d and f orbitals - Aufbau Principle, Pauli exclusion principle – Hund's rule – Electronic configuration – Valency, SP , SP^2 , SP^3 , dsp^2 , SP^3d^2 , d^2SP^3 hybridisation – examples for hybridization – Four types of quantum numbers – Principal, azimuthal, magnetic and spin quantum numbers.

UNIT II: CHEMICAL BONDING AND NUCLEAR CHEMISTRY (6 Hours)

Types of Bonds – Ionic, Covalent, Coordination, metallic and hydrogen bonding – Intra molecular, intermolecular hydrogen bonding – examples.

Fundamental particles – Neutron, Proton and Electron - Isotopes, Isobars and Isotones, Nuclear isomerism - Radio isotopes, Radioactivity – types - α , β and γ rays, Radioactive Series, Nuclear forces, Half-life period, Radioactive disintegration, Group displacement law, Nuclear forces, Packing fraction, Mass defect.

UNIT III: FUNCTIONAL GROUPS AND NOMENCLATURE OF ORGANIC COMPOUNDS AND INORGANIC COMPOUNDS (6 Hours)

Hydrocarbons – Alkanes, Alkenes and Alkynes series – derivatives of hydrocarbon – acid, acid chloride, acid anhydride, ester, alcohol, ether, thioether, nitro, nitroso, azo, phenols, aldehydes, ketones, amines, amides etc.

Organic compounds – IUPAC Nomenclature – Hydrocarbons and their derivatives, carbocyclic compounds, heterocyclic compounds. Inorganic compounds – Nomenclature – Co-ordination compounds – metal ion, ligand, co-ordination number, complex ion – definition – Nomenclature of cationic, anionic and neutral complexes.

UNIT IV: ORGANIC REACTIONS AND THERMODYNAMICS AND SPECTROSCOPY (6 Hours)

Definition of Nucleophile and electrophile -Examples, Types of organic reactions – Addition, condensation, Elimination, Substitution, Polymerization and rearrangement reactions. Thermodynamics – Heat – Definition, Exothermic and Endothermic reaction First, Second and Third law – Entropy, enthalpy, internal energy – work, variables and functions, system and surroundings – spectroscopy – Definition, Wavelength, Frequency, Velocity, EMR- Radiation- Sources and Types. Monochromatic Light- Refraction, Reflection- Definition

UNIT V: ANALYTICAL TERMS AND TECHNIQUES (6 Hours)

Error -Accuracy, Mean, Median. Mode – Quantitative analysis and qualitative analysis definition – solvent, solute, Solution– Definition - example, precipitation -crystallization- Isolation – Separation techniques, Chromatography- Mobile phase, stationary phase- adsorption, eluent- Rf Value-Column, TLC, PAPER, HPTLC, HPLC

Total Lecture Hours: 30

COURSE OUTCOME

The students should be able to

- CO1:** Explain the shape of orbital and quantum numbers
- CO2:** Acquire the knowledge of chemical bonding and particles
- CO3:** Know about Nomenclature of organic Compounds
- CO4:** Discuss the types of organic reactions
- CO5:** Understand the analytical terms and techniques

TEXT BOOKS

1. Bahl, B.S, and Bahl, A., Advanced Organic Chemistry, (12th edition), 2010. New Delhi, Sultan Chand & Co.
2. Jerry March, 2013. “Advanced Organic Chemistry, Reaction, Mechanism and Structure”, 7th Edition, Wiley Inter Science
3. Lee, J.D, 2000. ‘Concise Inorganic Chemistry’, 20th revised edition, Sultan Chand & Sons.

4. Madan, R Maron, S. H. and Prutton C. P. Principles of Physical Chemistry, 4thed.; The Macmillan Company: Newyork, 1972.
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1. Bahl BS, Bahl A. 2010. Advanced Organic Chemistry, 12th edition, New Delhi, Sultan Chand & Co.,
2. Bahl BS, Arun Bahl and Tuli GD. 2012. Essentials of Physical Chemistry, New Delhi, Sultan Chand and Son
3. Jerry March. 2013. Advanced Organic Chemistry, Reaction, Mechanism and Structure, 7th Edition, Wiley Inter Science.
4. Lee JD. 2000. Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons.
5. Morrison RT, Boyd RN, Bhattacharjee SK. 2011. Organic Chemistry, 7th edition, Pearson India.

E-RESOURCES

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2. [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_\(Inorganic_Chemistry\)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements)
3. <https://onlinecourses.nptel.ac.in>
4. https://www.bamu.ac.in/Portals/0/B_Sc-III-Year-Syllabus-Sem_-V-%26-VI-%5BAAnalytical-Chemistry%5D-2011.pdf
5. [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Analytical_Chemistry_2.1_\(Harvey\)/01%3A_Introduction_to_Analytical_Chemistry](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Analytical_Chemistry_2.1_(Harvey)/01%3A_Introduction_to_Analytical_Chemistry)

SEMESTER II

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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: II-CC-II: General Chemistry-II

Ins. Hrs. /Week: 5

Course Credit: 5

Course Code: U23CH203

UNIT-I: ACIDS, BASES AND IONIC EQUILIBRIA (15 Hours)

Concepts of Acids and Bases - Arrhenius concept, Bronsted-Lowry concept- Lewis's concept; Relative strengths of acids, bases and dissociation constant; dissociation of poly basic acids, ionic product of water, pH scale, pH of solutions; Degree of dissociation, common ion effect, factors affecting degree of dissociation; acid base indicators, theory of acid base indicators – action of phenolphthalein and methyl orange, titration curves - use of acid base indicators;

Buffer solutions – types, mechanism of buffer action in acid and basic buffer, Henderson-Hasselbalch equation;

Salt hydrolysis - salts of weak acids and strong bases, weak bases and strong acids, weak acids and weak bases - hydrolysis constant, degree of hydrolysis and relation between hydrolysis constant and degree of hydrolysis - Solubility product - determination and applications;

UNIT -II: CHEMISTRY OF S & P- BLOCK ELEMENTS (15 Hours)

Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates and bicarbonates. Diagonal relationship of Li with Mg. Preparation, properties and uses of NaOH, Na₂CO₃, KBr, KClO₃ alkaline earth metals. Anomalous behavior of Be.

Chemistry of p- Block Elements (Group 13 & 14)

preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Alloys of Al. comparison of carbon with silicon. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per noncarbonates and per

decarbonates.

UNIT-III: CHEMISTRY OF P- BLOCK ELEMENTS, HALOGENS AND NOBLE GASES (15 Hours)

Chemistry of p- Block Elements (Group 15-18)

General characteristics of elements of Group 15; chemistry of $\text{H}_2\text{N-NH}_2$, NH_2OH , HN_3 and HNO_3 . Chemistry of PH_3 , PCl_3 , PCl_5 , POCl_3 , P_2O_5 and oxy acids of phosphorous (H_3PO_3 and H_3PO_4). General properties of elements of group 16 - Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides - oxides of sulphur and selenium - Oxy acids of sulphur (Caro's and Marshall's acids).

Chemistry of Halogens: General characteristics of halogen with reference to electronegativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Halogen acids (HF , HCl , HBr and HI), oxides and oxy acids (HClO_4). Inter-halogen compounds (ICl , ClF_3 , BrF_5 and IF_7), pseudo halogens [$(\text{CN})_2$ and $(\text{SCN})_2$] and basic nature of Iodine.

Noble gases: Position in the periodic table. Preparation, properties and structure of XeF_2 , XeF_4 , XeF_6 and XeOF_4 ; uses of noble gases - clathrate compounds.

UNIT-IV: HYDROCARBON CHEMISTRY-I (15 Hours)

Petroproducts: Fractional distillation of petroleum; cracking, isomerisation, alkylation, reforming and uses

Alkenes-Nomenclature, general methods of preparation - Mechanism of elimination reactions - E_1 and E_2 mechanism - factors influencing - stereochemistry - orientation - Hofmann and Saytzeff rules. Reactions of alkenes - addition reactions - mechanisms - Markownikoff's rule, Kharasch effect, oxidation reactions - hydroxylation, oxidative degradation, epoxidation, ozonolysis; polymerization.

Alkadienes

Nomenclature - classification - isolated, conjugated and cumulated dienes; stability of conjugated dienes; mechanism of electrophilic addition to conjugated dienes - 1, 2 and 1, 4 additions; free radical addition to conjugated dienes- Diels-Alder reactions - polymerization - polybutadiene, polyisoprene (natural rubber), vulcanization, polychloroprene.

Alkynes

Nomenclature; general methods of preparation, properties and reactions; acidic nature of terminal alkynes and acetylene, polymerization and isomerization.

Cycloalkanes: Nomenclature, Relative stability of cycloalkanes, Bayer's strain theory and its limitations. Conformational analysis of cyclohexane, mono and di substituted cyclohexanes. Geometrical isomerism in cyclohexane.

UNIT-V: HYDROCARBON CHEMISTRY – II

(15 Hours)

Benzene: Source, structure of benzene, stability of benzene ring, molecular orbital picture of benzene, aromaticity, Huckel's $(4n+2)$ rule and its applications. Electrophilic substitution reactions - General mechanism of aromatic electrophilic substitution - nitration, sulphonation, halogenation, Friedel-Craft's alkylation and acylation. Mono substituted and disubstituted benzene - Effect of substituent – orientation and reactivity.

Polynuclear Aromatic hydrocarbons: Naphthalene – nomenclature, Haworth synthesis; physical properties, reactions – electrophilic substitution reaction, nitration, sulphonation, halogenation, Friedel – Crafts acylation & alkylation, preferential substitution at 1 - position – reduction, oxidation – uses. Anthracene – synthesis by Elbs reaction, Diels – Alder reaction and Haworth synthesis; physical properties; reactions - Diels-Alder reaction, preferential substitution at C-9 and C-10; uses.

Total Lecture Hour: 75

COURSE OUTCOME

- CO1:** Explain the concept of acids, bases and ionic equilibria; periodic properties of s and p block elements, preparation and properties of aliphatic and aromatic hydrocarbons
- CO2:** Discuss the periodic properties of s and p- block elements, reactions of aliphatic and aromatic hydrocarbons and strength of acids
- CO3:** Classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons
- CO4:** Explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements
- CO5:** Assess the application of hard and soft acids indicators, buffers, compounds of s and p-block elements and hydrocarbons

TEXT BOOKS

1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nded, S.Chand and Company, New Delhi.
2. Sathya Prakash, Tuli G D, Basu S K and Madan R D, (2003), Advanced Inorganic Chemistry, 17th ed., S.Chand and Company, New Delhi.

3. Bahl B S, Arul Bhal, (2003), Advanced Organic Chemistry, 3rd ed., S.Chand and Company, New Delhi.
4. Tewari K S, Mehrothra S N and Vishnoi N K, (1998), Text book of Organic Chemistry, 2nd ed., Vikas Publishing House, New Delhi.
5. Puri B R, Sharma L R, (2002), Principles of Physical Chemistry, 38th ed., Vishal Publishing Company, Jalandhar.

REFERENCES

1. Maron S H and Prutton C P, (1972), Principles of Physical Chemistry, 4th ed., The Macmillan Company, Newyork.
2. Barrow G M, (1992), Physical Chemistry, 5th ed., Tata McGraw Hill, NewDelhi.
3. Lee J D, (1991), Concise Inorganic Chemistry, 4thed., ELBS WilliamHeinemann, London.
4. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure andReactivity, 4th ed., Addison Wesley Publishing Company, India.
5. Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed.,Goel Publishing House, Meerut

E-RESOURCES

1. <https://onlinecourses.nptel.ac.in>
2. http://cactus.dixie.edu/smbblack/chem1010/lecture_notes/4B.html
3. <http://www.auburn.edu/~deruija/pdareson.pdf><https://swayam.gov.in/course/64>
-atomic-structure-and-chemical-bonding
4. <http://nptel.ac.in/courses/104101090/>
5. <http://nptel.ac.in/courses/104101090/5>



**SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE
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SUNDARAKKOTTAI, MANNARGUDI-614016.

(For the Candidates admitted in the academic year 2023 – 2024)

DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: II-CP-II: Qualitative Organic Analysis and preparation of Organic compounds

Ins. Hrs. /Week: 4

Course Credit: 4

Course Code: U23CH204P

UNIT I

Safety rules, symbols and first-aid in chemistry laboratory-Basic ideas about Bunsen burner, its operation and parts of the flame. Chemistry laboratory glassware –basis information and uses.

UNIT II

Qualitative Organic Analysis (40 hours)

Preliminary examination, detection of special elements - nitrogen, Sulphur and halogens

Aromatic and aliphatic nature, Test for saturation and unsaturation, identification of functional groups using solubility tests

Confirmation of functional groups

- monocarboxylic acid, dicarboxylic acid
- monohydric phenol, polyhydric phenol
- aldehyde, ketone, ester
- carbohydrate (reducing and non-reducing sugars)
- primary, secondary, tertiary amine
- monoamide, diamide, thioamide
- anilide, nitro compound

Preparation of derivatives for functional groups

UNIT III Preparation of Organic Compounds (20 hours)

- i. Nitration - picric acid from Phenol
- ii. Halogenation - p-bromo acetanilide from acetanilide
- iii. Oxidation - benzoic acid from Benzaldehyde
- iv. Methyl benzoate to Benzoic acid
- v. Salicylic acid from Methyl Salicylate
- vi. Rearrangement - Benzil to Benzilic Acid
- Vii. Hydrolysis of benzamide to Benzoic Acid

4. Separation and Purification Techniques (Not for Examination)

1. Purification of organic compounds by crystallization (from water / alcohol) and distillation
2. Determination of melting and boiling points of organic compounds.
3. Steam distillation - Extraction of essential oil from citrus fruits/eucalyptus leaves.

5. Chromatography (any one) (Group experiment)

1. Separation of amino acids by Paper Chromatography
2. Thin Layer Chromatography - mixture of sugars / plant pigments
/Permanganatedichromate.
3. Column Chromatography - extraction of carotene, chlorophyll and xanthophyll from leaves / separation of anthracene - anthracene picrate.

6. Electrophoresis – Separation of amino acids and proteins(Demonstration)

Isolation of casein from milk/Determination of saponification value of oil or fat

Estimation of acetic acid from commercial vinegar. (Any one Group experiment)

(4,5& 6–not for ESE)

Total Hours: 60

Scheme of Valuation:	Max. Marks
Record	-10 (Marks)
Procedure Writing	-10 (Marks)
Qualitative Organic Analysis	- 35 Marks
Preparation	- 20 Marks
Total Marks	- 75 Marks

COURSE OUTCOME

CO1: Observe the physical state, odor, colour and solubility of the given organic compound.

CO2: Identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.

CO3: Compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and non-reducing sugars and explain the reactions behind it.

CO4: Exhibit a solid derivative with respect to the identified functional group.

CO5: Acquire the of Knowledge of handling of different chemicals

TEXT BOOKS

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi, 2012.

2. Manna, A.K. Practical Organic Chemistry, Books and Allied: India, 2018.

3. Gurtu, J. N.; Kapoor, R. Advanced Experimental Chemistry (*Organic*), Sultan Chand: New Delhi, 1987.

REFERENCES

4. S. Furniss, B. S.; Hannaford, A. J.; Smith, P. W. G.; Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, 5th ed.; Pearson: India, 1989.

5. *Vogel's Text Book of Qualitative Chemical Analysis*, 5th edn. ELBS/ Longman

England.Mendham, J.; Denney, R. C.; Barnes, J. D.; Thomas, M.; Sivasankar, B.;

E-RESOURCES

1.<https://www.accessengineeringlibrary.com/content/book/9780071745925/chapter/chapter25>

2. <https://chemistryvce.weebly.com/volumetric-analysis.html>

3.[https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Quantifying_Nature/Volumetric_Chemical_Analysis_\(Shiundu\)/14.2%3A_Learning_Activity](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.2%3A_Learning_Activity)

4. <https://www.vlab.co.in/broad-area-chemical-sciences>

5.<https://edu.rsc.org/practical/qualitative-tests-for-organic-functional-groups-practical-videos-16-18-students/4014327.article>

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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: II-NME--II: Dairy Chemistry

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: U23NMECH22

UNIT I: COMPOSITION OF MILK

(6 Hours)

Milk-definition-general composition of milk- constituents of milk - lipids, proteins, carbohydrates, vitamins and minerals - physical properties of milk - colour, odour, acidity, specific gravity, viscosity and conductivity -Factors affecting the composition of milk - adulterants, preservatives with neutralizer-examples and their detection- estimation of fat, acidity and total solids in milk.

UNIT II: PROCESSING OF MILK

(6 Hours)

Microbiology of milk - destruction of micro - organisms in milk, physico – chemical changes taking place in milk due to processing - boiling, pasteurization – types of pasteurization - Bottle, Batch and HTST (High Temperature Short Time) – Vacuum pasteurization – Ultra High Temperature Pasteurization.

UNIT III: MAJOR MILK PRODUCTS

(6 Hours)

Cream - definition - composition - chemistry of creaming process - gravitational and centrifugal methods of separation of cream - estimation of fat in cream. Butter - definition - composition - theory of churning – desi butter - salted butter, estimation of acidity and moisture content in butter. Ghee - major constituents - common adulterants added to ghee and their detection - rancidity-definition - prevention - antioxidants and synergists - natural and synthetic

UNIT IV: SPECIAL MILK

(6 Hours)

Standardized milk - definition - merits - reconstituted milk - definition - flowdiagram of

manufacture - Homogenized milk - flavored milk – vitaminized milk - toned milk -Incitation milk - Vegetable toned milk - humanized milk - condensed milk - definition, composition and nutritive value.

UNIT-V: FERMENTED AND OTHER MILK PRODUCTS

Fermented milk products – fermentation of milk - definition, conditions,cultured milk - definition of culture - example, conditions - cultured cream,butter milk - Bulgariious milk -acidophilous milk – Yoheer Indigenous products- khoa and chhena definition - Ice cream -definition-percentagecomposition-types-ingredients-manufacture of ice–cream, stabilizers-emulsifiers and their role-milk powder-definition-need for making milk powder- drying process-types of drying.

Total Lecture Hours: 30

COURSE OUTCOME

CO1: Understand about general composition of milk – constituents and its physical properties.

CO2: Acquire knowledge about pasteurization of Milk and various types of pasteurization - Bottle, Batch and HTST Ultra High Temperature Pasteurization.

CO3: Learn about Cream and Butter their composition and how to estimate fat in cream and Ghee

CO4: Explain about Homogenized milk, flavoured milk, vitaminised milk and toned milk.

CO5: Have an idea about how to make milk powder and its drying process - types of drying process

TEXT BOOKS

1. K. Bagavathi Sundari, Applied Chemistry, MJP Publishers, first edition,2006.
2. K. S. Rangappa and K.T. Acharya, Indian Dairy Products, Asia PublishingHouse New Delhi, 1974.
3. Text book of dairy chemistry, M.P. Mathur, D. Datta Roy, P. Dinakar, IndianCouncil of Agricultural Research, 1 st edition, 2008.
4. A Text book of dairy chemistry, Saurav Singh, Daya Publishing house, 1 st edition,2013.
5. Text book of dairy chemistry, P. L. Choudhary, Bio-Green book publishers,2021.

REFERENCES

1. Robert Jenness and S. Patom, Principles of Dairy Chemistry, S.Wiley, NewYork, 2005.
2. F.P.Wond, Fundamentals of Dairy Chemistry, Springer, Singapore, 2006.
3. Sukumar De, Outlines of Dairy Technology, Oxford University Press, NewDelhi, 1980.
4. .P.F.Fox and P.L.H. Mcsweeney, Dairy Chemistry and Biochemistry, Springer, Second edition, 2016.
5. Dairy chemistry and biochemistry, P. F. Fox, T. Uniacke-Lowe, P.L.H. McSweeney, J.A. OMahony, Springer, Second edition, 2015.

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1. https://www.academia.edu/28720946/FUNDAMENTALS_OF_DAIRY_CHEMISTRY_3_RD_EDITION
2. <https://www.slideshare.net/OnerAltnsoy/a-textbook-of-dairy-chemistry>
3. <https://www.britannica.com/topic/dairy-product>
4. <https://www.britannica.com/topic/dairy-product>
5. <https://egyankosh.ac.in/bitstream/123456789/62021/1/Milk%20Composition%20and%20its%20Constituents.pdf>

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DEPARTMENT OF CHEMISTRY

B.Sc., CHEMISTRY

Semester: II-SEC-I: Cosmetics and Personal Grooming

Ins. Hrs. /Week: 2

Course Credit: 2

Course Code: U23SECCH21

UNIT-I; SKIN CARE

Nutrition of the skin, skin care and cleansing of the skin; face powder – ingredients; creams and lotions – cleansing, moisturizing all purpose, shaving and sunscreen (formulation only); Gels – formulation and advantages; astringent and skin tonics – key ingredients, skin lightness, depilatories.

UNIT-II: HAIR CARE & DENTAL CARE

Shampoos – types – powder, cream, liquid, gel – ingredients; conditioner – types – ingredients

DENTAL CARE

Tooth pastes – ingredients – mouth wash

UNIT- III: MAKE UP

Base – foundation – types – ingredients; lipstick, eyeliner, mascara, eye shadow, concealers, rouge

UNIT- IV: PERFUMES

Classification - Natural – plant origin – parts of the plant used, chief constituents; animal origin – amber gries from whale, civetone from civet cat, musk from musk deer; synthetic – classification emphasizing characteristics – esters – alcohols – aldehydes – ketones

UNIT-V: BEAUTY TREATMENTS

Facials - types – advantages – disadvantages; face masks – types; bleach -types – advantages– disadvantages; shaping the brows; eyelash tinting; perming types; hair coloring and dyeing; permanent waving – hair straightening; wax types – waxing; pedicure, manicure - advantages – disadvantages

Total Lecture Hours:30

COURSE OUTCOME

CO1: Know about the composition of various cosmetic products

CO2: Understand chemical aspects and applications of hair care and dental care and skincare products.

CO3: Understand chemical aspects and applications of perfumes and skin care products.

CO4: Explain the methods of beauty treatments their advantages and disadvantage

CO5: Discuss the hazards of cosmetic products.

TEXT BOOKS:

1. Thankamma Jacob, (1997) Foods, drugs and cosmetics – A consumer guide, Macmillan publication, London.
2. Wilkinson J B E and Moore R J, (1997) Harry's cosmeticology, 7th ed., Chemical Publishers, London.
3. George Howard, (1987) Principles and practice of perfumes and cosmetics

REFERENCES

1. W.A.Poucher, Joseph A. Brink, Jr. Perfumes, Cosmetics and Soaps, Springer, 2000.
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co. Publishers, second edition, 2006.

E-RESOURCES

1. https://personalcarescience.com.au/userfiles/files/Book_sample/Beginner%20book%20V7%20-%20SAMPLE..pdf
2. <http://www.khake.com/page75.html>
3. Net.foxsm/list/284

ALLIED CHEMISTRY

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DEPARTMENT OF CHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: I-AC-I: Allied Chemistry-I

Ins. Hrs. /Week 3

Course Credit: 2

Course Code: U23ACH101

UNIT -I: CHEMICAL BONDING AND NUCLEAR CHEMISTRY (9 Hours)

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M.O diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers- Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes - carbon dating, rock dating and medicinal applications.

UNIT- II: INDUSTRIAL CHEMISTRY (9 Hours)

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required).

Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.

UNIT- III: FUNDAMENTAL CONCEPTS IN ORGANIC CHEMISTRY (9 Hours)

Hybridization: Orbital overlap hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Polar effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation.

Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

UNIT -IV: DRUGS AND SPECIALITY CHEMICALS

(9 Hours)

Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Artificial Sweeteners viz., saccharin, Aspartame and cyclamate; Organic Halogen compounds viz., Freon, Teflon.

UNIT- V: ANALYTICAL CHEMISTRY

(9 Hours)

Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.

Total Lecture Hours: 45

COURSE OUTCOME

CO1: State the theories of chemical bonding, nuclear reactions and its applications.

CO2: Evaluate the efficiencies and uses of various fuels and fertilizers.

CO3: Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.

CO4: Demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.

CO5: Analyze various methods to identify an appropriate method for the separation of chemical components.

TEXT BOOKS:

1. V. Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009
2. S. Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,20.
3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition,2012
4. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry; Sultan Chand & sons, New Delhi, twentyninth edition, 2007.
5. V. Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.

REFERENCES

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.
4. B. R. Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
5. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition,2012.

E- RESOURCES:

- 1.<https://www.kopykitab.com/Industrial-Chemistry-1-by-Dr-G-S-Gugale-Dr-A-V-Nagawade-Dr-R-A-Pawar-Dr-K-M-Gadave>
- 2.<https://ncert.nic.in/textbook/pdf/kech104.pdf>
- 3.[https://www.amazon.in/Fundamental-Organic-Chemistry-R -](https://www.amazon.in/Fundamental-Organic-Chemistry-R)
4. <https://www.pharmamanufacturing.com/ebooks>
5. <https://open.umn.edu/opentextbooks/textbooks/486>

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DEPARTMENT OF CHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: I & II-AP-I: Allied Chemistry Practical

Ins. Hrs./Week: 4 Course Credit: 2 Course Code: U23ACH102P

I. VOLUMETRIC ANALYSIS (40 Hours)

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator

II. ORGANIC QUALITATIVE ANALYSIS (20 Hours)

Analyze the following organic Compounds.

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Acid
6. Amine

Total Hours: 60

Scheme of Valuation:	Max. Marks
Record	10 (Marks)
Procedure Writing	10(Marks)
Volumetric analysis	35 Marks
Results	
<1%	- 35 Marks
1-2%	-35 Marks
2-3%	-25 Marks
3- 4%	- 15 Marks
>4%	- 10 Marks
Organic qualitative analysis	- 20 Marks
Total Marks:	75

COURSE OUTCOME

The student should be able to

CO1: Gain an understanding of the use of standard flask and volumetric pipettes, burette.

CO2: Design, carry out, record and interpret the results of volumetric titration.

CO3: Apply their skill in the analysis of water/hardness.

CO4: Analyze the chemical constituents in allied chemical products.

CO5: Acquire the Knowledge of handling of chemicals

TEXT BOOKS

1. Gopalan R. 2000. Elements of analytical chemistry, S. Chand, New Delhi
2. Gnanapragasam, N.S ,Ramamurthy G.1998.Organic Chemistry Lab Manual, S. Viswanathan and Co. Pvt. Ltd. Chennai
3. Henry. W. Schimpf , A Text Book of Volumetric Analysis
4. McPherson Peter , Practical Volumetric Analysis
5. Manna, A.K. Practical Organic Chemistry, Books and Allied: India,2018.

REFERENCES:

1. Venkateswaran, V.; Veeraswamy, R.; Kulandaivelu, A.R. Basic Principles of Practical Chemistry, 2nd ed.; Sultan Chand: New Delhi, 2012.
2. Vogel's Textbook of Quantitative Chemical Analysis, 6th ed.; Pearson Education Ltd: New Delhi, 2000.

E-RESOURCES

1. <https://chemistryvce.weebly.com/volumetric-analysis.html>
2. [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Quantifying_Nature/Volumetric_Chemical_Analysis_\(Shiundu\)/14.2%3A_Learning_Activity](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.2%3A_Learning_Activity)
3. <https://byjus.com/chemistry/volumetric-analysis/>
4. https://www.researchgate.net/publication/344658899_Volumetric_Analysis_-_Titration_for_Beginners
5. <https://chemdictionary.org/titration-sindicato>

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DEPARTMENT OF CHEMISTRY

B.Sc., BIOCHEMISTRY

Semester: II-AC-II: Allied Chemistry-II

Ins. Hrs. /Week: 3

Course Credit: 2

Course Code: U23ACH203

UNIT-I: CO-ORDINATION CHEMISTRY AND WATER TECHNOLOGY (10 Hours)

Co-ordination Chemistry: Definition of terms - IUPAC Nomenclature - Werner's theory - EAN rule - Pauling's theory – Postulates - Applications to $[\text{Ni}(\text{CO})_4]$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Co}(\text{CN})_6]^{3-}$ - Chelation - Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques – BOD and COD

UNIT -II: CARBOHYDRATES

(8 Hours)

Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose

**UNIT- III: AMINO ACIDS AND ESSENTIAL ELEMENTS OF BIOSYSTEM
(9 Hours)**

Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method - Proteins classification – structure - Color reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg

UNIT -IV: ELECTROCHEMISTRY

(10 Hours)

Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.

UNIT-V: PHOTOCHEMISTRY

(8 Hours)

Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples).

Total Lecture Hours: 45

COURSE OUTCOME

- CO1: Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.
- CO2: Explain the preparation and property of carbohydrate.
- CO3: Enlighten the biological role of transition metals, amino acids and nucleic acids.
- CO4: Apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
- CO5: Outline the various type of photochemical process.

TEXT BOOKS:

- 1.V. Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
- 3 . Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition,
- 4.P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
- 5.Gurudeep Raj, (2001), Advanced Inorganic Chemistry Vol – I, 26th ed.,Goel Publishing House, Meerut

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1. Bahl, B.S, and Bahl, A., Advanced Organic Chemistry, (12th edition), 2010. New Delhi, Sultan Chand & Co.
- 2 .P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
3. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
4. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
5. Huheey J E, (1993), Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed., Addison Wesley Publishing Company, India.

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- 2.<https://onlinelibrary.wiley.com/doi/book/10.1002/9783527618255>
- 3.<https://www.amazon.in/Amino-Acids-Nutrition-Health-Experimental-ebook/dp/B08FD6ZH86>
- 4.<https://www.freebookcentre.net/Chemistry/ElectroChemistry-Books-Download.html>
5. authors.library.caltech.edu/25034/21/BPOCchapter20.pdf