CENTRAL UNIVERSITY OF HARYANA

(Established under the Central Universities Act, 2009) (NAAC Accredited 'A' Grade)



Curriculum and Syllabi

Of

Integrated B.Sc.-M.Sc. (Chemistry) (w.e.f. Session 2022-23)

DEPARTMENT OF CHEMISTRY SCHOOL OF BASIC SCIENCES

Approved by:Approval Status :Approval Date

BOS √ 06-09-2022 School Board √ 12-09-2022 Academic Council √ 07-10-2022

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VISION AND MISSION

i) Vision and Mission of the University

Vision

To develop enlightened citizenship of a knowledge society for peace and prosperity of individuals, nation and the world, through promotion of innovation, creative endeavours, and scholarly inquiry.

Mission

To serve as a beacon of change, through multi-disciplinary learning, for creation of knowledge community, by building a strong character and nurturing a value-based transparent work ethics, promoting creative and critical thinking for holistic development and self-sustenance for the people of India. The University seeks to achieve this objective by cultivating an environment of excellence in teaching, research and innovation in pure and applied areas of learning.

ii) Vision and Mission of the Department

Vision

To establish a world-class teaching and research reputation of the department that contributes to society through its innovative, creative and scholarly approach.

Mission

To educate the students by adopting highest academic and professional standards to meet the global competency in the field of chemical sciences. To establish and maintain a high quality of support, research facilities, multidisciplinary and skill-based learning opportunities to our staff, students and researchers to orient them to world class creative and innovative minds.

1. BACKGROUND

i) NEP-2020 and LOCF an integrated Approach

Considering the curricular reforms as instrumental for desired learning outcomes, all the academic departments of Central University of Haryana made a rigorous attempt to revise the curriculum of undergraduate and postgraduate programmes in alignment with National Education Policy-2020 and UGC Quality Mandate for Higher Education Institutions-2021. The process of revising the curriculum could be prompted with the adoption of "Comprehensive Roadmap for Implementation of NEP-2020" in the 32nd meeting of the Academic Council of the University held on April 23, 2021. The Roadmap identified the key features of the Policy and elucidated the Action Plan with well-defined responsibilities and indicative timeline for major academic reforms.

The process of revamping the curriculum started with the series of webinars and discussions conducted by the University to orient the teachers about the key features of the Policy, enabling them to revise the curriculum in sync with the Policy. Proper orientation of the faculty about the vision and provisions of NEP-2020 made it easier for them to appreciate and incorporate the vital aspects of the Policy in the revised curriculum focused on 'creating holistic, thoughtful, creative and well-rounded individuals equipped with the key 21st century skills' for the 'development of an enlightened, socially conscious, knowledgeable, and skilled nation'.

With NEP-2020 in background, the revised curricula articulate the spirit of the policy by emphasising upon—integrated approach to learning; innovative pedagogies and assessment strategies; multidisciplinary and cross-disciplinary education; creative and critical thinking; ethical and Constitutional values through value-based courses; 21st century capabilities across the range of disciplines through life skills, entrepreneurial and professional skills; community and constructive public engagement; social, moral and environmental awareness; Organic Living and Global Citizenship Education (GCED); holistic, inquiry-based, discovery-based, discussion-based, and analysis-based learning; exposure to Indian knowledge system, cultural traditions and classical literature through relevant courses offering 'Knowledge of India'; fine blend of modern pedagogies with indigenous and traditional ways of learning; flexibility in course choices; student-centric participatory learning; imaginative and flexible curricular structures to enable creative combination of disciplines for study; offering multiple entry and exit points initially in undergraduate programmes; alignment of Vocational courses with the International Standard Classification of Occupations maintained by the International Labour Organization; breaking the silos of disciplines; integration of extra-curricular and curricular aspects; exploring internships with local industry, businesses, artists and crafts persons; closer collaborations between industry and higher education institutions for technical, vocational and science programmes; and formative assessment tools to be aligned with the learning outcomes, capabilities, and dispositions as specified for each course. In case of UG programmes in Engineering and Vocational Studies, it was decided that the departments shall incorporate pertinent NEP recommendations while complying with AICTE, NBA, NSQF, International Standard Classification of Occupations, Sector Skill Council and other relevant agencies/sources. The University has also developed consensus on adoption of Blended Learning with 40% component of online teaching and 60% face to face classes for each programme.

The revised curricula of various programmes could be devised with concerted efforts of the faculty, Heads of the Departments and Deans of Schools of Study. The draft prepared by each department was discussed in series of discussion sessions conducted at Department, School and the University level. The leadership of the University has been a driving force behind the entire exercise of developing the uniform template and structure for the revised curriculum. The Vice Chancellor of the University conducted series of meetings with Heads and Deans to deliberate upon the vital parameters of the revised curriculum to formulate a uniform template featuring Background, Programme Outcomes, Programme Specific Outcomes, Postgraduate Attributes, Structure of Masters Course, Learning Outcome Index, Semester-wise Courses and Credit Distribution, Course-level Learning Outcomes, References and Appendices. The experts of various Boards of Studies and School Boards contributed to a large extent in giving the final shape to the revised curriculum of each programme.

To ensure the implementation of curricular reforms envisioned in NEP-2020, the University has decided to implement various provisions in a phased manner. Accordingly, the curriculum may be reviewed annually.

ii) About Chemistry

Chemistry is the science of matter and its transformations. It addresses fundamental questions about the observable matter, ranging from its components, structure, properties and interconversions. As a system of knowledge, Chemistry not only explains the existence and behavior of matter around and within us, but also empowers us to manipulate the matter into new and improved forms for our use. From the ancient practices of rasayan vidya and alchemy, modern chemistry has grown over centuries into a formidable science that touches all aspects of human life. Humanity's progress in the last three centuries is pivoted on the contributions of chemistry, chemical industry and associated endeavors. The range of influence of chemistry in our life spans from essentials such as food (agrochemicals, preservatives), shelter (cement, metals, alloys, polymers) and health (drugs, cosmetics, soap, toothpaste), to advancements such as textiles (polymers, leather), beverages (flavoring and fermentation), crime fighting (forensics), weaponry (explosives), space travel (fuel) and cosmology (element detection). The list can go on endlessly. The most visible contribution of chemistry to civilization is achieved by the advancements in modern medicine that was fuelled by organic chemistry. This led to significant improvements in the living standards, extension of human average life span and fighting of dangerous diseases such as cancer and microbial infections.

Chemistry is placed centrally between the other two major branches of science, namely physics and biology. Therefore, it is often called the *central science*. It influences the developments in these two broad realms of science as much as it is influenced by the discoveries in them. The fundamental importance of chemistry and chemical industry in sustaining human civilization demands for a steady supply of trained and skilled manpower. Thus, it is unsurprising that it is an essential and integral department in higher education institutions.

Education in chemistry not only imparts the technical know-how about structure, reactions and properties of matter, but also empowers the learner to raise fundamental

questions about various natural phenomena, address local issues and come up with sustainable solutions, identify areas of life where intervention of chemistry can bring about progress and imbibe and spread the spirit of free enquiry and scientific temper.

iii) About the Programme (Nature, Extent and Aims)

The integrated B.Sc.-M.Sc. Programme in Chemistry will impart advanced knowledge of basic and applied chemical sciences to the graduates. It will prepare the students for taking up challenging assignments in academia and industry and also empower them with skill and knowledge for generating employment for their own and others. The Programme introduces the students to advanced developments in chemical sciences as well as in the field of other allied sciences, by providing them multidisciplinary and interdisciplinary courses. The design of choice-based curriculum can enrich students with analytical and problem-solving capabilities. It is designed to bring out the best of the abilities of each student, allow them to sharpen the scientific temper and be abreast with the contemporary developments in the area.

The programme includes a balanced combination of *Core, Elective* and *Ability Enhancement* Courses. The courses are designed in such a way to cover the entire spectrum of chemical sciences from fundamentals (that will bring admitted students from various backgrounds to a common level) to most recent advancements in the field (that will make them ready to take up challenging assignments in the real world).

The integrated B.Sc.-M.Sc. Programme in Chemistry is of a five-year duration which is divided into ten semesters. The teaching and learning in the Programme will involve theory (lectures), practicals, tutorial and seminar-based classes. During the whole programme about 40 % syllabus of each course may be delivered via online mode and with a blended teaching-learning approach.

The curriculum will be taught through formal lectures with the aid of pre-made presentations, audio and video tools whenever necessary. Other teaching aids can also be used as and when required. The additional requirements like industrial visits, summer training and project work are also incorporated into the curriculum.

The Aims of the programme include

- To inculcate basic to advanced knowledge of chemical sciences among students.
- To provide higher education, disciplinary and inter/multi-disciplinary researchoriented knowledge to the students to make them lifelong learners.
- To provide a learned, skilled and creative pool of graduates who are ready to take up challenging assignments in different kinds of chemical industries, research institutions and academia.
- To mould responsible, proactive citizens who are equipped with scientific thinking and skills to address problems of their locality
- Adequate blend of theory, computation and hands-on experiments.
- Modernized lab courses close to recent/current research.

iv) Qualification Descriptors (possible career pathways)

On successful completion of the Integrated B.Sc.-M.Sc. Chemistry Programme, students of the department are expected to be ready to take up opportunities all around the world in areas that demand skills in chemical and allied sciences. As the chemical industry is enormously vast and diverse, numerous opportunities and challenges await the graduates. The graduates are expected to satisfactorily address the professional expectations, maintain a work-life balance and lead productive and meaningful lives. Some of the possible career paths for the undergraduate and postgraduate students may be:

- 1. Teaching and Research in academia
- 2. Research scientists in pharmaceutical and other chemical and material industries
- 3. Research scientists in other allied sciences
- 4. Entrepreneurship in chemical science-based ventures

5. Administrative Assignments in various government and private agencies

6. Chemist/Scientist/Technician assignments in any of the following industries: pharmaceutical, polymers, petrochemicals, materials sciences, nanotechnology, fuels, non-conventional energy, renewable resources, agrochemicals, fermentation and processing, paints and pigments, metallurgy, packaging, cosmetics, cements, natural products, forensics, explosives, and any other various allied branches of chemistry.

2. STRUCTURE OF INTEGRATED B.Sc.-M.Sc. PROGRAMME

The Integrated B.Sc.-M.Sc. Chemistry Programme is of a *five-year* duration which is divided into ten semesters. The programme under Choice-Based Credit System (CBCS) includes a balanced combination of *Core, Elective* and *Ability Enhancement Courses* (Compulsory and Skill based). Distribution of the courses for undergraduate programme (for first three years) is given in **Table-1**.

The programme offers exit options to the students as per the relevant ordinances of CUH and guidelines of UGC and Ministry of Education.

After successful completion of five years (ten semesters) of the programme the candidate will be awarded with the Integrated Degree i.e. **Integrated B.Sc.-M.Sc. (Chemistry)**.

Sr. No.	Types of Courses	Nature	Total Credit	Credit % age of Courses	% age of Courses
1	Core Courses (CC)	Compulsory Courses (CC)	84	56.75	53.85
2	Elective Courses (EC)	1 1		16.21	15.38
		Generic Elective Courses (GE)	24	16.21	15.38
3	Ability Enhancement Courses (AEC)	Ability Enhancement Compulsory Courses (AEC)	8	5.40	7.69
		Ability Enhancement Elective (Skill Based) (SEC)	8	5.40	7.69
			148	100	100

Table 1 (% age of courses for first three years of the Programme)

Course Structure (Chemistry Major)

Courses	Credits*	Credits*
	Theory+ Practical	Theory + Tutoria
I. Core Course	14×4 = 56	14×5 = 70
(14 Papers)		
Core Course Practical / Tutorial*		
(14 Papers)	14×2 = 28	14×1=14
II. Elective Course		
(8 Papers)		
A.1. Discipline Specific Elective	4×4 = 16	4×5 = 20
(4 Papers)		1.0 20
A.2. Discipline Specific Elective		
Practical/Tutorial*	$4 \times 2 = 08$	4×1 = 04
(4 Papers)	4~2 - 00	4~1 - 04
B.1. Generic Elective/Interdisciplinary	4×4 = 16	4×5 = 20
(4 Papers)		
B.2. Generic Elective	$4 \times 2 = 08$	$4 \times 1 = 04$
Practical/ Tutorial*	1~2 = 00	1~1 - 01
(4 Papers)		
Optional Dissertation or project work in place o credits) in 6 th Semester	f one Discipline Specific I	Elective paper (6
III. Ability Enhancement Courses		
1. Ability Enhancement Compulsory**	$2 \times 4 = 08$	2×4 = 08
(2 Papers of 4 credit each)		
Environmental Science/		
English/		
MIL Communication/Sanskrit		
2. Ability Enhancement Elective	2×4 = 08	2×4 = 08
(Skill Based) (Minimum 2)		
(2 Papers of 4 credit each)		
Total credit	148	148

HODDY/ Sports/ NUC/ NSS/ related courses on its own. *Wherever there is a practical there will be no tutorial and vice-versa.,

** University/Department may include more options or delete some from this list. The courses will be offered according to faculty strength and as per availability of faculty members.

NOTE: MOOC courses (SWAYAM) having similarity more than 75% with the core course may be offered to the students. For elective courses (whatever nomenclature may be used), the students may opt from the MOOC courses provided these courses are not in the list of core course (SWAYAM) keeps changing, the departmental committee is authorized to finalize the list of MOOC courses for each semester based on the above criteria.

3. SEMESTER-WISE COURSES AND CREDIT DISTRIBUTION

(for first three years)

First Year

Sr. No.	Course No.	Course Name	Course Code	Course Type	L	Τ	Р	Credit	
				(Opted)	Hrs.				
Sen	nester I				-				
1		Inorganic Chemistry-I	SBS CH 020101 C 3104	сс	3	1	0	4	
2		Inorganic Chemistry Practical-I	SBS CH 020102 C 0042	сс	0	0	4	2	
3		Organic Chemistry-I	SBS CH 020103 C 3104	сс	3	1	0	4	
4		Organic Chemistry Practical-I	SBS CH 020104 C 0042	сс	0	0	4	2	
5		From the list of courses available (any one)	AEC-1		3	1	0	4	
5		From the list of courses available (any one)	SEC-1		2	0	0	2	
7		Offered by other Departments	GE		3	1	4	6	
					То	tal	Cred	lit 24	
Sen	nester II								
1		Physical Chemistry-I	SBS CH 020201 C 3104	сс	3	1	0	4	
2		Physical Chemistry Practical-I	SBS CH 020202 C 0042	сс	0	0	4	2	
3		Organic Chemistry-II	SBS CH 020203 C 3104	сс	3	1	0	4	
1		Organic Chemistry Practical-II	SBS CH 020204 C 0042	сс	0	0	4	2	
5		From the list of courses available (any one)	AEC-2		3	1	0	4	
5		From the list of courses available (any one)	SEC-2		2	0	0	2	
7		(Offered by other Departments	GE		3	1	4	6	
					То	tal	Cred	it 24	

CC = Core Course; AEC = Ability Enhancement Course; SEC = Skill Enhancement Course; GE = Generic Elective Course; (or students may choose any one from the given list)

In addition to the courses students will be trained for Seminars, Group Discussions and Individual/Team Projects throughout the semesters.

Second Year

Sr. No.	Course No.	Course Name	Course Code	Course Type	L	T	P	Credit
				(Opted)	Hr	s.		
Sen	nester	III						
1		Physical Chemistry-II	SBS CH 020301 C 3104	сс	3	1	0	4
2		Physical Chemistry Practical-II	SBS CH 020302 C 0042	СС	0	0	4	2
3		Organic Chemistry-III	SBS CH 020303 C 3104	СС	3	1	0	4
4		Organic Chemistry Practical-III	SBS CH 020304 C 0042	СС	0	0	4	2
5		Molecular Spectroscopy and Photochemistry	SBS CH 020305 C 3104	СС	3	1	0	4
6		Spectroscopy Practical	SBS CH 020306 C 0042	СС	0	0	4	2
7		Offered by other Departments	GE		3	1	4	6
					Tot	tal Cr	edit	24
Sen	nester	IV						
1		Physical Chemistry-III	SBS CH 020401 C 3104	сс	3	1	0	4
2		Physical Chemistry Practical-III	SBS CH 020402 C 0042	сс	0	0	4	2
3		Inorganic Chemistry-II	SBS CH 020403 C 3104	сс	3	1	0	4
4		Inorganic Chemistry Practical-II	SBS CH 020404 C 0042	сс	0	0	4	2
5		Introduction to Quantum Chemistry	SBS CH 020405 C 3104	сс	3	1	0	4
6		Quantum Chemistry Practical	SBS CH 020406 C 0042	сс	0	0	4	2
7		Offered by other Departments	GE	•	3	1	4	6
					Tot	tal Cr	edit	24

<mark>CC =</mark> Core Course; AEC = Ability Enhancement Course; SEC = Skill Enhancement Course; GE = Generic Elective Course; (or students may choose any one from the given list)

In addition to the courses students will be trained for Seminars, Group Discussions and Individual/Team Projects throughout the semesters.

Third Year

Sr. No.	Course No.	Course Name	Course Code	Course Type	L	Τ	Р	Credit	
				(Opted)	Hr	Hrs.			
Sen	nester	V							
1		Inorganic Chemistry-III	SBS CH 020501 C 3104	сс	3	1	0	4	
2		Inorganic Chemistry Practical-III	SBS CH 020502 C 0042	CC	0	0	4	2	
3		Analytical Chemistry	SBS CH 020503 C 3104	СС	3	1	0	4	
4		Analytical Chemistry Practical	SBS CH 020504 C 0042	CC	0	0	4	2	
5		From the list of courses available	SEC-3	•	2	0	0	2	
6		From the list of courses available	DSE-1		3	1	0	4	
7		From the list of courses available	Practical (DSE	5-1)	0	0	4	2	
8		From the list of courses available	DSE-2	DSE-2		1	0	4	
9		From the list of courses available	Practical (DSE	E-2)	0	0	4	2	
					То	tal Cr	edit	26	
Sen	nester	VI							
1		Green Chemistry	SBS CH 020601 C 3104	сс	3	1	0	4	
2		Green Chemistry Practical	SBS CH 020602 C 0042	СС	0	0	4	2	
3		Materials Chemistry	SBS CH 020603 C 3104	СС	3	1	0	4	
4		Materials Chemistry Practical	SBS CH 020604 C 0042	СС	0	0	4	2	
5		From the list of courses available	SEC-4	•	2	0	0	2	
6		From the list of courses available	DSE-3		3	1	0	4	
7		From the list of courses available	Practical (DSE	Practical (DSE-3)		0	4	2	
8		From the list of courses available	DSE-4		3	1	0	4	
9		From the list of courses available	Practical (DSE	-4)	0	0	4	2	
					To	tal Cr	edit	26	

<mark>CC</mark> = Core Course; <mark>SEC</mark> = Skill Enhancement Course; DSE = Discipline Specific Elective Course; (or students may choose any one from the given list)

In addition to the courses students will be trained for Seminars, Group Discussions and Individual/Team Projects throughout the semesters.

Note:

- 1. AEC, SEC, DSE and GE courses will be offered according to faculty strength and as per the availability of faculty members.
- 2. The University/Department may add/delete courses from time to time as per requirement.
- 3. The entry and exit in the Integrated B.Sc.-M.Sc. programme will be decided according the relevant University Ordinance.

LIST of COURSES

Core Papers (C): (Credit: 06 each) (3 periods + 1 tutorial/week for theory and 4 periods/week for practical)

- 1. Inorganic Chemistry I (4 + 4)
- 2. Organic Chemistry I (4 + 4)
- 3. Physical Chemistry I (4 + 4)
- 4. Organic Chemistry II (4 + 4)
- 5. Physical Chemistry II (4 + 4)
- 6. Organic Chemistry III (4 + 4)
- 7. Molecular Spectroscopy and Photochemistry (4+4)
- 8. Physical Chemistry III (4 + 4)
- 9. Inorganic Chemistry II (4 + 4)
- 10. Introduction to Quantum Chemistry (4 + 4)
- 11. Inorganic Chemistry III (4 + 4)
- 12. Analytical Chemistry (4 + 4)
- 13. Green Chemistry (4 + 4)
- 14. Materials Chemistry (4 + 4)

Discipline Specific Elective (DSE) Papers: (Credit: 06 each) (3 periods + 1 tutorial/week for theory and 4 periods/week for practical)

- 1. Medicinal Chemistry
- 2. Electrochemistry
- 3. Electrochemistry Practical
- 4. Advanced Analytical Chemistry
- 5. Organic Spectroscopy
- 6. Heterocyclic Chemistry
- 7. Organometallics and Bioinorganic chemistry
- 8. Introduction to Nanochemistry & applications
- 9. Dissertation (To be taken as optional in place of one DSE course)

Ability Enhancement (AEC) Papers: (Credit: 04 each) (3 periods + 1 tutorial/week)

- 1. English for Communication
- 2. History of Indian Science
- 3. Good Laboratory Practices
- 4. Cheminformatics
- 5. Research methodology
- 6. Chemistry in Everyday life

Skill Enhancement (SEC) Papers: (Credit: 02 each) (2 periods week)

- 1. Personality Development
- 2. Computer Applications in Chemistry
- 3. Science Communication and
- 4. Popularization
- 5. Biofertilizer
- 6. Herbal Science & Technology
- 7. Fermentation Science & Technology
- 8. Environment Impact Analysis

Generic Elective (GE) Papers: (Credit: 06 each) (3 periods + 1 tutorial/week for theory and 4 periods/week for practical)

- 1. GE: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons
- 2. GE: Chemical Energetics, Equilibria & Functional Organic Chemistry-I
- 3. Solutions, Phase Equilibria, Conductance, Electrochemistry, & Functional Group Organic Chemistry
- 4. GE: Transition Metal & Coordination Chemistry, States of Matter & Chemical Kinetics
- 5. Organometallics, Bio-inorganic Chemistry, Polynuclear Hydrocarbons & UV, IR Spectra
- 6. GE: Quantum Chemistry, Spectroscopy & Photochemistry
- 7. Molecules of Life
- 8. Chemistry of Main Group Elements, Theories of Acids & Bases

Note:

- 1. University/Department may include more options or delete some from this list.
- 2. The courses will be offered according to faculty strength and as per availability of faculty members.

4. COURSES

Semester I

Course	No:	Course Name: Inorganic Chemistr	/-l				urse Code: S CH 020101 C 3104				
Batch:		Programme:	Semester:	L	Т	Р	Credits	Contact H	Irs.		
2022		Integrated B.Sc						per Week			
onward	ds	M.Sc. Chemistry	I	3	1	0	4	Total Hrs	.: 60		
Total E	valuatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.					
CIE:	30 Mar	ks	Pre-requisit	e of course	: Basic k	nowledge a	about atom	nic structur	e, chemical		
TEE:	70 Mar	ks	bonding, pe	riodic prope	rties and	redox react	ions.				
Course To provide basic knowledge about atomic structu						iuantum m	echanics. d	ual nature (of particles.		
Objecti		bonding aspect, ele	-		,		,		-,		
Course		After completing th		•	cted to le	arn the foll	owing:				
Outcor	nes:	CO1: Understandin	•								
		CO2 : Understand t	•	•		c radii, ele	ctronegativ	vity, ionizat	ion energy,		
		electron affinity of CO3 : Understand		•		of chomi	ical handa	intor mal	acular and		
		intramolecular wea	•		•	or chem	ical Donus,	, inter-moi	ecular and		
		CO4 : In-depth know				otential an	d volumetr	ric analysis			
		CO5 : Ability to und	-		•			•			
		CO6: Understandin		•							
				OURSE SYLI							
NOTE:											
i) Ques	tion no.	1 is compulsory and	to be set fror	n the entire	syllabus.	It will have	seven sub-	parts and st	tudents		
need to	o answei	r any four. Each part	carries three	and half ma	rks.						
ii) Ques	stion no	s. 2 to 5 are to be set	from all four	units one fr	om each.	Every ques	tion will ha	ve three su	b-parts and		
	ts need	to answer any two su	b-parts of ea	· ·	. Each par	t carries se	ven marks.				
Unit No.				Contents					Contact Hrs.		
1	ΑΤΟΜ								113.		
	Bohr's	theory, its limitation e equation, Heisenb		•	, .						
	wave equation, significance of ψ and ψ^2 . Quantum numbers and their significance. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions for hydrogen atom. Radial and angular distribution curves. Shapes of <i>s</i> , <i>p</i> , <i>d</i> and <i>f</i> orbitals. Contour boundary and probability diagrams. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number.										
II	PERIO s, p, d,	DICITY OF ELEMENTS <i>f</i> block elements, the ties of the elements	e long form of	periodic tal	ole. Detai	led discussi	on of the fo	ollowing	15		

	(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.	
	(b) Atomic radii (van der Waals) (c) Ionic and crystal radii.	
	(d) Covalent radii (octahedral and tetrahedral)	
	(e) Ionization enthalpy, Successive ionization enthalpies and factors affecting	
	ionization energy. Applications of ionization enthalpy.	
	(f) Electron gain enthalpy, trends of electron gain enthalpy (g) Electronegativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffé's	
	electronegativity scales. Variation of electronegativity with bond order, partial charge,	
	hybridization, group electronegativity. Sanderson's electron density ratio	
III	CHEMICAL BONDING-I	15
	(i) <i>Ionic bond:</i> General characteristics, types of ions, size effects, radius ratio rule and its	
	limitations. Packing of ions in crystals. Born-Landé equation with derivation and	
	importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber	
	cycle and its application, Solvation energy.	
	(ii) <i>Metallic Bond:</i> Qualitative idea of valence bond and band theories. Semiconductors and insulators, defects in solids.	
	(iii) Weak Chemical Forces: van der Waals forces, ion-dipole forces, dipole-dipole	
	interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions.	
	Repulsive forces, Hydrogen bonding (theories of hydrogen bonding, valence bond treatment)	
	Effects of chemical force, melting and boiling points, solubility energetics of dissolution	
	process.	
IV	CHEMICAL BONDING-II AND OXIDATION-REDUCTION	15
	Covalent bond: Lewis structure, Valence Bond theory (Heitler-London approach).	
	Energetics of hybridization, equivalent and non-equivalent hybrid orbitals. Bent's rule,	
	Resonance and resonance energy, Molecular orbital theory. Molecular orbital diagrams of diatomic and simple polyatomic molecules N ₂ , O ₂ , C ₂ , B ₂ , F ₂ , CO, NO, and their ions; HCl,	
	BeF ₂ , CO ₂ , (idea of <i>s</i> - <i>p</i> mixing and orbital interaction to be given). Formal charge, Valence	
	shell electron pair repulsion theory (VSEPR), shapes of simple molecules and ions containing	
	lone pairs and bond pairs of electrons, multiple bonding (σ and π bond approach) and	
	bond lengths.	
	Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules	
	and consequences of polarization.	
	Ionic character in covalent compounds: Bond moment and dipole moment. Percentage	
	ionic character from dipole moment and electronegativity difference. Redox equations, Standard Electrode Potential and its application to inorganic reactions.	
	Principles involved in volumetric analysis to be carried out in class.	
Sugge	sted Readings:	
1.	Atkins, P.W. & Paula, J. Physical Chemistry, 10th Edition, Oxford University Press, 2014.	
2.	Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.	
3.	Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.	70
4. 5	Douglas, B.E. and McDaniel, D.H. Concepts & Models of Inorganic Chemistry Oxford, 19	70
5.	Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications, 1962.	

	Course Name:				Course C				
	Inorganic Chemist	ry Practical-I			SBS CH (020102 C 00	42		
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs	•	
2022	Integrated B.Sc						per Week:	04	
onwards	M.Sc. Chemistry	I	0	0	4	2	Total Hrs.:	60	
fotal Evalua	ation Marks: 50	Examinatio	n Duration:	6 Hrs.					
CIE: 15 N	/larks	Pre-requisit	e of cours	e. Skill to	handle r	renaration	of various s	olution	
		•			•	•	ng experiment		
	1arks				•		• •		
Course	To acquire the skill								
Objective	titrimetry during t	•	s. Also to co	arry out se	paration of	mixtures o	f inorganic coi	mpound	
	by different metho	ds.							
Course	After completing t	his course. stu	dent is exp	ected to le	arn the foll	owing:			
Outcomes:	CO1: Basic knowle		•			- 0			
CO2: Preparation of various solutions									
	CO3: Separation of								
	CO4: Estimation of								
CO5: Knowledge about indicators									
	CO6: To work-up, i	solate and pu	rify, determ	ine the pu	rity of the	prepared co	ompound		
		(OURSE SYL	LABUS					
NOTE:									
۲wo questic	ons will be set, one from	n each of the l	JNIT. The ca	indidates a	are require	d to attemp	ot all the quest	ions.	
Unit No.			Content	ts				Contact	
								Hrs.	
	TITRIMETRIC ANALYS	S						35	
	i) Calibration and use of apparatus								
	(ii) Preparation of solutions of different Molarity/Normality of titrants								
	ACID-BASE TITRATION	-							
	(i) Estimation of carbonate and hydroxide present together in mixture.								
	(ii) Estimation of carbo	nate and bica	rbonate pre	esent toge	ther in a m	ixture.			
	(iii) Estimation of free alkali present in different soaps/detergents								
11	OXIDATION-REDUCTIO	N TITRIMETR	Y					25	
	(i) Estimation of Fe(II)	and oxalic aci	d using star	ndardized	KMnO ₄ sol	ution.			
	(ii) Estimation of oxalic acid and sodium oxalate in a given mixture.								
	(iii) Estimation of Fe(I	l) with K ₂ Cr ₂ O	7 using int	ernal (dipl	nenylamine	e, anthrani	lic acid)		
	and external indicator								
Suggested F	Readings:								

Course	e No:	Course Name: Organic Chemistry-	1			Course C		ode: 0103 C 3104				
Batch: 2022	:	Programme: Integrated B.Sc	Semester:	L	Т	P	Credit	Contact H				
onwar	ds	M.Sc. (Chemistry)	I	3	1	0	4	Total Hrs.				
Total E	Evaluatio	n Marks: 100	Examination	Duration:		3 Hrs.						
CIE:	30 Mar	ks	Pre-requisite		: Basic kn	owledge of	chemical s	tructures of	the simple			
TEE:	70 Mar	ks	organic comp	ounds.								
Course Object	Objective and substitution reactions, stereochemistry and basic chemistry of alkanes, alkenes, alky aromatic hydrocarbons , cycloalkanes and conformational analysis.											
Outcor	CourseAfter completing this course, student is expected to learn the following:Outcomes:CO1: Thorough knowledge of basics of organic chemistryCO2: Basic understanding of stereochemistryCO3: Basic chemistry of alkanes and alkenesCO4: Ability to understand, explain and predict various aspects of cycloalkanes and conform analysis.											
			COL	JRSE SY	LLABUS							
ii) Que studen	stion no	any four. Each part 5. 2 to 5 are to be set to answer any two su	from all four u	inits one f h questior	rom each.							
Unit No.				Contents					Contact Hrs.			
1	 BASICS OF ORGANIC CHEMISTRY Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions. Formulae representation: Fischer Projection, Newmann and Sawhorse Projection formulae 							effects, d bases; charges; relative mination	15			
II	STEREC Isomer E/Z no	eir interconversions DCHEMISTRY ism: Types of isome tations with C.I.P rul Isomerism: Optical	rism, Geometr es.						15			

	Cycloalkanes and Conformational Analysis: Types of cycloalkanes and their relative stability,	
	Baeyer strain theory, Conformation analysis of alkanes: Relative stability: Energy diagrams	
	of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams.	
	ALKANES AND ALKENES Carbon-Carbon sigma bonds: Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation -relative reactivity and selectivity.	15
	Carbon-Carbon pi bonds: Formation of alkenes and alkynes by elimination reactions Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration- oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.	
IV	ALKYNES AND AROMATIC HYDROCARBONS Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.	15
	Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples.	
	Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.	
	s ted Readings: J. Singh, L.D.S. Yadav, Organic Chemistry (Volume I), 14 th Edition, Pragati Prakashan, 2019.	
	S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, Revised Edition. (Revi Singh and Om Prakash). TRINITY Press, An Imprint of Laxmi Publications Pvt. Ltd., 2015.	sed by S. P
3.	R. N. Boyd, R. T. Morrison and S. K. Bhattcharjee, Organic Chemistry, 7 th Edition, Pearson, 2014.	
4.	S. M. Mukerji, S. P. Singh, K.P. Kapoor and R. Das, Organic Chemistry (Volume III), 2 nd Edition International Publishers, 2014.	n, New Age
5.	J. E. McMurry, Fundamentals of Organic Chemistry, 7 th Edition, Cengage Learning India, 2013.	
	S. M. Mukerji, S. P. Singh, K.P. Kapoor and R. Das, Organic Chemistry (Volume II), 2 nd Edition International Publishers, 2012.	
	S. M. Mukerji, S. P. Singh, K.P.Kapoor and R. Das, Organic Chemistry (Volume I), 2 nd Edition International Publishers, 2010.	, New Ag
8.	P. S. Kalsi, Stereochemistry Conformation and Mechanism, New Age International, 2005.	
9.	I. L. Finar, Organic Chemistry (Volume 1), 6 th Edition, Pearson, 2002.	
10	. I. L. Finar, Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Pro Edition, Pearson, 2002.	oducts), 5 ¹

11. E. L. Eliel & S. H. Wilen, Stereochemistry of Organic Compounds, Wiley: London, 1994.

Course No:	Course Name:	Dractical			Course Code: SBS CH 020104 C 0042				
Batch:	Organic Chemistry Programme:	Semester:	L	т	SBS CH 02	Credit	42 Contact H	**	
2022	Integrated B.Sc	Semester.	L .	•	r	Credit	per Week		
onwards	M.Sc. Chemistry	1	0	0	4	2	Total Hrs:	. <u>60</u>	
	ation Marks: 50	•	U	U		2	rotarins.	00	
CIE: 15 Marks		Examinatio	n Duration:	6 Hrs.					
TEE: 35 N	Лarks	Pre-requisite of course: Common understanding of chemicals.							
Course Objective	To inculcate the co b.p. determination,							-	
CourseAfter completing this course, student is expected to learn the following:Outcomes:CO1: About the calibration of thermometer and its usesCO2: Determination of b.p. and m.p. of the organic compounds purification of organiCO3: About the use of thin layer chromatography							of organic c	ompounds	
		CC	URSE SYI	LABUS					
NOTE:									
Two questic	ons will be set, one from	each of the l	JNIT. The ca	ndidates a	ire required	to attemp	ot both ques	tions.	
Unit No.			Content	ts				Contact Hrs.	
I	1. Checking the calibra	tion of the th	nermomete	r				30	
	2. Purification of organ	nic compound	ds by crysta	llization us	sing the foll	owing solv	vents:		
	a) Water								
	b) Alcohol								
	c) Alcohol-Water3. Determination of t	ha malting	noints o	fabovo	compound	hac ah	unknown		
	organic compounds (Kj	•	•		•				
11	4.Effect of impurities							30	
	organic compounds		01		0 1				
	5.Determination of bo	iling point o	f liquid con	npounds.	(boiling po	int lower	than and		
	more than 100 °C by di	stillation and	l capillary m	nethod)					
	6.Chromatography								
	a. Separation of a mi	xture of two	o amino ac	ids by as	cending an	d horizont	tal paper		
	chromatography	turo of two o	ugare by ac	conding a	nor chrom	atography			
	b. Separation of a mixc. Separation of a mix				•				
	layer chromatography						. Sy chin		

Suggested Readings:

1. B.S. Furniss ; A. J. Hannaford ; P.W.G. Smith ; A. R. Tatchell, Practical Organic Chemistry, 5th Edition., Pearson, 2012.

2. F.G. Mann & B.C. Saunders, Practical Organic Chemistry, Pearson, 2009.

Semester II

Course	e No:	Course Name:				Course				
		Physical Chemistry				SBS CH (020201 C 3	1		
Batch:	:	Programme:	Semester:	L	Т	Р	Credit	Contact H		
2022		Integrated B.Sc						per Week		
onwar		M.Sc.(Chemistry)	II	3	1	0	4	Total Hrs.	60	
Total I	Evaluati	ion Marks: 100	Examinatio	n Duratio	า:	3 Hrs.				
CIE: TEE:	30 Ma 70 Ma		Pre-requisit to Sen. Sec.		se: Knowle	edge of bas	sic physica	l chemistry	course up	
Course	e	To provide student	s with a basi	c understa	ndina of p	hvsical che	mistrv. aa	seous. liauia	and solid	
Object			ts with a basic understanding of physical chemistry, gaseous, liquid and solid uilibria. This course will strengthen the fundamentals of physical chemistry,							
		especially gaseous			-	-			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Course	ρ	After completing t					following			
Outco		CO1 : Basic underst			-					
		CO2 : Use of gaseo		•	•	ues in dailv	life.			
		CO3 : Skills for anal	•							
		CO4 : Skills for deve								
		CO5: Developmen		• •						
		CO6 : Use of advan					nistry.			
							,			
				OURSE SY	LLABUS					
ii) Qu	d to ans estion r	wer any four. Each nos. 2 to 5 are to be dents need to answe	set from all	four units	one from	each. Eve				
Unit			er any two su	•	each ques		part carri	es seven ma	Contact	
No.				Com	lents				Hrs.	
<u>I</u>	GASE								15	
-	GASEOUS STATEKinetic molecular model of a gas: postulates and derivation of the collision frequency; collision diameter; mean free path and viscos their temperature and pressure dependence, relation between coefficient of viscosity, calculation of σ from η ; variation of visco and pressure.						y of gases nean free	, including path and		
	mean		probable) an	d average	kinetic e	g molecular velocities (average, root kinetic energy, law of equipartition of of heat capacities.				
	and it behav real g	ior of real gases: E s variation with p ior. Van der Waals gas behavior, ment ici); virial equation	ressure for equation of tion of othe	different state, its er equatio	gases. Ca derivation ons of st	uses of d and appli ate (Bertl	eviation f cation in nelot, die	rom ideal explaining lectric or		

	calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.	
11	LIQUID STATEQualitative treatment of the structure of the liquid state; Radial distribution function; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.Qualitative discussion of structure of water. Different bonding present in solid and liquid state of water. Difference in structure of liquid and solid state of water.	15
III	SOLID STATE Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals. Glasses and liquid crystals.	15
IV	 IONIC EQUILIBRIA Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment). Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations. Multistage equilibria in polyelectrolyte systems; hydrolysis and hydrolysis constants. 	15

Suggested Readings:

1. P. W. Atkins, and J. D. Paula, Atkin's Physical Chemistry, 10th Edition, Oxford University Press (2014).

- 2. T. Engel, and P. Reid, Physical Chemistry 3rd Edition, *Pearson* (2013).
- R. G. Mortimer, Physical Chemistry 3rd Edition, *Elsevier*, NOIDA, UP (2009).
 D. W. Ball, Physical Chemistry, *Thomson Press*, India (2007).
- 5. G. W. Castellan, Physical Chemistry 4th Edition, *Narosa Publication House* (2004).

Course	e No:	Course Name:				Course 0	Code:		
		Physical Chemistry	Practical-I			SBS CH (020202 C (042	
Batch: 2022	:	Programme: Integrated B.Sc	Semester:	L	т	Р	Credit	Contact Hr per Week:	s.
onwar	ds	M.Sc.(Chemistry	П	0	0	4	2	Total Hrs.:	60
Total I	Evaluati	on Marks: 50	Examinatio			6 Hrs.			
CIE:	15 Ma	rks						preparation c practical kr	
TEE:	35 Ma	rks	up to Sen. S		practical	aboratory			owiedge
Course Object	-	To provide studer strengthen the fun techniques.	ts with a bo	asic unders				•	
Outco	mes:	CO1: Basic unders CO2: Use of surfac CO3: Skills for ana CO4: Skills for dev CO5: Developmen CO6: Use of advan	e tension, vi yzing and de eloping indus t of alternate	scosity and eveloping n strially imp e testing m	indexing t ew sustain ortant pra- ethods.	echnique able meth ctical met	hods.		
			CC	OURSE SY	LABUS				
NOTE:	Deper delete	iding on availabil d.	ity of time a	and equip	ment's, s	ome exp	eriments	may be ad	ded/
Unit				Cont	ents				Contact
No. I	Conf	ace tension and Vis							Hrs. 30
	a. De b. St co c. Det sugar at	etermine the surface udy the variation of ncentration. ermination of visco room temperature. udy the variation o	tension by (of surface sity of aqueo	(i) drop nui tension o pus solution	of deterge	ent solut	ions with	h und(iii)	
II	Indexi a. Find b. Det pH r a. Str act b. Pr i. S ii. c. pH	ng by powder diffra ling Miller indices o ermination of avera netry udy the effect on pH etate and their mixt eparation of buffer Sodium acetate-acet Ammonium chlorid metric titration of (i ermination of disso	f unknown X ge particle si of addition ures. solutions of ic acid e-ammonium) strong acid	RD using JC ize using Sc of HCl/Na different pl h hydroxid l vs. strong	CPDS card f therrer equ aOH to so H e base, (ii)	ile. Jation. lutions of	acetic aci		30

Suggested Readings:

1. R. Gupta, Practical Physical Chemistry, New Age International Pub. House, New Delhi (2017).

2. B. D. Khosla, V. C. Garg, and A. Gulati, Senior Practical Physical Chemistry, *R. Chand & Co.*, New Delhi (2011).

3. C. W. Garland, J. W. Nibler, and D. P. Shoemaker, Experiments in Physical Chemistry, 8th Edition; McGraw-Hill, New York (2003).

4. A. M. Halpern, and G. C. Mc. Bane, Experimental Physical Chemistry 3rd Edition, W.H. Freeman & Co., New York (2003).

Course	e No:	Course Name:			Course Code: SBS CH 020203 C 3104					
		Organic Chemistry-			-	SBS CH 0				
Batch:		Programme:	Semester:	L	Т	Р	Credits	Contact Hrs.	,	
2022		Integrated B.Sc						per Week:	04	
onward	ds	M.Sc. Chemistry	П	3	1	0	4	Total Hrs.:	60	
Total E	Evaluatio	n Marks: 100	Examinatior	n Duration:		3 Hrs.				
CIE:	30 Mar		preparation	and proper	ties of alc	ohols, phe	nols, ethers	ogenated hydr and epoxides	, addition	
TEE:	70 Mar							their derivative		
Course		To provide studer						•		
Object	lives		roperties of alcohols, phenols, ethers and epoxides, structure reactivity and ponyl compounds, carboxylic acids and their derivatives.							
			, ,							
Course		After completing th		•			lowing:			
Outcor	mes:	CO1: Understandin		•	•		لير جاء ما			
		CO2: Understandin		• •			-	ers and epoxid	es	
		CO3: Understandin	-			•		ماه می از می مرد ا		
		CO4: Understandin			· ·			•		
		CO5: Understandin	- · ·	tion and rea	ictions of	Sulphur co	ntaining cor	mpounas		
		CO6: Scope of orga	nicreactions							
			C	OURSE SYL	LABUS					
NOTE:										
i) Ques	stion no.	1 is compulsory and	to be set from	the entire s	syllabus. It	will have s	seven sub-p	arts and stude	nts need	
		our. Each part carrie					·			
ii) Que	estion nos	s. 2 to 5 are to be set	from all four	units one fr	om each.	Every ques	stion will ha	ve three sub-p	oarts and	
studen	nts need t	o answer any two su	b-parts of ea	ch question	. Each par	t carries se	ven marks.	-		
Unit				Conte	ents				Contact	
No.									Contact	
I	CHEMIS	TRY OF HALOGENAT	ED HYDROCA						Hrs.	
	mechan	alides: Methods of		RBONS						
	eliminat	isms with stereoche	•	nucleophilic					Hrs.	
		isms with stereoche tion. <i>lides:</i> Preparation,	mical aspects including pre	nucleophilic and effect	of solven	t etc.; nuc	leophilic su	bstitution vs.	Hrs.	
	<i>Aryl ha</i> substitu	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne	mical aspects including pre mechanism.	nucleophilio and effect paration fr	of solven om diazo	t etc.; nuc nium salts	leophilic sul 5. nucleoph	bstitution vs. ilic aromatic	Hrs.	
	<i>Aryl ha</i> substitu Relative	isms with stereoche ion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl,	mical aspects including pre mechanism.	nucleophilio and effect paration fr	of solven om diazo	t etc.; nuc nium salts	leophilic sul 5. nucleoph	bstitution vs. ilic aromatic	Hrs.	
	Aryl ha substitu Relative reactior	isms with stereoche ion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, is.	mical aspects including pre mechanism. allyl/benzyl, v	nucleophilic and effect paration fr vinyl and ar	of solven om diazo yl halides	t etc.; nuc nium salts towards i	leophilic sul 5. nucleoph	bstitution vs. ilic aromatic	Hrs.	
11	Aryl ha substitu Relative reaction Organo	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, ns. metallic compounds	mical aspects including pre mechanism. allyl/benzyl, v of Mg and Li a	nucleophilic and effect paration fr vinyl and ar and their use	of solven om diazo yl halides	t etc.; nuc nium salts towards i	leophilic sul 5. nucleoph	bstitution vs. ilic aromatic	Hrs. 15	
11	Aryl ha substitu Relative reaction Organou ALCOH	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, s. metallic compounds DLS, PHENOLS, ETHE	mical aspects including pre mechanism. allyl/benzyl, v of Mg and Li a RS AND EPOX	nucleophilic and effect paration fr vinyl and ar and their use IDES	of solven om diazo yl halides e in synth	t etc.; nuc nium salts towards r esis.	leophilic sul 5. nucleoph nucleophilic	bstitution vs. ilic aromatic substitution	Hrs.	
11	Aryl ha substitu Relative reaction Organo ALCOHO Alcohol	isms with stereoche cion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, s. metallic compounds DLS, PHENOLS, ETHE s: preparation, prop	mical aspects including pre mechanism. allyl/benzyl, v of Mg and Li a RS AND EPOX erties and re	nucleophilic and effect paration fr vinyl and ar and their use IDES elative reac	of solven om diazo yl halides <u>e in synth</u> tivity of 1	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a	leophilic sul . nucleoph nucleophilic alcohols, Bc	bstitution vs. ilic aromatic substitution	Hrs. 15	
11	Aryl ha substitu Relative reaction Organo ALCOHO Alcohols Reducti	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, ns. metallic compounds DLS, PHENOLS, ETHE s: preparation, prop on; Preparation and	mical aspects including pre mechanism. allyl/benzyl, v of Mg and Li a RS AND EPOX erties and re properties of	nucleophilic and effect paration fr vinyl and ar and their use IDES elative reac	of solven om diazo yl halides <u>e in synth</u> tivity of 1	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a	leophilic sul . nucleoph nucleophilic alcohols, Bc	bstitution vs. ilic aromatic substitution	Hrs. 15	
11	Aryl ha substitu Relative reaction Organo ALCOHO Alcohols Reducti Pinacol-	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, is. metallic compounds DLS, PHENOLS, ETHE s: preparation, prop on; Preparation and Pinacolone rearrang	mical aspects including pre mechanism. allyl/benzyl, w of Mg and Li a RS AND EPOX erties and re properties of ement.	nucleophilic and effect paration fr vinyl and ar and their use lative reac glycols: Oxic	of solven om diazo yl halides <u>e in synth</u> tivity of 1 dation by p	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a periodic ac	leophilic sul s. nucleoph nucleophilic alcohols, Bo id and lead	bstitution vs. ilic aromatic substitution puvaelt-Blanc tetraacetate,	Hrs. 15	
II	Aryl ha substitu Relative reaction Organou Alcohols Reducti Pinacol- Phenols	isms with stereoche cion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, s. metallic compounds DLS, PHENOLS, ETHE s: preparation, propon; Preparation and Pinacolone rearrang : Preparation and pr	mical aspects including pre mechanism. allyl/benzyl, w of Mg and Li a RS AND EPOX erties and re properties of ement. operties; Acid	nucleophilic and effect paration fr vinyl and ar and their use lative reac glycols: Oxic dity and fac	of solven om diazo yl halides <u>e in synth</u> tivity of 1 dation by p tors effec	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a periodic ac ting it, Rin	leophilic sul s. nucleoph nucleophilic alcohols, Bc id and lead g substitutio	bstitution vs. ilic aromatic substitution puvaelt-Blanc tetraacetate, on reactions,	Hrs. 15	
11	Aryl ha substitu Relative reaction Organo Alcohol Reducti Pinacol- Phenols Reimer-	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne e reactivity of alkyl, ns. metallic compounds DLS, PHENOLS, ETHE s: preparation, prop on; Preparation and Pinacolone rearrang <i>:</i> Preparation and pu -Tiemann and Koll	mical aspects including pre mechanism. allyl/benzyl, w of Mg and Li a RS AND EPOX erties and re properties of ement. operties; Acid	nucleophilic and effect paration fr vinyl and ar and their use lative reac glycols: Oxic dity and fac	of solven om diazo yl halides <u>e in synth</u> tivity of 1 dation by p tors effec	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a periodic ac ting it, Rin	leophilic sul s. nucleoph nucleophilic alcohols, Bc id and lead g substitutio	bstitution vs. ilic aromatic substitution puvaelt-Blanc tetraacetate, on reactions,	Hrs. 15	
11	Aryl ha substitu Relative reaction Organo ALCOHO Alcohols Reducti Pinacol- Phenols Reimer- mechan	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne reactivity of alkyl, as. metallic compounds DLS, PHENOLS, ETHE <i>s:</i> preparation, prop on; Preparation and Pinacolone rearrang <i>:</i> Preparation and pi -Tiemann and Koll ism.	mical aspects including pre mechanism. allyl/benzyl, w of Mg and Li a RS AND EPOX erties and re properties of ement. operties; Acio pe's–Schmidt	nucleophilic and effect paration fr vinyl and ar and their use lative reac glycols: Oxic dity and fac Reactions,	of solven om diazo yl halides <u>e in synth</u> tivity of 1 dation by p tors effec Fries an	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a periodic ac ting it, Rin nd Claiser	leophilic sul s. nucleoph nucleophilic alcohols, Bo id and lead g substitution rearrange	bstitution vs. ilic aromatic substitution buvaelt-Blanc tetraacetate, on reactions, ements with	Hrs. 15	
II	Aryl ha substitu Relative reaction Organou Alcohols Reducti Pinacol- Phenols Reimer- mechan Ethers o	isms with stereoche tion. <i>lides:</i> Preparation, tion; SNAr, Benzyne e reactivity of alkyl, ns. metallic compounds DLS, PHENOLS, ETHE s: preparation, prop on; Preparation and Pinacolone rearrang <i>:</i> Preparation and pu -Tiemann and Koll	mical aspects including pre mechanism. allyl/benzyl, w of Mg and Li a RS AND EPOX erties and re properties; Acido perties; Acido pe's–Schmidt ation and read	nucleophilic and effect paration fr vinyl and ar and their use lative reac glycols: Oxic dity and fac Reactions,	of solven om diazo yl halides <u>e in synth</u> tivity of 1 dation by p tors effec Fries an	t etc.; nuc nium salts towards r esis. L°, 2°, 3° a periodic ac ting it, Rin nd Claiser	leophilic sul s. nucleoph nucleophilic alcohols, Bo id and lead g substitution rearrange	bstitution vs. ilic aromatic substitution buvaelt-Blanc tetraacetate, on reactions, ements with	Hrs. 15	

III	CARBONYL COMPOUNDS	15
	Structure, reactivity and preparation; Nucleophilic additions, Nucleophilic addition-elimination	
	reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin	
	condensation, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reaction,	
	Beckmann and Benzil-Benzilic acid rearrangements, haloform reaction and Baeyer Villiger	
	oxidation, α -substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner, LiAlH ₄ ,	
	NaBH ₄ , MPV, PDC and PGC).	
	Addition reactions of unsaturated carbonyl compounds: Michael addition.	
	Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of	
	diethyl malonate and ethyl acetoacetate.	
IV	CARBOXYLIC ACIDS AND THEIR DERIVATIVES	15
	Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic/phthalic, lactic, malic, tartaric, citric, maleic and fumaric acids; Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmannbromamide degradation and Curtius rearrangement.	
Sugge	ested Readings:	
1	. Solomons, T.W G., Fryhle, B. Craig. Organic Chemistry, John Wiley & Sons, Inc (2009).	
2	. McMurry, J.E. Fundamentals of Organic Chemistry, Seventh edition Cengage Learning (2013).	
3	. P. Sykes, A Guide Book to Mechanism in Organic Chemistry, Orient Longman, New Delhi, 6 th Edition	n (1997),
4	. 4 Morrison R. T. and Boyd R. N. Organic Chemistry, Sixth Edition Prentice Hall India (2003).	

Course	e No:	Course Name: Organic Chemistry	Practical-II			Course C	ode: 20204 C 004	40		
Batch 2022	:	Programme: Integrated B.Sc	Semester:	L	т	P	Credits	Contact Hrs	. 04	
onwar	rds	M.Sc. Chemistry	111	0	0	4	2	Total Hrs.:	<u> </u>	
		n Marks: 100			Ū		2	Total III S.	00	
			Examination	Duration:		6 Hrs.				
CIE:	15 Mar		Pre-requisite compounds	Pre-requisite of course: functional group tests, preparation of compounds						
TEE:	35 Mar									
Course Object		To provide student compounds	ts with basic i	understand	ing of fur	nctional gro	oup tests, p	preparation of	f Organic	
Course	е	After completing th		•			-			
Outco	mes:	CO1: Understandir	ng of Function	al group te	sts for alc	ohols, phe	nols, carboi	nyl and carbo	xylic acid	
		group.								
		CO2: Understandin		-	•	ounds				
		CO3: Learn organic	chemistry thr	ough exper	iments					
			CC	OURSE SYL	LABUS					
NOTE:	:									
Two q	uestions	will be set, one from	each of the U	NIT. The ca	ndidates a	are require	d to attemp	ot all the ques	tions.	
Unit				Conte	ents				Contact	
No. I	Idontifi	estion of elements a			тесте				Hrs. 30	
I			and FUNCTIONAL GROUP TESTS (N, S, and halogen) and functional group tests for alcohols, phenols,							
		l and carboxylic acid			unctional	group test				
		IC PREPARATIONS	0 1						30	
	i. Ace	etylation of one of th	e following co	mpounds:	amines (a	niline, o-, n	n-, p- toluid	lines and o-		
		, -, p-anisidine) and pł	•	•	•		•			
	a.	Using conventional	method.							
		Using green approa								
		nzolyation of one of								
	ani	sidine) and one of th	e following pl	nenols (β-na	aphthol, r	esorcinol, p	o- cresol) by	Schotten-		
	Bau	umann reaction.		1. (
	Bau iii. Oxi	dation of ethanol/ is			ction).					
	Bau iii. Oxi iv. Bro	dation of ethanol/ is mination of any one	of the followi	ng:	ction).					
	Bau iii. Oxi iv. Bro a.	dation of ethanol/ is mination of any one Acetanilide by conv	of the followi entional meth	ng: ods		pethod)				
	Bau iii. Oxi iv. Brc a. b.	dation of ethanol/ is mination of any one Acetanilide by conv Acetanilide using gr	of the followi entional meth een approach	ng: ods		nethod)				
	Bau iii. Oxi iv. Brc a. b. v. Nit	dation of ethanol/ is omination of any one Acetanilide by conv Acetanilide using gr ration of any one of	of the followi entional meth een approach the following:	ng: ods (Bromate-b	promide n	nethod)				
	Bau iii. Oxi iv. Brc a. a. b. v. Nit a.	dation of ethanol/ is mination of any one Acetanilide by conv Acetanilide using gr ration of any one of Acetanilide/nitrobe	of the followi entional meth een approach the following: nzene by conv	ng: ods (Bromate-b entional mo	promide n					
	Bau iii. Oxi iv. Brc a. b. v. Nit a. b.	dation of ethanol/ is omination of any one Acetanilide by conv Acetanilide using gr ration of any one of	of the followi entional meth een approach the following: nzene by conv en approach (u	ng: ods (Bromate-b entional mo using ceric a	oromide n ethod ammoniur	n nitrate).				
	Bau iii. Oxi iv. Brc a. b. v. Nit a. b. v. Sel	dation of ethanol/ is omination of any one Acetanilide by conv Acetanilide using gr ration of any one of Acetanilide/nitrobe Salicylic acid by gree	of the followi entional meth een approach the following: nzene by conv en approach (u neta dinitrobe	ng: ods (Bromate-k entional mo using ceric a nzene to mo	oromide n ethod ammoniur -nitroanili	n nitrate). ne.				
	Bau iii. Oxi iv. Brc a. b. v. Nit a. b. vi. Sel vii. Rec	dation of ethanol/ is omination of any one Acetanilide by conv Acetanilide using gr ration of any one of Acetanilide/nitrobe Salicylic acid by gree ective reduction of n	of the followi entional meth een approach the following: nzene by conv en approach (u neta dinitrobe nzaldehyde by	ng: ods (Bromate-k entional mo using ceric a nzene to mo	oromide n ethod ammoniur -nitroanili	n nitrate). ne.				
	Bau iii. Oxi iv. Brc a. b. v. Nit a. b. vi. Sel vii. Rec viii. Hyd	dation of ethanol/ is mination of any one Acetanilide by conv Acetanilide using gr ration of any one of Acetanilide/nitrobe Salicylic acid by gree ective reduction of n duction of p-nitrober	of the followi entional meth een approach the following: nzene by conv en approach (u neta dinitroben zaldehyde by d esters.	ng: ods (Bromate-k entional mo using ceric a nzene to mo sodium boo	oromide n ethod ammoniur -nitroanili rohydride.	n nitrate). ne.				

	 x. S-Benzylisothiouronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid). xi. Aldol condensation using either conventional or green method. xii. Benzil-Benzilic acid rearrangement. The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization, melting point and TLC.
Sugges	ted Readings:
1.	Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2.	Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearsor (2012)
2	Abbunchie V/K 8 Aggemust D. Compareheaving Drastical Organic Chamistry, Dransvetian and Organitati

- 3. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
- 4. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000).

Semester III

Course	e No:	Course Name: Physical Chemistry	/-			Course SBS CH (Code: 020301 C 3	3104		
Batch:		Programme:	Semester:	L	Т	Р	Credit	Contact Hrs	•	
2022		Integrated B.Sc						per Week:	4	
onwar	ds	M.Sc.(Chemistry)	Ш	3	1	0	4	Total Hrs.:	60	
Total I	Evaluati	on Marks: 100	Examinatio	n Duratior	1:	3 Hrs.				
CIE:	30 Ma	rks	Pre-requisite of course: Knowledge of basic physical chemistry course up to Sen. Sec. level.							
TEE:	70 Ma									
Course		To provide studen								
Object									specially	
Course	е	After completing t	his course, st	udent is e	pected to	learn the	following	:		
Outco	mes:	CO1: Basic unders	tanding of ch	emical the	rmodynam	nics.	-			
		CO2: Use of chemi	cal thermody	namics in	daily life.					
		CO3: Skills for ana		• •						
		CO4: Skills for dev		• •			hods.			
		CO5: Developmen			•					
		CO6: Use of advan	ced and rece	nt chemica	al thermod	lynamic cł	nemistry.			
			CC	OURSE SYI	LABUS					
studer ii) Que	stion no nts neec estion n	 1 is compulsory and I to answer any four os. 2 to 5 are to be lents need to answer 	. Each part c set from all	arries three four units	e and half one from e	marks. each. Ever	y questio	n will have the	ree sub-	
Unit				Cont			part carrie		Contact	
No.									Hrs.	
I	CHEM	ICAL THERMODYNA	MICS-I						15	
	systen First a enthal irrever adiaba Second	ive and extensive as; zeroth law of the <i>law:</i> Concept of he py, <i>H</i> , relation betw rsible and free expa- tic conditions. <i>d Law:</i> Concept of l law of thermod	ermodynamic eat, q , work, een heat cap unsion of gas entropy; ther	es. w, interna acities, calo es (ideal an modynami	l energy, <i>l</i> culations o nd van der c scale of	U, and stand q , w , U and q , w , U and r Waals) the temperated	atement of and <i>H</i> for under isoth ure, statem	first law; reversible, hermal and hent of the		
	Calcul <i>Third</i>	ation of entropy ch <i>Law:</i> Statement of y of molecules.			irreversibl	e process		of absolute		

	Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs- Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases.	
	CHEMICAL THERMODYNAMICS-II <i>Thermochemistry:</i> Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchhoff's equations) and pressure on enthalpy of reactions. Adiabatic flame temperature, explosion temperature.	
	<i>Free Energy Functions:</i> Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state.	
III	CHEMICAL EQUILIBRIUM	15
	Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Coupling of exoergic and endoergic reactions. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants K_p , K_c and K_x . Le Chatelier principle (quantitative treatment); equilibrium between ideal gases and a pure condensed phase.	
IV	SOLUTIONS AND COLLIGATIVE PROPERTIES	15
	Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Excess thermodynamic functions.	
	Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.	
Sugge	sted Readings:	
1.	A. Peter, and J. Paula, Physical Chemistry 10 th Edition, Oxford University Press (2014).	
2. 3. asl	T. Engel, and P. Reid, Physical Chemistry 3 rd Edition, <i>Prentice-Hall</i> (2012). M. J. Assael, A. R. H. Goodwin, M. Stamatoudis, W. A. Wakeham, and S. Will, Com and questions in thermodynamics. <i>CRC Press</i> , New York (2011).	umonly
4.	I. N. Levine, Physical Chemistry 6 th Edition, Tata Mc Graw Hill (2010).	
5.	C. R. Metz, 2000 solved problems in chemistry, Schaum Series (2006).	
6.	G. W. Castellan, Physical Chemistry 4 th Edition, Narosa (2004).	
0.		
7.	D. A. McQuarrie, and J.D. Simon, Molecular Thermodynamics, <i>Viva Books Pvt.</i> ., New Delhi (2004).	

Course	e No:	Course Name:				Course			
		Physical Chemistry	y Practical-II		-	SBS CH	I 020302 C	C 0042	
Batch	:	Programme:	Semester:	L	т	Р	Credit	Contact Hrs	5.
2022		Integrated B.Sc						per Week:	04
onwar	ds	M.Sc. Chemistry	111	0	0	4	2	Total Hrs.:	60
Total I	Evaluati	on Marks: 50	Examinatio	on Duration	n:	6 Hrs.			
CIE:	15 Ma	rks	Pre-requisite of course: Knowledge of solution preparatio measure in chemistry practical laboratory and basic practical ki						
•									
TEE:	35 Ma	rks	up to Sen. S		P			-	
Course	e To provide stude				standing o	f laborato	ory technic	ques. This co	urse wi
Object	t ives strengthen the fu		ndamentals o	f analytical	chemistry	, and basi	cs of physic	cal chemistry p	oractica
		techniques.							
Course		After completing t			•		following	:	
Outco	mes:	CO1: Basic unders		•				.c	
		CO2 : Use of surfac	-	•	•	•	•	ite.	
		CO3 : Skills for ana	, .						
		CO4: Skills for dev CO5: Developmen		• •	•		nous.		
		CO6: Use of advar		-		erimental	chemistry		
					alee in exp		,	•	
			0	OURSE SY					
NOTE	Donor	ding on availabil		OURSE SY		ome evn	orimonts	may be add	lod /
	-	iding on availabil				ome exp	eriments	may be add	led/
delete	-	iding on availabil			oment's, s	ome exp	eriments	-	led/ Contac
delete Unit	-	ıding on availabil		and equip	oment's, s	ome exp	eriments	-	-
delete Unit No.	ed.	MOCHEMISTRY-I	ity of time a	and equip Cont	oment's, s ents				Contac
delete Unit No.	ed. THERI (a) De	MOCHEMISTRY-I termination of heat	ity of time a	and equip Cont	ents	erent volu	mes using	change of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal	MOCHEMISTRY-I termination of heat py data of a know	ity of time a capacity of a wn system (and equip Cont a calorimet method of	er for diffe	erent volu culation	mes using of heat ca	change of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal calorin	MOCHEMISTRY-I termination of heat py data of a known meter from known of	ity of time a capacity of a wn system (enthalpy of s	and equip Cont a calorimet method of olution or	er for diffe back cal enthalpy o	erent volu culation f neutraliz	mes using of heat ca zation).	change of apacity of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal calorin (b) D	MOCHEMISTRY-I termination of heat py data of a known meter from known o etermination of hea	ity of time a capacity of a wn system (enthalpy of s t capacity of	and equip Cont a calorimet method of olution or the calorin	er for diffe back cal enthalpy o	erent volu culation f neutraliz	mes using of heat ca zation).	change of apacity of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal calorin (b) D hydrod	MOCHEMISTRY-I termination of heat py data of a known meter from known of etermination of hea chloric acid with so	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox	and equip Cont a calorimet method of olution or the calorin kide.	er for diffe back cal enthalpy o neter and e	erent volu culation f neutraliz	mes using of heat ca zation).	change of apacity of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal calorin (b) D hydrod	MOCHEMISTRY-I termination of heat py data of a known meter from known o etermination of hea	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox	and equip Cont a calorimet method of olution or the calorin kide.	er for diffe back cal enthalpy o neter and e	erent volu culation f neutraliz	mes using of heat ca zation).	change of apacity of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De	MOCHEMISTRY-I termination of heat py data of a known meter from known of etermination of hea chloric acid with so lculation of the entle etermination of hear	ity of time a capacity of a wn system (enthalpy of s t capacity of dium hydrox halpy of ioni t capacity of	and equip Cont a calorimet method of olution or the calorin cide. zation of e	er for diffe f back cal enthalpy o neter and e thanoic	erent volu culation f neutraliz nthalpy o	mes using of heat ca zation). f neutraliz	change of apacity of	Contac Hrs.
delete Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De	MOCHEMISTRY-I termination of heat py data of a known meter from known of etermination of hea chloric acid with so lculation of the entl	ity of time a capacity of a wn system (enthalpy of s t capacity of dium hydrox halpy of ioni t capacity of	and equip Cont a calorimet method of olution or the calorin cide. zation of e	er for diffe f back cal enthalpy o neter and e thanoic	erent volu culation f neutraliz nthalpy o	mes using of heat ca zation). f neutraliz	change of apacity of	Contac Hrs.
deleta Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot	MOCHEMISTRY-I termination of heat py data of a known meter from known of etermination of hea chloric acid with so lculation of the entl etermination of hear hermic and exother	ity of time a capacity of a wn system (enthalpy of s t capacity of dium hydrox halpy of ioni t capacity of	and equip Cont a calorimet method of olution or the calorin cide. zation of e	er for diffe f back cal enthalpy o neter and e thanoic	erent volu culation f neutraliz nthalpy o	mes using of heat ca zation). f neutraliz	change of apacity of	Contac <u>Hrs.</u> 30
deleta Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot	MOCHEMISTRY-I termination of heat py data of a known meter from known of etermination of heat chloric acid with so lculation of the entl etermination of heat hermic and exother	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox halpy of ioni t capacity of rmic) solution	and equip Cont a calorimet method of olution or the calorin cide. zation of e the calorin n of salts.	er for diffe ents back cal enthalpy o neter and e thanoic neter and	erent volu culation f neutraliz nthalpy o	mes using of heat ca zation). f neutraliz nthalpy	change of apacity of ation of	Contac Hrs.
deleta Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot THERI (a) D	MOCHEMISTRY-I termination of heat py data of a known meter from known of etermination of hea chloric acid with so lculation of the entl etermination of hear hermic and exother	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox halpy of ioni t capacity of rmic) solution	and equip Cont a calorimet method of olution or of the calorin cide. zation of e the calorin n of salts.	er for diffe f back cal enthalpy o neter and e thanoic meter and	erent volu culation f neutraliz nthalpy o integral e acid by	mes using of heat ca zation). f neutraliz nthalpy the therm	change of apacity of ation of	Contac <u>Hrs.</u> 30
deleta Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot THERI (a) D metho	MOCHEMISTRY-I termination of heat py data of a known eter from known of etermination of heat chloric acid with so lculation of the entle etermination of heat hermic and exother MOCHEMISTRY-II etermination of ba	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox halpy of ioni t capacity of rmic) solution asicity/protici changes of te	and equip Cont a calorimet method of olution or the calorin side. zation of e the calorin n of salts.	er for diffe f back cal enthalpy o neter and e thanoic neter and oolyprotic s observed	erent volu culation f neutraliz nthalpy o integral e acid by d in the g	mes using of heat ca zation). f neutraliz nthalpy the therm graph of te	change of apacity of ation of wochemical	Contac <u>Hrs.</u> 30
deleta Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot THERI (a) D metho versus of the	MOCHEMISTRY-I termination of heat py data of a known etermination of hea chloric acid with so lculation of the entl etermination of heat hermic and exother MOCHEMISTRY-II etermination of ba d in terms of the o time for different a first step.	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox halpy of ioni t capacity of rmic) solution asicity/protici changes of to additions of a	and equip Cont a calorimet method of olution or of the calorin cide. zation of e the calorir n of salts. ty of a p emperature a base. Also	er for diffe ents er for diffe f back cal enthalpy o neter and e thanoic neter and oolyprotic s observed o calculate	erent volu culation f neutraliz nthalpy o integral e acid by d in the g the entha	mes using of heat ca zation). f neutraliz nthalpy the therm graph of te	change of apacity of ation of wochemical	Contac <u>Hrs.</u> 30
deleta Unit No.	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot THERI (a) D metho versus of the (b) D	MOCHEMISTRY-I termination of heat py data of a know meter from known of etermination of heat chloric acid with so lculation of the entle etermination of heat hermic and exother MOCHEMISTRY-II etermination of bat d in terms of the of time for different a first step. termination of enth	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox halpy of ioni t capacity of rmic) solution asicity/protici changes of to additions of a halpy of hydr	and equip Cont a calorimet method of olution or of the calorin cide. zation of e the calorin n of salts. ty of a p emperature a base. Also ation of co	er for diffe f back cal enthalpy o neter and e thanoic meter and oolyprotic s observed o calculate pper sulph	erent volu culation f neutraliz nthalpy o integral e acid by 1 in the g the entha ate.	mes using of heat ca zation). f neutraliz nthalpy the therm graph of te lpy of neu	change of apacity of ation of wochemical	Contac <u>Hrs.</u> 30
NOTE: delete Unit No. I	ed. THERI (a) De enthal calorin (b) D hydroo (c) Ca acid. (d) De (endot THERI (a) D metho versus of the (b) D	MOCHEMISTRY-I termination of heat py data of a known etermination of hea chloric acid with so lculation of the entl etermination of heat hermic and exother MOCHEMISTRY-II etermination of ba d in terms of the o time for different a first step.	ity of time a capacity of a wn system (enthalpy of s t capacity of odium hydrox halpy of ioni t capacity of rmic) solution asicity/protici changes of to additions of a halpy of hydr	and equip Cont a calorimet method of olution or of the calorin cide. zation of e the calorin n of salts. ty of a p emperature a base. Also ation of co	er for diffe f back cal enthalpy o neter and e thanoic meter and oolyprotic s observed o calculate pper sulph	erent volu culation f neutraliz nthalpy o integral e acid by 1 in the g the entha ate.	mes using of heat ca zation). f neutraliz nthalpy the therm graph of te lpy of neu	change of apacity of ation of wochemical	Contac <u>Hrs.</u> 30

Suggested Readings:

- 1. R. Gupta, Practical Physical Chemistry, New Age International Pub. House, New Delhi (2017).
- 2. J. B. Yadav, Advanced Practical Physical Chemistry, Krishana Prakashan Media, Pvt. Ltd. (2015).
- 3. B.D. Khosla, V. C. Garg, a n d A. Gulati, Senior Practical Physical Chemistry, *R. Chand & Co.*, New Delhi (2011).
- 4. V. D. Athawale, and P. Mathur, Experimental Physical Chemistry, *New Age International*, New Delhi (2001).
- 5. A. M. Halpern, and G. C. Mc. Bane, Experimental Physical Chemistry 3rd Edition, W.H. Freeman & Co., New York (2003).

Cours	e No:	Course Name:							
		Organic Chemistry-	111			SBS CH	020303 C 3	5104	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	
2022		Integrated B.Sc						per Week:	04
onwa	rds	M.Sc. Chemistry	Ш	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	on Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE: TEE:	30 Mar 70 Mar		-				-	n containing f nds, alkaloids	
Cours		To provide students	s with hasic w	nderstandina	ofnitron	en containi	na function	al arouns nre	paration
Objec	-	of polynuclear hydr terpenes		-					•
Cours	e	After completing th	nis course, stu	dent is expe	cted to le	arn the foll	owing:		
Outco	omes:	CO1: Nitrogen cont	aining functio	onal groups a	nd their i	eactions.			
		CO2: Familiarizatio	n with polynu	clear hydroc	arbons ar	nd their rea	ctions.		
		CO3: Heterocyclic of	compounds ar	nd their react	ions.				
		CO4: Alkaloids and	Terpenes						
		CO5: Understandin	g reactions ar	nd reaction m	nechanisr	n of nitroge	en containir	ng functional g	groups.
		CO6: Understandin	g the reactior	ns and mecha	inisms of	diazonium	compound	S.	
		1	C	OURSE SYLL	ABUS				
NOTE	:								
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire s	syllabus.	t will have	four sub-pa	arts and stude	nts need
to ans	swer any	two. Each part carrie	s three and h	alf marks.					
ii) Que	estion no	s. 2 to 5 are to be set	from all four	units one fro	om each.	Every ques	tion will ha	ve three sub-i	
stude	nts need	to answer any two si	ub-parts of ea	ch question.				ve un ce sub j	parts and
Unit					Each par	t carries th	ree and half	-	oarts and
				Conte		t carries th	ree and half	-	barts and
No.				Conte		t carries th	ree and half	-	
NO. I	NITRO	GEN CONTAINING FU	NCTIONAL GI			t carries th	ree and hal	-	Contact
				ROUPS	nts			f marks.	Contact Hrs.
	Prepara	ation and important	reactions of	ROUPS nitro and co	mpound	s, nitriles a	nd isonitril	f marks. es Amines:	Contact Hrs.
	Prepara Effect o	ation and important of substituent and so	reactions of olvent on bas	ROUPS nitro and co icity; Prepara	mpounds	s, nitriles a	nd isonitril s: Gabriel p	f marks. es Amines: hthalimide	Contact Hrs.
	Prepara Effect of synthes	ation and important of substituent and so sis, Carbylamine re	reactions of olvent on bas action, Mani	ROUPS nitro and co icity; Prepara nich reactio	mpounds ation and	s, nitriles a properties nann's ext	nd isonitril s: Gabriel p naustive m	f marks. es Amines: hthalimide iethylation,	Contact Hrs.
	Prepara Effect of synthes Hofmar	ation and important of substituent and so sis, Carbylamine re nn-elimination reacti	reactions of olvent on bas action, Mani on; Distinctio	ROUPS nitro and co icity; Prepara nich reactio n between 1	mpounds ation and n, Hoffn °, 2° and	s, nitriles a l properties nann's ext 3° amines	nd isonitril s: Gabriel p naustive m with Hinsbe	f marks. es Amines: hthalimide iethylation,	Contact Hrs.
	Prepara Effect of synthes Hofmar	ation and important of substituent and so sis, Carbylamine re	reactions of olvent on bas action, Mani on; Distinctio	ROUPS nitro and co icity; Prepara nich reactio n between 1	mpounds ation and n, Hoffn °, 2° and	s, nitriles a l properties nann's ext 3° amines	nd isonitril s: Gabriel p naustive m with Hinsbe	f marks. es Amines: hthalimide iethylation,	Contact Hrs.
	Prepara Effect of synthes Hofman and nit	ation and important of substituent and so sis, Carbylamine re nn-elimination reacti	reactions of olvent on bas action, Mani on; Distinction Salts: Prepara	ROUPS nitro and co icity; Prepara nich reactio n between 1	mpounds ation and n, Hoffn °, 2° and	s, nitriles a l properties nann's ext 3° amines	nd isonitril s: Gabriel p naustive m with Hinsbe	f marks. es Amines: hthalimide iethylation,	Contact Hrs.
III	HETEROCYCLIC COMPOUNDS	15							
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	Classification and nomenclature, Structure, aromaticity in 5-numbered and 6-membered rings								
	containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of:								
	Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis),								
	Thiophene, Pyridine (Hantzsch synthesis), Pyrimidine, Structure elucidation of indole, Fischer								
	indole synthesis and Madelung synthesis), Structure elucidation of quinoline and isoquinoline,								
	Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner- Miller synthesis,								
	Bischler-Napieralski reaction, Pictet-Spengler reaction, Pomeranz-Fritsch reaction.								
	Derivatives of furan: Furfural and furoic acid.								
IV	ALKALOIDS AND TERPENES	15							
	Natural occurrence, General structural features, Isolation and their physiological action								
	Hoffmann's exhaustive methylation, Emde's modification, Structure elucidation and synthesis of								
	Hygrine and Nicotine. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and								
	Reserpine.								
	Occurrence, classification, isoprene rule; Elucidation of stucture and synthesis of Citral, Neral and								
	α-terpineol.								
Sugge	sted Readings:								
1.	Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Educa	ation).							
2.	Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).								
3.	Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling							
	Kindersley (India) Pvt. Ltd. (Pearson Education).								
4.	Acheson, R.M. Introduction to the Chemistry of Heterocyclic compounds, John Welly & Sons (1976	5).							
5.	Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.								
6.	McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.								
7.	Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.								
8.	Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.								
9.	Singh, J.; Ali, S.M. & Singh, J. Natural Product Chemistry, Prajati Parakashan (2010).								

Cours	e No:	Course Name:				Course C	ode:				
		Organic Chemistry	Practical-III			SBS CH	020304 C (0042			
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.		
2022		Integrated B.Sc						per Week:	04		
onwai	rds	M.Sc. Chemistry	Ш	0	0	4	2	Total Hrs.:	60		
Total	Evaluatio	n Marks: 100	Examination Duration: 6 Hrs.								
CIE:	15 Mar	ks	Pre-requisite of course: functional group tests, preparation of Organic compounds								
TEE:	35 Mar	ks									
Cours	е	To provide studen	ts with basic	understandi	<i>ng of</i> fur	nctional gro	oup tests, p	preparation o	f Organic		
Objec	tives	compounds									
Cours	е	After completing the	nis course, stu	dent is expe	cted to le	earn the fol	lowing:				
Outco	mes:	CO1: Understandir	ng of Function	al group tes	sts for alc	ohols, phe	nols, carbo	nyl and carbo	xylic acid		
		group.									
		CO2: Understandir	ng of preparati	on of organi	ic compo	unds					
		CO3: Learn organic	chemistry th	ough experi	ments						
		CO4: Preparation of	of methyl oran	ge							
		CO5: Extraction of	caffeine from	tea leaves							
		CO6: Analysis of Ca	arbohydrate								
			C	OURSE SYL	LABUS						
NOTE	:										
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire	syllabus.	It will have	four sub-pa	arts and stude	ents need		
to ans	wer any t	two. Each part carrie	s three and h	alf marks.							
ii) Que	estion no	s. 2 to 5 are to be se	t from all four	units one fr	om each.	Every ques	stion will ha	ve three sub-	parts and		
stude	nts need	to answer any two s	ub-parts of ea	ch question	. Each par	t carries th	ree and hal	f marks.			
Unit				Conte	nts				Contact		
No.									Hrs.		
I	1. Qua	litative analysis of	unknown or	ganic comp	ounds co	ontaining i	monofuncti	onal groups	60		
	(carboh	ydrates, aryl halides	, aromatic hy	drocarbons,	nitro cor	npounds, a	mines and	amides) and			
	simple l	pifunctional groups,	for e.g. salicyl	ic acid, cinna	amic acid,	nitrophen	ols, etc.				
	2. Ident	ification of function	al groups of s	imple organ	ic compo	unds by IR	spectrosco	py and NMR			
	spectro	scopy (IR and NMR	of simple or	ganic compo	ounds ma	iy be done	wherever	facilities are			
	availabl	e, otherwise sample	spectra may	be provided	for simpl	le organic d	compounds	like Ethanol,			
	Aniline,	Phenol, acetic acid	, other simpl	e aldehydes	, carboxy	lic acid, et	c., for ider	ntification of			
	functior	nal groups. Referen	ces from stan	dard spectr	oscopy b	ooks may	also be tak	en for such			
	purpose	e for enhancing stud	ents understa	nding and sk	cill).						
	3. Prepa	aration of methyl ora	ange.								
	4. Extra	ction of caffeine from	n tea leaves.								
I	5. Analy	sis of Carbohydrate	: aldoses and	ketoses, red	ucing and	d non-redu	cing sugars	using simple			

- 1. Vogel, A.I. *Quantitative Organic Analysis,* Part 3, Pearson (2012).
- 2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
- 3. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry, 5th Ed.,* Pearson (2012)
- 4. Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis,* University Press (2000).
- 5. Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis,* University Press (2000).

	se No:	Course Name:		Course Code:								
		Molecular Spectros	scopy & Photo	chemistry		SBS CH	020305 C 3	3104				
Batch	n:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	i.			
2022		Integrated B.Sc						per Week:	04			
onwa	rds	M.Sc. Chemistry	111	3	1	0	4	Total Hrs.:	60			
Total	Evaluatio	n Marks: 100	Examinatio	Examination Duration: 3 Hrs.								
CIE:	30 Mar	ks	Pre-requisit	e of course	: Knowle	edge of rad	diation and	its interacti	on with			
TEE:	70 Mar	ks	matter. Kno	wledge of ro	otation, vi	bration in r	nolecules.					
Cours		To provide students	s with basic un	derstanding	<i>of</i> variou	is spectrosc	opic techni	ques such as r	otational			
Objec	ctives	spectroscopy, FTIR										
		will be also equipp	ed with under	standing of	photophy	vsical and p	hotochemic	al processes.				
Cours	se	After completing the					owing:					
Outco	omes:	CO1: Understandin		• •	•	•						
		CO2: Understanding of concept of rotational spectroscopy CO3: Knowledge of vibrational spectroscopy, both FTIR and Raman										
		-					an					
		CO4: Understandin			•	• •						
		CO5: Understandin CO5: Understandin			ysical prie	enomena						
			C	OURSE SYL	IABUS							
	estion no.	1 is compulsory and	to be set from	n the entire	syllabus.	It will have	seven sub-	parts and stud	dents			
i) Que need ii) Que stude	estion no. to answe estion no	1 is compulsory and r any four. Each part s. 2 to 5 are to be se to answer any two s	to be set fror carries three t from all four	n the entire and half ma units one fr ch question	syllabus. rks. om each. . Each par	Every ques	tion will ha		parts and			
i) Que need ii) Que	estion no. to answe estion no	r any four. Each part s. 2 to 5 are to be se	to be set fror carries three t from all four	n the entire and half ma units one fr	syllabus. rks. om each. . Each par	Every ques	tion will ha					
i) Que need ii) Que stude Unit	estion no. to answe estion no nts need	r any four. Each part s. 2 to 5 are to be se	to be set from carries three t from all four ub-parts of ea	n the entire and half ma units one fr ch question Conte	syllabus. rks. om each. . Each par e nts	Every ques	tion will ha		parts and Contact			
i) Que need ii) Que stude Unit No.	estion no. to answe estion no nts need GENER/ Interact	r any four. Each part s. 2 to 5 are to be set to answer any two set AL PRINCIPLES AND cion of electromagn	to be set from carries three t from all four ub-parts of ea ROTATIONAL letic radiation	n the entire and half ma units one fr <u>ch question</u> Conte SPECTROSC with mole	syllabus. rks. om each. <u>Each par</u> nts OPY cules and	Every ques t carries se d various t	tion will ha ven marks. ypes of spe	ve three sub-	parts and Contact Hrs.			
i) Que need ii) Que stude Unit No.	estion no. to answe estion no nts need GENER/ Interact Oppenh	r any four. Each part s. 2 to 5 are to be set to answer any two se AL PRINCIPLES AND	to be set from carries three t from all four ub-parts of ea ROTATIONAL etic radiation on. Rotation sp	n the entire and half ma units one fr ch question Conte SPECTROSC with mole pectroscopy:	syllabus. rks. om each. . Each par ents OPY cules and Selectior	Every ques t carries se d various t n rules, inte	tion will ha ven marks. ypes of spo nsities of sp	ve three sub- ectra; Born- pectral lines,	parts and Contact Hrs.			
i) Que need ii) Que stude Unit No.	estion no. to answe estion no nts need GENER/ Interact Oppenh determ	r any four. Each part s. 2 to 5 are to be set to answer any two se AL PRINCIPLES AND tion of electromagn neimer approximatio	to be set from carries three t from all four ub-parts of ea ROTATIONAL netic radiation on. Rotation sp ths of diatomi	n the entire and half ma units one fr ch question Conte SPECTROSC with mole pectroscopy:	syllabus. rks. om each. . Each par ents OPY cules and Selectior	Every ques t carries se d various t n rules, inte	tion will ha ven marks. ypes of spo nsities of sp	ve three sub- ectra; Born- pectral lines,	parts and Contact Hrs.			
i) Que need ii) Que stude Unit No. I	estion no. to answe estion no ents need GENER/ Interact Oppenh determ VIBRAT Classica vibratic overtor	AL PRINCIPLES AND to answer any two set to answer any two set AL PRINCIPLES AND tion of electromagn neimer approximatio ination of bond leng IONAL SPECTROSCO I equation of vibrations, anharmonicity, nes, hot bands, degree up frequencies. Vib	to be set from carries three t from all four ub-parts of ea ROTATIONAL etic radiation in. Rotation sp ths of diatomi PY fon, computat Morse poter ees of freedom	n the entire and half ma units one fr ch question Conte SPECTROSC with mole bectroscopy: c and linear ion of force ntial, dissoc	syllabus. rks. om each. Each par ents OPY cules and Selectior triatomic constant iation en omic mole	Every ques t carries se d various t rules, inte molecules, , amplitude ergies, fun	tion will ha ven marks. ypes of spo nsities of sp isotopic su e of diatomi damental	ve three sub- ectra; Born- bectral lines, ibstitution. ic molecular frequencies, ion, concept	parts and Contact Hrs. 15			

IV	PHOTOPHYSICAL AND PHOTOCHEMICAL PROCESSES Laws of photochemistry, quantum yield. Jablonski diagrams: Franck-Condon principle, Law of photochemical equivalence, quantum efficiency, low and high quantum efficiency. Kinetics of photochemical reactions ($H_2 + Br_2 = HBr$, $2HI = H_2 + I_2$), energy transfer in photochemical reactions (photosensitization and quenching), fluorescence, phosphorescence, chemiluminescence, Discussion of Electronic spectra and photochemistry (Lambert-Beer law and its applications).	15
1. 2.).

Course	e No:	Course Name: Spectroscopy Pract	ical			Course Co SBS CH (ode: 020306 C 0	0042	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs.	
2022		Integrated B.Sc						per Week:	04
onwar	ďs	M.Sc. Chemistry	111	0	0	4	2	Total Hrs.:	60
Total I	Evaluatio	n Marks: 50	Examinatio	n Duration:		6 Hrs.			
CIE:	15 Mar	ks	Pre-requisit	e of course:	Knowled	ge of indica	tors, colori	metry, Lambei	rt-Beers
TEE:	35 Marl	۲S	law						
Course		To skill students ab	out determin	ation of indic	ator cons	stant of vari	ous indicat	ors by colorim	netry and
Object	tives	verify Beer's law fo	r determining	concentratio	on of a gi	ven solutior	n by colorin	netry.	-
Course	е	After completing th	iis course, stu	dent is expe	cted to le	arn the foll	owing:		
Outco	mes:	CO1: Practical under	-	•					
		CO2: Knowledge of							
		CO3: Practical unde	-						
		CO4: Understandin	-		concentr	ation of solu	utions		
		CO5: Develop skill o	-						
		CO6: Understandin	g of adsorptio	n					
			C	OURSE SYLL	ABUS				
NOTE: Two q		will be set, one from	each of the l	JNIT. The car	ididates a	are required	l to attemp	t all the quest	ions.
Unit				Conte	nts				Contact
No.									Hrs.
I	COLORI	METRY							30
	Determi	nation of indicator c	onstant - colo	rimetry					
II		ATION OF BEER'S LA		inneti y.					30
	-	tion of Beer's Law - D		n of concentr	ation of s	solution by	colorimetry	1.	
							•		
	(Instructor may explain the principle of using colorimeter, its handling drawing standard calibration curve, and its application in finding unknown concentration of dyes, concentration of								
	metal solutions (<i>e.g.</i> Ni, Cu using appropriate reagent) from standard calibration curve.								
Sugge	sted Rea		0 11 1						
	1. Pract	icals in physical cher	nistry – a mo	dern approad	h, P.S.Sir	ndhu, Macm	nillan (2009).	
	о г								.
	2. Expe	riments in Physical C	nemistry, J.M	.wilson, R.J.I	vewcoml	o, A.K.Dena	ro, 2 ^m Edn.	, Elsevier (196	oð).

Semester IV

Course	e No:	Course Name:				Course Co	ode:		
		Physical Chemistry	-111			SBS CH (020401 C 3	3104	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	i.
2022		Integrated B.Sc						per Week:	04
onwar	ds	M.Sc. Chemistry	IV	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE:	30 Mar	-	freedom, Or	der and mol	ecularity	of a reaction	n, Types of	nents and d catalyst, spec	•
TEE:	70 Marl			Physical adso	•	•			
Course	e	Concept of phases,	components c	and degrees o	offreedon	n, Order and	d molecula	rity of a reacti	on, Types
Object	tives	of catalyst, specific	ity and selecti	ivity, Physica	l adsorpti	on, chemisc	orption.		
Course	e	After completing the		-			-		
Outco	mes:	CO1: Phases, comp	onents, Gibbs	s phase rule,	Phase dia	igrams and	application	ns.	
		CO2: Chemical kine		reactions, de	eterminat	ion of rate,	theories c	of reaction rat	e, steady
		state approximatio							
		CO3: Catalyst – me		base catalys	sis, enzym	e catalysis.			
		CO4: Adsorption is							
		CO5: Understandir		•				ations, constr	uction of
		phase diagram of c				phase diag	ram.		
		CO6: Understandin	g the basics o	f chemical ki	netics.				
			C	OURSE SYLL	ABUS				
NOTE:	:								
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire s	syllabus.	t will have	four sub-pa	arts and stude	ents need
to ans	wer any t	wo. Each part carrie	s three and ha	alf marks.					
ii) Que	estion nos	s. 2 to 5 are to be se	t from all four	units one fro	om each.	Every quest	ion will ha	ve three sub-	parts and
studer	nts need t	to answer any two s	ub-parts of ea	ch question.	Each par	t carries thr	ee and hal	f marks.	
Unit				Conte	nts				Contact
No.									Hrs.
I	PHASE I	Equilibria							15
	Concept	t of phases, compo	nents and de	grees of fre	edom, de	erivation of	Gibbs Pha	ase Rule for	
	nonread	ctive and reactive sys	stems; Clausiu	s-Clapeyron	equation	and its appl	lications to	solid-liquid,	
	liquid-va	apour and solid-vap	oour equilibri	a, phase dia	agram fo	r one com	ponent sy	stems, with	
	applicat	ions. Phase diagram	ns for systems	s of solid-liq	uid equili	bria involvi	ng eutectio	c, congruent	
	and inc	ongruent melting po	oints, solid so	lutions. Thre	ee compo	onent syster	ms, water-	-chloroform-	
	acetic a	acid system, triang	ular plots. <i>B</i>	inary solutic	ons: Gibb	s-Duhem-N	Aargules e	equation, its	
	derivati	on and applications	to fractional d	istillation of	binary m	iscible liquio	ds (ideal ar	nd nonideal),	
	azeotro	pes, lever rule, part	al miscibility	of liquids, CS	ST, miscib	le pairs, ste	am distilla	tion. Nernst	
	distribu	tion law: its derivation	on and applica	ations.					

II	CHEMICAL KINETICS	15
	Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction,	
	differential and integrated rate laws for first, second and fractional order reactions,	
	pseudounimolecular reactions, determination of the order, kinetics of complex reactions (limited	
	to first order): (i) Opposing reactions (ii) parallel reactions and (iii) consecutive reactions and their	
	differential rate equations (steady-state approximation in reaction mechanisms) (iv) chain	
	reactions. Temperature dependence of reaction rates; Arrhenius equation; activation energy.	
	Collision theory of reaction rates, Lindemann mechanism, qualitative treatment of the theory of	
	absolute reaction rates.	
II	CATALYSIS	15
	Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces;	
	effect of particle size and efficiency of nanoparticles as catalysts. Enzyme catalysis, Michaelis-	
	Menten mechanism, acid-base catalysis.	
IV	SURFACE CHEMISTRY	15
	Physical adsorption, chemisorption, adsorption isotherms (Freundlich, Temkin, Derivation of Langumuir adsorption isotherms, surface area determination), BET theory of multilayer adsorption (no derivation), Adsorption in solution.	
Sugge	sted Readings:	
1.	Atkins P. W. and De Paula J., Physical Chemistry, (tenth edition) Oxford University Press, 2014.	
2.	Castellan, G. W. Physical Chemistry, 4th Ed., Narosa, 2004.	
3.	McQuarrie, D. A. & Simon, J. D., Molecular Thermodynamics, Viva Books, 2004.	
4.	Engel, T. & Reid, P. Physical Chemistry Third Edition, Prentice-Hall, 2012.	
5.	Zundhal, S.S. Chemistry concepts and applications Cengage India, 2011	
6.	Ball, D. W. Physical Chemistry Cengage India, 2012.	
7.	Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier: NOIDA, UP, 2009.	
8.	Levine, I. N. Physical Chemistry 6th Ed., Tata McGraw-Hill, 2011.	
9.	Metz, C. R. Physical Chemistry 2nd Ed., Tata McGraw-Hill, 2009.	

Course	e No:	Course Name:				Course Co					
		Physical Chemistry	-III Practical			SBS CH	020402 C 0	0042			
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs			
2022		Integrated B.Sc						per Week:	04		
onwar	rds	M.Sc. Chemistry	IV	0	0	4	2	Total Hrs.:	60		
Total I	Evaluatio	n Marks: 100	Examination Duration: 6 Hrs.								
CIE: TEE:	15 Mar 35 Marl		•					nstant, Poter tric titrations			
		Determination of cell constant, Potentiometric titrations									
Course Object		S									
Course	е	After completing this course, student is expected to learn the following:									
Outco	mes:	nes: CO1: Determination of cell constant									
		CO2: Equivalent co	nductance, de	egree of disso	ociation a	and dissocia	ition consta	ant of a weak	acid.		
		CO3: Potentiomet	ric titrations								
		CO4: Conductome	tric titrations o	of Strong aci	d Vs. stro	ng base					
		CO5: Conductomet	ric titrations c	of Strong acid	d vs. wea	k base.					
		CO6: Potassium die	chromate vs. N	∕lohr's salt							
			C	OURSE SYLI	.ABUS						
NOTE:	:										
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire	syllabus.	It will have	four sub-pa	arts and stude	ents need		
to ans	wer any t	wo. Each part carrie	s three and ha	alf marks.							
ii) Que	estion nos	s. 2 to 5 are to be set	t from all four	units one fro	om each.	Every ques	tion will ha	ve three sub-	parts and		
studer	nts need t	to answer any two s	ub-parts of ea	ch question.	Each par	t carries th	ree and hal	f marks.			
Unit				Conte	nts				Contact		
No.									Hrs.		
I		tometry							30		
	1 Deter	mination of cell cons	stant								
	2 Equiva	alent conductance, d	legree of disso	ociation and	dissociati	ion constan	t of a weak	acid.			
	3.Condu	uctometric titrations	of: Strong ac	cid Vs. stron	g base (ii	i) Weak aci	d vs. stron	g base, (iii)			
	Mixture	of strong acid and (iv)weak acid v	s. strong bas	se, Strong	g acid vs. we	eak base.				
II	Potentio	Wixture of strong acid and (iv)weak acid vs. strong base, Strong acid vs. weak base. 30 Potentiometry 30 Potentiometric titrations of: (i) Strong acid vs. strong base (ii) Weak acid vs. strong base (iii) 30 Dibasic acid vs. strong base (iv) Potassium dichromate vs. Mohr's salt. 30									

1 Khosla, B. D.; Garg, V. C. and Gulati, A. Senior Practical Physical Chemistry, R. Chand New Delhi, 2011. 2 Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry Eighth Edition; McGraw-Hill: New York, 2003.

3 Halpern, A. M. and McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York, 2003.

(List of experiments and references are suggestive. However, more experiments can be added/list of experiments can be revised as per available facilities).

Course	e No:	Course Name:				Course Co					
		Inorganic Chemistry		I	1)20403 C 3	-			
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs			
2022		Integrated B.Sc						per Week:	04		
Onwa	rds	M.Sc. Chemistry	IV	3	1	0	4	Total Hrs.:	60		
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.					
CIE:	30 Marl	ks	-				•	ple, chemistry			
TEE:	70 Marl	٢S	p Block Elen	nents, inorga	nic polyn	ners, occurr	ence and u	ses of noble g	gases.		
Course	е	To provide student	s with basic	understandi	<i>ng of</i> Pri	nciples of i	netallurgy,	concept of a	acid-base		
Objec	tives	reactions, Chemistic compounds.	ry of s and p	Block Eleme	ents, occu	urrence and	l nature of	bonding in r	oble gas		
Cours	е	After completing this course, student is expected to learn the following:									
Outco	mes:	mes: CO1: Understanding of principles of metallurgy									
	CO2: Understanding the concept of acid-base reactions										
		CO3: Understandin	g the basic pr	operties of e	lements	of s and p B	lock				
		CO4: Understandin						ounds			
		CO5: Understandin	g the Types o	f inorganic p	olymers						
		CO6: Scope of inorg	ganic compou	nds/polyme	rs						
			C	OURSE SYLI	ABUS						
NOTE:											
		1 is compulsory and			-	It will have	seven sub-	parts and stud	lents		
		any four. Each part									
-		s. 2 to 5 are to be set				• •		ve three sub-	parts and		
	nts need t	to answer any two su	b-parts of ea			t carries sev	ven marks.				
Unit				Conte	nts				Contact		
No.									Hrs.		
I	-	L PRINCIPLES of ME							15		
				als based on standard electrode potentials. Ellingham diagrams							
			es using carbon and carbon monoxide as reducing agent. Electrolytic								
	Reduction, Hydrometallurgy. Methods of purification of metals: Electrolytic Kr process, van Arkel-de Boer process and Mond's process, Zone refining.							cess, Parting			
					ss, zone r	enning.			1 -		
II		TRY OF s AND p BLO			dation at	atos disas	nal ralatio	nchin and	15		
		air effect, Relative	•			-		•			
		ous behaviour of fi		-	Jup. Allo	mopy and	catenation	. complex			
	Tormatio	on tendency of s and	р вюск еіет	ents.							

 Hydrides and their classification. Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudohalogens and basic properties of halogens. Synthesis, structural aspects and applications of silicones and siloxanes, borazines, silicates and phosphazenes, and polysulphates. III NOBLE GASES Occurrence and uses, rationalization of inertness of noble gases, Clathrates; preparation and properties of XeF₂, XeF₄ and XeF₆; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF₂). Molecular shapes of noble gas compounds (VSEPR theory). IV INORGANIC POLYMERS Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and polysulphates. Suggested Readings: Lee, J.D. Concise Inorganic Chemistry, ELBS (1991). Douglas, B. E; M c D a ni el, D. H. & A l e x a n d e r, J. J. Concepts & Models of Inorganic Chemistry 3rd Ed., John Wiley Sons, N.Y. (1994). Greenwood, N.N. & Earnshaw. Chemistry of the Elements, Butterworth- Heinemann (1997). Cotton, F.A. & Wilkinson, G. Advanced Inorganic Chemistry, Cen ga ge Learning In dia Edition (2002). Miessler, G. L. & Donald, A. Tarr. Inorganic Chemistry 5th Ed. Oxford University Press (2010). Atkins, P. Shriver & Atkins' Inorganic Chemistry 5th Ed. Oxford University Press (2010). 			
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6. Miessler, G. L. & Donald, A. Tarr. <i>Inorganic Chemistry</i> 4 th Ed., Pearson (2010).	4	. Cotton, F.A. & Wilkinson, G. Advanced Inorganic Chemistry, Wiley, VCH (1999).	
	5	. Rodger, G.E. Inorganic and Solid-State Chemistry, Cengage Learning India Edition (20	002).
7. Atkins, P. Shriver & Atkins' Inorganic Chemistry 5 th Ed. Oxford University Press (2010).	6		
	7	. Atkins, P. Shriver & Atkins' Inorganic Chemistry 5th Ed. Oxford University Press (2010).	

Course	e No:	Course Name: Inorganic Chemistry	/ Practical-II			Course Co SBS CH 0	de: 20404 C 0	042		
Batch	:	Programme:	Semester:	L	т	Р	Credits	Contact Hrs	•	
2022		Integrated B.Sc						per Week:	04	
Onwa	rds	M.Sc. Chemistry	IV	0	0	4	2	Total Hrs.:	60	
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		6 Hrs.		·		
CIE:	15 Mar	ks	Pre-requisit	e of course:	lodo / ioc	limetric titra	ations, inoi	rganic prepara	ations	
TEE:	35 Mar	ks								
Course Objec		<i>To provide students</i> compounds	with basic un	derstanding	of Iodo / i	iodimetric ti	trations, p	reparation of	inorganic	
Course Outco		After completing th CO1: Understandin CO2: Understandin CO3: Learn Inorgan	on of ions by ion of inorga	lodimetri nic comp	cally / iodor	-				
			C	OURSE SYLL	ABUS					
NOTE										
	uestions	will be set, one from	each of the L			re required	to attemp	t all the quest		
Unit				Conte	nts				Contact	
No.		IODIMETRIC TITRAT							Hrs. 30	
	-	timation of Cu(II) and		ing sodium t	thiosulph	ate solutior	n (lodimetr	rically).	50	
	(ii) Es	timation of (i) arseni	te and (ii) ant	imony in tart	ar-emeti	c iodimetric	ally			
	(iii) Es	timation of available	e chlorine in b	leaching pov	vder iodo	metrically.				
11	INORGANIC PREPARATIONS 3 (i) Cuprous Chloride, Cu ₂ Cl ₂ 3									
	(i) Cuprous Chioride, Cu ₂ Cl ₂ (ii) Preparation of Aluminium potassium sulphate KAI(SO ₄) ₂ .12H ₂ O (Potash alum) or Chrome alum.									
	sted Rea ndham, J.	dings: , A. I. Vogel's Quanti	tative Chemic	al Analysis 6	th Ed., Pe	arson (2009)).			

Course	e No:	Course Name:				Course Co	ode:		
		Introduction to Qua	antum Chemis	stry		SBS CH	020405 C 3	3104	
Batch:		Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.
2022		Integrated B.Sc						per Week:	04
onwar	ds	M.Sc. Chemistry	IV	3	1	0	4	Total Hrs.:	60
Total E	Evaluatio	n Marks: 100	Examinatio	n Duration:	l	3 Hrs.	1	•	
CIE:	30 Marl	ks	Pre-requisit	e of cours	se: Intro	duction t	o black-b	ody radiati	on and
0.11			distribution	of energy,	Basic id	ea about (operators,	eigen funct	ion and
TEE:	70 Marl	ks				• •		-particle and	•
							ons, Avera	ge and most p	probable
6	_	Introduction to bl		electron fro			aux Davaia i	alaa ahauta	
Course		Introduction to bl	-						-
Object									
	a box, discussion of solution of wave functions, Average and most probable distances of e							felectron	
		from nucleus.							
Course		After completing th		-			-		
Outco	mes:	CO1: Introduction		-					
		CO2: Quantitative		•					
		CO3: Qualitative tr			om and h	ydrogen-lik	ke ions		
		CO4: Scope of Phys		•					
		CO5: Representation							
		CO6: Valence bond	and molecula	ar orbital app	proaches				
			C	OURSE SYLL	.ABUS				
NOTE:									
i)Ques	tion no.	1 is compulsory and	to be set fron	n the entire s	syllabus. I	t will have	four sub-pa	arts and stude	ents need
to ans	wer any t	wo. Each part carrie	s three and ha	alf marks.					
ii) Que	estion nos	s. 2 to 5 are to be set	from all four	units one fro	om each.	Every quest	tion will ha	ve three sub-	parts and
studer	nts need t	to answer any two su	ub-parts of ea	ch question.	Each par	t carries thr	ee and hal	f marks.	
Unit				Conte	nts				Contact
No.									Hrs.
I	UNIT-I							_	20
		iction to black-body			•••	•		•	
	•	ation, wave particle o			-		• • •		
		: wave function and					-	-	
	-	ficance. Basic idea ab	•				-	•	
	••	ion to free-particle	•		•				
	-	s, degeneracy, hydro	-	-	•	•			
	-	parts of the hydrog	enic orbitals,	degeneracie	s, spheric	al harmoni	cs, represe	ntations of	
	· ·	enic orbitals.							
II	UNIT-II			ta an stall a			f Cale and		20
		ative treatment of si	•				-	•	
	and disc	cussion of solution of	wave functio	ons. Rigid rota	ator mode	ei and discu	ssion of ap	plication of	

	Schrodinger equation. idea about transformation to spherical polar coordinate, discussion on	
	solution,	
	UNIT-III	20
	Qualitative treatment of hydrogen atom and hydrogen-like ions: setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression). Average and most probable distances of electron from nucleus. Valence bond and molecular orbital approaches, LCAO-MO treatment of H2, H2+; bonding and anti-bonding orbitals, Comparison of LCAO-MO and VB treatments of H2 (only wavefunctions, detailed solution not required) and their limitations.	20
Sug	gested Readings:	
	1. Laideler K. J. and Meiser J. M. Physical Chemistry Third Edition (International)1999	
	2. Levine I. N., Physical Chemistry, Fourth Edition), McGraw-Hill (International), 1995.	
	3. McQuarrie D. A. and Simon J. D. Physical Chemistry- A Molecular Approach, University Science	
	Books, 1998.	
	4.Chandra, A. K. Introductory Quantum Chemistry Tata McGraw-Hill (2001).	
	5. House, J. E. Fundamentals of Quantum Chemistry 2nd Ed. Elsevier: USA (2004).	

	e No:	Course Name:				Course C	ode:				
1		Quantum Chemist	ry Practical			SBS CH	020406 C 0	0042			
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.		
2022		Integrated B.Sc						per Week:	04		
onwar	rds	M.Sc. Chemistry	IV	0	0	4	2	Total Hrs.:	60		
Total I	Evaluatio	n Marks: 100	Examinatio	n Duration:	1	6 Hrs.		1			
CIE:	15 Mar	ks	-	Pre-requisite of course: calculate the energy of various conformations of							
				-		•		using ope			
TEE:	35 Mar	ks	softwares,	academic vis	sit to con	nputationa	l labs to gai	in knowledge	2.		
Course	е	Calculate the energy	gy of various o	conformatior	ns of mole	ecules, stud	lents gain h	hand-on expe	erience in		
Object	tives	using open-source	e softwares, a	cademic visi	t to com	outational	labs to gaiı	n knowledge.			
Course	e	After completing t	his course, stu	dent is expe	cted to le	arn the foll	owing:				
Outco	mes:	CO1: Building a mo		•			-				
		CO2: Instructor ca	n demonstrat	e the studer	nts use o	f hyperche	m software	e, Gaussian so	oftware –		
		geometry optimiza	ition).								
		CO3: Basic idea is	to encourage	the students	to get kr	nowledge v	ithout kee	ping any rigid	practical		
		syllabus framewor	k).								
			C	OURSE SYLI	ABUS						
NOTE:	:										
i)Ques	stion no.	1 is compulsory and	to be set from	n the entire	syllabus.	lt will have	four sub-pa	arts and stude	ents need		
to ans	wer any t	two. Each part carrie	es three and h	alf marks.							
ii) Que	estion no	s. 2 to 5 are to be se	t from all four	units one fro	om each	Every ques	tion will have				
studer	nts need	to answer any two s	ub-parts of ea	ch question	onn cucin.	Lvery ques		ve three sub-	parts and		
Unit			ents need to answer any two sub-parts of each question. Each part carries three and half marks.						parts and		
No.		Contents							parts and Contact		
	UNIT-I			Conte	Each par						
I	-			Conte	Each par nts	t carries th	ree and half	f marks.	Contact		
1	(i) The	students may be de		Conte	Each par nts ib activiti	t carries th es – buildi	ree and half	f marks. sular model	Contact Hrs.		
	(i) The s (leveling	g of atoms, editing ir	ndividual atom	Conte yperchem la is, changing l	Each par nts b activiti	t carries th es – buildi er, centreri	ree and half	f marks. sular model n of atoms),	Contact Hrs.		
	(i) The s (leveling Selectio	g of atoms, editing in of calculation met	ndividual atom hod (<i>e.g</i> .force	Conte yperchem la is, changing l field calcula	Each par nts b activiti pond orde tion, ab-in	t carries th es – buildi er, centreri nitio set up	ree and half ng a molec ng, rotation), displaying	f marks. cular model n of atoms), g calculated	Contact Hrs.		
	(i) The s (leveling Selection propert	g of atoms, editing in on of calculation met ies, (instructor may o	ndividual atom hod (<i>e.g</i> .force demonstrate (Conte yperchem la is, changing l field calcula Computer pro	Each par nts b activiti bond orde tion, ab-in ograms th	t carries th es – buildi er, centreri nitio set up nat calculate	ree and half ng a molec ng, rotation), displaying e the energy	f marks. ular model of atoms), g calculated y of various	Contact Hrs.		
	(i) The s (leveling Selection propert conform	g of atoms, editing in on of calculation met ies, (instructor may nations of molecule	ndividual atom hod (<i>e.g</i> .force demonstrate (s and predict	Conte yperchem la is, changing l field calcula Computer pro the lowest e	Each par nts ab activiti pond orde tion, ab-in ograms th energy, to	t carries th es – buildi er, centreri nitio set up nat calculato learn how	ree and half ng a molec ng, rotation), displaying e the energy v to constru	f marks. cular model n of atoms), g calculated y of various nct or draw	Contact Hrs.		
	(i) The solution (i) The solution (ii) The solution (iii) (i	g of atoms, editing in on of calculation met ies, (instructor may nations of molecule ntations of molecule	ndividual atom hod (<i>e.g</i> .force demonstrate (s and predict ules using a	Conte yperchem la is, changing l field calcula Computer pro the lowest e molecular	Each par nts ab activiti bond orde tion, ab-in ograms the energy, to modelir	t carries th es – buildi er, centreri nitio set up nat calculate learn how ng prograr	ree and half ng a molec ng, rotation), displaying e the energy r to constru n called F	f marks. sular model o of atoms), g calculated y of various act or draw HyperChem	Contact Hrs.		
	(i) The s (leveling Selection propert conform represe (HyperC	g of atoms, editing in on of calculation met ies, (instructor may nations of molecule ntations of molecule Cube, Inc.), to perfor	ndividual atom hod (<i>e.g</i> .force demonstrate (s and predict ules using a m geometry (Conte yperchem la s, changing l field calcula Computer pro the lowest e molecular optimizations	Each par nts ab activiti bond orde tion, ab-in ograms the energy, to modelir	t carries th es – buildi er, centreri nitio set up nat calculate learn how ng prograr	ree and half ng a molec ng, rotation), displaying e the energy r to constru n called F	f marks. sular model o of atoms), g calculated y of various act or draw HyperChem	Contact Hrs.		
	(i) The solution (i) The solution (i) The solution (i)	g of atoms, editing in on of calculation met ies, (instructor may nations of molecule ntations of molec Cube, Inc.), to perfor energy conformation	ndividual atom hod (<i>e.g.</i> force demonstrate (s and predict ules using a m geometry on ns of molecule	Conte yperchem la is, changing l field calcula Computer pro the lowest e molecular optimizations s).	Each par nts ab activiti bond orde tion, ab-ie ograms the energy, to modelin s (energy	t carries th es – buildi er, centreri nitio set up nat calculato learn how ng prograr minimizati	ng a molec ng a molec ng, rotation), displaying e the energy r to constru n called F ons) to dete	f marks. cular model o of atoms), g calculated y of various oct or draw HyperChem ermine the	Contact Hrs.		
	(i) The selection Selection propert conform represe (HyperC lowest of (Depend	g of atoms, editing in on of calculation met ies, (instructor may nations of molecules ntations of molec Cube, Inc.), to perfor energy conformation ding upon the avai	ndividual atom hod (<i>e.g.</i> force demonstrate (s and predict ules using a m geometry (ns of molecule lability of inf	Conte yperchem la s, changing l field calcula Computer pro the lowest e molecular optimizations s).	Each par nts b activiti pond orde tion, ab-in pgrams th energy, to modelir s (energy facilities,	t carries th es – buildi er, centreri nitio set up nat calculato learn how ng prograr minimizati instructor	ree and half ng a molec ng, rotation), displaying e the energy r to constru n called H ons) to dete can demo	f marks. cular model of atoms), g calculated y of various ict or draw HyperChem ermine the	Contact Hrs.		
	(i) The selection (leveling Selection propert conform represe (HyperC lowest of (Depend student	g of atoms, editing in on of calculation met ies, (instructor may nations of molecule ntations of molec cube, Inc.), to perfor energy conformation ding upon the avai s use of hyperchem	ndividual atom hod (<i>e.g.</i> force demonstrate (s and predict ules using a m geometry of ns of molecule lability of inf software, Ga	Conte yperchem la is, changing l field calcula Computer pro the lowest e molecular optimizations s). rastructure ussian softw	Each par nts ab activiti bond orde tion, ab-in ograms the energy, to modelin s (energy facilities, are – geo	t carries th es – buildi er, centreri nitio set up nat calculato learn how ng prograr minimizati instructor ometry opt	ree and half ng a molec ng, rotation), displaying e the energy to constru n called H ons) to dete can demo	f marks. cular model o of atoms), g calculated y of various oct or draw HyperChem ermine the onstrate the They can be	Contact Hrs.		
	(i) The selection (leveling Selection propert conform represe (HyperC lowest of (Depend student	g of atoms, editing in on of calculation met ies, (instructor may nations of molecules ntations of molec Cube, Inc.), to perfor energy conformation ding upon the avai	ndividual atom hod (<i>e.g.</i> force demonstrate (s and predict ules using a m geometry of ns of molecule lability of inf software, Ga	Conte yperchem la is, changing l field calcula Computer pro the lowest e molecular optimizations s). rastructure ussian softw	Each par nts ab activiti bond orde tion, ab-in ograms the energy, to modelin s (energy facilities, are – geo	t carries th es – buildi er, centreri nitio set up nat calculato learn how ng prograr minimizati instructor ometry opt	ree and half ng a molec ng, rotation), displaying e the energy to constru n called H ons) to dete can demo	f marks. cular model o of atoms), g calculated y of various oct or draw HyperChem ermine the onstrate the They can be	Contact Hrs.		
	(i) The selection (leveling Selection propert conform represe (HyperC lowest of (Depend student allowed conside	g of atoms, editing in on of calculation met ies, (instructor may nations of molecule ntations of molecule cube, Inc.), to perfor energy conformation ding upon the avai s use of hyperchem I for academic visit red for viva voce/exa	ndividual atom hod (<i>e.g.</i> force demonstrate (s and predict ules using a m geometry o ns of molecule lability of inf software, Ga t to computa amination). Op	Conte yperchem la is, changing l field calcula Computer pro the lowest e molecular optimizations s). rastructure ussian softw tional labs to pen source so	Each par nts b activiti bond orde tion, ab-in ograms th energy, to modelin s (energy facilities, are – geo to gain k oftwares i	t carries th es – buildi er, centreri nitio set up nat calculato learn how og prograr minimizati instructor ometry opt cnowledge may be use	ree and half ng a molec ng, rotation), displaying e the energy to constru n called H ons) to det can demo can demo mization). and a rep d for lab de	f marks. Jular model of atoms), g calculated y of various act or draw HyperChem ermine the onstrate the They can be ort may be monstration	Contact Hrs.		
	(i) The second student and stu	g of atoms, editing in on of calculation met ies, (instructor may on nations of molecules ntations of molecules cube, Inc.), to perfor energy conformation ding upon the avait s use of hyperchem I for academic visit	ndividual atom hod (<i>e.g.</i> force demonstrate (s and predict ules using a m geometry of ns of molecule lability of inf software, Ga t to computa amination). Op a report alon	Conte yperchem la s, changing l field calcula Computer pro the lowest e molecular optimizations s). rastructure ussian softw tional labs to pen source so g with viva-v	Each par nts b activiti bond orde tion, ab-in ograms th energy, to modelir s (energy facilities, are – geo to gain k oftwares n voce shall	t carries th es – buildi er, centreri nitio set up nat calculate learn how ng prograr minimizati instructor ometry opt anowledge may be use constitute	ree and half ng a molec ng, rotation), displaying e the energy r to constru n called H ons) to dete can demo mization). and a rep d for lab det practical e	f marks. cular model of atoms), g calculated y of various act or draw HyperChem ermine the onstrate the They can be ort may be monstration	Contact Hrs.		

	(for perfoming various calculation as mentioned) in lab computers, periodic evaluation of which	
	can also be accepted as conducting lab practical examination. Basic idea is to encourage the	
	students to get knowledge without keeping any rigid practical syllabus framework).	
	(Examples of the computational work that can be done: Compare the optimized C-C bond lengths	
	in ethane, ethene, ethyne and benzene. Visualize the molecular orbitals of the ethane σ bonds and	
	ethene, ethyne, benzene and pyridine π bonds.	
II	UNIT-II	30
	ii. (a) Perform a conformational analysis of butane. (b) Determine the enthalpy of isomerization of	
	cis and trans 2-butene.	
	iii. Visualize the electron density and electrostatic potential maps for LiH, HF, N ₂ , NO and CO and	
	comment. Relate to the dipole moments. Animate the vibrations of these molecules.	
	(Software: ChemSketch, ArgusLab (www.planaria-software.com), TINKER 6.2	
	(dasher.wustl.edu/ffe), WebLab Viewer, Hyperchem, or any similar software.	
Sugg	gested Readings:	
	1.Essentials of computational chemistry – Theories and models, C. J. Crammer, Wiley, 2nd Edn.,	
	2.Principle and applications of quantum chemistry, V.K.Gupta, Elsevier, 2016.	
3	3. Practicals in physical chemistry – a modern approach, P.S.Sindhu, Macmillan,	
4	4. Experiments in Physical Chemistry, J.M.Wilson, R.J.Newcomb, A.R.Denaro, 2nd Edn., Elsevier.	
Į	5. A.R. Leach, Molecular Modelling Principles and Application, Longman, 2001.	
(6. J.M. Haile, Molecular Dynamics Simulation Elementary Methods, John Wiley and Sons, 1997.	
-	7. Gupta, S.P. QSAR and Molecular Modeling, Springer - Anamaya Publishers, 2008.	

Semester V

Course	e No:	Course Name:				Course C	ode:			
		Inorganic Chemistr	y-III			SBS CH	020501 C 3	3104		
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	i.	
2022		Integrated B.Sc						per Week:	04	
onwar	rds	M.Sc.(Chemistry)	V	3	1	0	4	Total Hrs.:	60	
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.				
CIE:	30 Mar	ks					•	oordination o		
TEE:	70 Marks							-		
Course	е	To provide studen							-	
Objec	tives	transition elements	s transition ele	ements, lantl	hanoids a	nd actinoid	s, bioinorgo	anic chemistry	/	
Course	е	After completing th					-			
Outco	mes:	CO1: Coordination	compounds	– its nome	nclature,	theories,	d-orbital s	plitting in co	mplexes,	
		chelate.								
		CO2: Transition me		•			•			
		CO3: Lanthanides, Actinides – separation, color, spectra and magnetic behavior								
		CO4: Bioinorganic chemistry – metal ions in biological system, its toxicity; hemoglobin.								
		CO5: Understanding the nomenclature of coordination compounds/complexes, Molecular orbital								
		theory, d-orbital splitting in tetrahedral, octahedral, square planar complexes, chelate effects. CO6: Understanding the transition metals stability in reactions, origin of colour and magnetic								
			ng the transit	ion metals	stability	in reactions	s, origin of	colour and	magnetic	
		properties.	0	OURSE SYLI	ABUS					
NOTE	_		<u> </u>							
NOTE:			+ + from	a tha antina	o ullo bu o		formarchia	مسغم محمط مغبيها		
-		1 is compulsory and			syllabus.	it will have	tour sub-pa	arts and stude	ents need	
		two. Each part carrie			om ooch		tion will be	va thraa cuh	parts and	
-		s. 2 to 5 are to be set to answer any two si							parts and	
Unit	its need		up-hauts of ea	Conte	· · ·	t carries tri	ee and nai	I IIIdi KS.	Contact	
No.				conte	1115				Hrs.	
1 I	COOPD	INATION CHEMISTR	v						піз. 15	
•		's theory, EAN rule,		mnounde	alence bo	nd theory	inner and a	outer orbital	1.5	
		xes), Crystal field the		•		•	-			
		g the magnitude of	•				-	-		
		tahedral geometry					-			
		bipyramidal, square		-	-	-				
		energies, enthalpies								
		ansition metal series	•							
		ntative coronation		-	-		-	-		
		sm in coordination	•					•		
	isomen		compounds.	Stereothem	istry UI	complexes	with the t	Loorumation		

	number 4 and 6, Chelate effect.	
II	TRANSITION ELEMENTS	15
	General group trends with special reference to electronic configuration, colour, variable valency,	
	magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer & Bsworth diagrams). Difference between the first, second and third	
	transition series. Chemistry of Ti, V, Cr Mn, Fe and Co in various oxidation states (excluding their	
	metallurgy)	
III	LANTHANOIDS AND ACTINOIDS	15
	Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).	
IV	BIOINORGANIC CHEMISTRY	15
	Metal ions present in biological systems, classification of elements according to their action in	
	biological system. Geochemical effect on the distribution of metals. Sodium / K-pump, carbonic	
	anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine.	
	Iron and its application in bio-systems, Haemoglobin; Storage and transfer of iron.	
00	ested Readings:	
	L. Purcell, K.F & Kotz, J.C. Inorganic Chemistry W.B. Saunders Co, 1977.	
	2. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.	
	B. Lippard, S.J. & Berg, J.M. Principles of Bioinorganic Chemistry Panima Publishing Company 1994.	
	 Cotton, F.A. & Wilkinson, G, Advanced Inorganic Chemistry Wiley-VCH, 1999 Basolo, F, and Pearson, R.C. Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967. 	
		07
Ċ	5. Greenwood, N.N. & Earnshaw A. Chemistry of the Elements, Butterworth-Heinemann, 19	97.

Cours	e No:	Course Name:				Course C	ode:		
		Inorganic Chemistr	y Practical-III			SBS CH	020502 C (0042	
Batch):	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.
2022		Integrated B.Sc						per Week:	04
onwa	rds	M.Sc.(Chemistry)	V	0	0	4	2	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		6 Hrs.			
CIE:	30 Mar	ks	-				•	s of mixtures,	Synthesis
TEE:	70 Mar	ks	of ammine	complexes o	of Ni(II) a	nd its ligar	nd exchange	e reactions.	
Cours	Durse Qualitative semimicro analysis of mixtures, Synthesis of ammine complexes of Ni(II)						I) and its		
Objec	tives	ligand exchange re	eactions.						
Cours	e	After completing th	nis course, stu	dent is expe	cted to le	arn the fol	lowing:		
Outco	omes:	CO1: Qualitative se	emimicro ana	lysis of mix	tures cor	ntaining 3 a	anions and	3 cations.	
		CO2: Controlled sy	nthesis of tw	o copper ox	alate hy	drate com	plexes		
		CO3: Preparation	of acetylaceta	anato compl	lexes				
		CO4: Synthesis of	ammine com	plexes					
		CO5: Analysis of co	opper, cadmiu	ım, bismuth,	tin, iron,	aluminum	, chromium	, zinc radicals	
		CO6: Exchange rea	ctions						
			C	OURSE SYLI	LABUS				
NOTE	:		C	OURSE SYLI	LABUS				
		1 is compulsory and				lt will have	four sub-pa	arts and stude	ents need
i)Ques	stion no.	1 is compulsory and two. Each part carrie	to be set fron	n the entire		lt will have	four sub-pa	arts and stude	ents need
i)Ques to ans	stion no. swer any f		to be set fron s three and ha	n the entire s	syllabus.		-		
i)Ques to ans ii) Que	stion no. swer any f estion no:	two. Each part carrie	to be set fron s three and ha t from all four	n the entire s alf marks. units one fre	syllabus. om each.	Every ques	stion will ha	ive three sub-	
i)Ques to ans ii) Que	stion no. swer any f estion no:	two. Each part carrie s. 2 to 5 are to be set	to be set fron s three and ha t from all four	n the entire s alf marks. units one fre	syllabus. om each. Each par	Every ques	stion will ha	ive three sub-	
i)Ques to ans ii) Que stude	stion no. swer any f estion no:	two. Each part carrie s. 2 to 5 are to be set	to be set fron s three and ha t from all four	n the entire s alf marks. units one fro ch question.	syllabus. om each. Each par	Every ques	stion will ha	ive three sub-	parts and
i)Ques to ans ii) Que stude Unit	stion no. swer any t estion no: nts need 1. Quali be give	two. Each part carrie s. 2 to 5 are to be set to answer any two su tative semimicro and n on understanding	to be set fron s three and ha t from all four ub-parts of ea alysis of mixtu	n the entire s alf marks. units one fro ch question. Conte ures containi	syllabus. om each. Each par nts ng 3 anic	Every ques t carries th	stion will ha ree and hal ations. Emp	ive three sub- f marks. phasis should	parts and
i)Ques to ans ii) Que stude Unit No.	stion no. swer any f estion no: nts need 1. Quali be give analyze Carbona iodide,	two. Each part carrie s. 2 to 5 are to be set to answer any two su tative semimicro and n on understanding	to be set fron s three and ha t from all four ub-parts of ea alysis of mixtu of the chem sulphide, su sphate, ammo	n the entire s alf marks. units one fro ch question. Conte ures containi istry of diffo lphate, sulp ponium, potas	syllabus. om each. Each par nts ng 3 anic erent rea hite, ace	Every quest t carries th ons and 3 c ctions. Fol tate, fluor ad, copper,	stion will ha ree and hal ations. Emp lowing radi ide, chlorid cadmium,	ive three sub- f marks. hasis should icals may be de, bromide, bismuth, tin,	parts and Contact Hrs.
i)Ques to ans ii) Que stude Unit No.	stion no. swer any t estion no: nts need 1. Quali be give analyze Carbona iodide, iron, a magnes PbSO ₄ ,	two. Each part carrie s. 2 to 5 are to be set to answer any two su tative semimicro and n on understanding d: ate, nitrate, nitrite, borate, oxalate, pho	to be set fron s three and ha t from all four ub-parts of ea alysis of mixtu of the chem sulphide, su sphate, ammo n, zinc, mar aining one int mbination of a	n the entire s alf marks. units one fro ch question. Conte ures containi istry of diffo lphate, sulp onium, potas aganese, co erfering anio anions e.g. C	syllabus. om each. Each par nts ng 3 anic erent rea hite, ace ssium, lea balt, nic on, or ins O_3^{2-} and S	Every quest t carries the ons and 3 c ctions. Fol tate, fluor ad, copper, kel, bariu soluble cor 503 ²⁻ , NO2 ⁻	stion will ha ree and hal ations. Emp lowing radi ide, chlorid cadmium, l m strontiu nponent (B and NO ₃ -, C	tive three sub- f marks. Thasis should icals may be de, bromide, bismuth, tin, m, calcium, aSO₄, SrSO₄, cl ⁻ and Br ⁻ , Cl ⁻	parts and Contact Hrs.
i)Ques to ans ii) Que stude Unit No.	stion no. swer any f estion no: nts need 1. Quali be give analyze Carbona iodide, iron, a magnes PbSO ₄ , and I ⁻ , B	two. Each part carrie s. 2 to 5 are to be set to answer any two su tative semimicro and n on understanding d: ate, nitrate, nitrite, borate, oxalate, pho- luminum, chromiun ium. Mixtures conta CaF ₂ or Al ₂ O ₃) or cor r and I ⁻ , NO ₃ ⁻ and Br ⁻ , rolled synthesis of	to be set fron s three and ha t from all four ub-parts of ea alysis of mixtu of the chem sulphide, su sphate, ammo n, zinc, mar aining one int nbination of a , NO ₃ ⁻ and I ⁻ . S	n the entire s alf marks. units one fro ch question. Conte ures containi istry of diffe phate, sulp onium, potas aganese, co erfering anio anions e.g. Co pot analysis,	syllabus. om each. Each par nts ng 3 anic erent rea hite, ace ssium, lea balt, nic on, or ins $O_3^{2^2}$ and S /tests sho	Every quest t carries the ons and 3 c ctions. Fol tate, fluor ad, copper, kel, bariu soluble con $5O_3^{2-}$, NO_2^{-1}	ation will ha ree and hal ations. Emp lowing radi ide, chlorid cadmium, l m strontiu nponent (B and NO ₃ ⁻ , C ne wheneve	ove three sub- f marks. ohasis should icals may be de, bromide, bismuth, tin, m, calcium, aSO4, SrSO4, cl ⁻ and Br ⁻ , Cl ⁻ r possible.	parts and Contact Hrs.
i)Ques to ans ii) Que stude Unit No.	stion no. swer any f estion no: nts need 1. Quali be give analyze Carbona iodide, iron, a magnes PbSO4, and I ⁻ , B 2. Cont factors. 3. Prep	two. Each part carrie s. 2 to 5 are to be set to answer any two su tative semimicro and n on understanding d: ate, nitrate, nitrite, borate, oxalate, pho- luminum, chromiun ium. Mixtures conta CaF ₂ or Al ₂ O ₃) or cor r and I ⁻ , NO ₃ ⁻ and Br ⁻ , rolled synthesis of	to be set fron s three and ha t from all four ub-parts of ea alysis of mixtu of the chem sulphide, su sphate, ammo n, zinc, mar aining one int mbination of a , NO ₃ ⁻ and I ⁻ . S two copper o	n the entire s alf marks. units one fro ch question. Conte ures containi istry of diffo phate, sulp onium, potas aganese, co erfering anio anions e.g. C pot analysis, oxalate hydr	syllabus. om each. Each par nts ng 3 anic erent rea hite, ace ssium, lea balt, nic on, or ins O_3^{2-} and S /tests sho rate com	Every quest t carries the ons and 3 c ctions. Fol tate, fluor ad, copper, kel, bariu soluble cor $G_{3^{2^{-}}}$, $NO_{2^{-}}$ puld be dor plexes: kin	stion will ha ree and hal ations. Emp lowing radi ide, chlorid cadmium, l m strontiu mponent (B and NO ₃ ⁻ , C he wheneve etic vs the	tive three sub- f marks. Thasis should icals may be de, bromide, bismuth, tin, m, calcium, taSO₄, SrSO₄, cl ⁻ and Br ⁻ , Cl ⁻ r possible. rmodynamic	parts and Contact Hrs.

	like acetylacetone, DMG, glycine) by substitution method.	
Sugge	ested Readings:	
1. Vog	gel's Qualitative Inorganic Analysis, Revised by G. Svehla. Pearson Education, 2002.	
2. Ma	rr & Rockett Practical Inorganic Chemistry. John Wiley & Sons 1972.	

Course	e No:	Course Name:				Course C	ode:		
		Analytical Chemisti	ry			SBS CH	020503 C 3	3104	
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.
2022		Integrated B.Sc						per Week:	04
onwar	ds	M.Sc. Chemistry	V	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.		•	
CIE:	30 Mar	ks	Pre-requisit	e of course	e: Funda	mentals of	f analytical	chemistry,	Basics of
			spectroscop	ic, basics of	separatio	n techniqu	es and its a	pplications.	
TEE:	70 Marl	٢S							
Course	е	Fundamentals of a	nalytical chen	nistry, Basics	of spect	roscopic, bo	sics of sep	aration techni	iques and
Object	tives	its applications.							
Course	е	After completing th	nis course, stu	dent is expe	cted to le	earn the foll	owing:		
Outco	mes:	CO1: Familiarizatio	n with fundan	nentals of ar	nalytical c	hemistry.			
		CO2: Basics of spec	troscopic, the	ermal, electro	ochemica	l technique	S		
		CO3: Learning basi	cs of separation	on technique	es and its	application	s.		
		CO4: Understandin	g analytical to	ools, statistic	al metho	ds applied	to analytica	l chemistry.	
		CO5: Understandin	g principle of	UV-Vis spec	troscopy	and its app	lications.		
		CO6: Understandin	g principles o	f thermo-gra	avimetric	analysis an	d study of t	hermal decor	nposition
		of materials/charac	cterization of	materials.					
			C	OURSE SYL	LABUS				
NOTE:	:								
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire	syllabus.	It will have	four sub-pa	arts and stude	ents need
to ans	wer any t	wo. Each part carrie	s three and ha	alf marks.					
ii) Que	estion nos	s. 2 to 5 are to be set	t from all four	units one fr	om each.	Every ques	tion will ha	ve three sub-	parts and
studer	nts need t	to answer any two su	ub-parts of ea	ch question.	Each par	t carries th	ree and hal	f marks.	
Unit				Conte	nts				Contact
No.									Hrs.
I	-	ATIVE AND QUANTI							15
		analytical chemistry					-		
		y and precision, stat	istical test of	data; F, Q a	nd t-test,	rejection of	of data, and	d confidence	
	interval	S.							
II	SPECTR	OSCOPY							15
		of spectra, interactio	on of radiatio	n with matt	er, funda	amental lav	vs of snert	rosconv and	
	_	n rules, validity of Be							
	Vibration spectroscopy: Basic principles of instrumentation, sampling techniques. Application of								
		troscopy for charact substitution. Introdu			retation of	of data, Eff	ect and im	portance of	
	UV-Visi	ble Spectrometry: B	asic principle	s of instrum	entation,	principles	of quantita	tive analysis	
		stimation of metal i					•	-	
	complex	kes using Job's meth	od of continue	ous variatior	n and mol	e ratio met	hod.		

III	THERMAL ANALYSIS and SEPARATION TECHNIQUES	15
	Theory of thermogravimetry (TG and DTG), instrumentation, estimation of Ca and Mg from their	
	mixture.	
	Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of	
	extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and	
	counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction	
	of metal ions from aqueous solution, extraction of organic species from the aqueous and non- aqueous media.	
	Chromatography techniques: Classification, principle and efficiency of the technique. Mechanism	
	of separation: adsorption, partition & ion exchange. Development of chromatograms: frontal,	
	elution and displacement methods. Qualitative and quantitative aspects of chromatographic	
	methods of analysis using LC, GLC, TLC and HPLC.	
		45
IV	ELECTROANALYTICAL METHODS	15
	Classification of electroanalytical methods, basic principle of pH metric, potentiometric and	
	conductometric titrations. Techniques used for the determination of equivalence points.	
	determination of pKa values.	
	sted Readings: Idham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.	
	ard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing California, US/	A. 1988.
	stian, G.D. Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.	, 1900.
	is, D.C.: Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.	
	og, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Saunder College Publ	lications.
(1998)		,
6 Mike	es, O. Laboratory Hand Book of Chromatographic & Allied Methods, Elles Harwood	
John \	Viley 1979.	
7 Ditts	s, R.V. Analytical Chemistry; Methods of separation, van Nostrand, 1974.	
8 Kho	okar, S. M., Basic Concepts of Analytical Chemistry, New Age (Second edition)1998	
9.Sko	og D.A., Holler F.J., Nieman T.A., Principles of instrumental analysis, 5th Edn., Brooks & Cole (199	7).

Course	e No:	Course Name:				Course Co	ode:						
		Analytical Chemisti	y Practical			SBS CH	020504 C (0042					
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs					
2022		Integrated B.Sc						per Week:	04				
onwar	ds	M.Sc.(Chemistry)	V	0	0	4	2	Total Hrs.:	60				
Total I	Evaluatio	n Marks: 100	Examination	Examination Duration: 6 Hrs.									
CIE:	15 Mar	ks	Pre-requisite of course: Paper chromatographic separation, Determine the										
						•		and soaps, Es					
TEE:	35 Marl	ks	of calcium, oxygen dem	-				nination of E (COD).	Biological				
Course	2	Paper chromatogi	aphic separa	tion, Deterr	nine the	pH of the g	given aera	ted drinks fru	iit juices,				
Object								ination of					
		Biological oxygen a	lemand (BOD)	and chemic	al oxygei	n demand ('COD).						
Course	e	After completing th	nis course, stu	dent is expe	cted to le	arn the foll	owing:						
Outco	mes:	CO1 : Chromatogra	phy										
		CO2: Solvent Extra	ctions										
		CO3: Analysis of so	bil										
		CO4: Ion exchange	!										
		CO5: Spectrophoto	ometry										
		CO6: Separation o	f amino acids	from organ	ic acids b	y ion excha	ange chror	natography.					
			C	OURSE SYLI	LABUS								
NOTE:													
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire	syllabus.	lt will have	four sub-pa	arts and stude	ents need				
to ans	wer any t	wo. Each part carrie	s three and ha	alf marks.									
		s. 2 to 5 are to be set							parts and				
	nts need	to answer any two si	ub-parts of ea	-		t carries thi	ree and hal	f marks.	-				
Unit				Conte	nts				Contact				
No.									Hrs.				
I		ATOGRAPHY		21 21	- 21				15				
	•••••	r chromatographic so	•										
		ration and identifica			•	nt in the gi	ven mixtur	e (glucose &					
		e) by paper chromato	• • • •	-		 	a al tal a 1996	4 h a a					
		arate a mixture of Su	idan yellow ar	nd Sudan Re	d by ILC t	echnique ai	nd identify	them on the					
		their Rf values.	tion of the op	tivo in anodio	unto of ulo	nto flouror							
		omatographic separa	ition of the ac	live ingredie	ents of pla	ints, flower	s and juices	SDYTEC	15				
II		IT EXTRACTIONS							15				
		parate a mixture of in chloroform, and		•			-	ne Ni ²⁺ -DMG					

	ii. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.					
	iii. Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques.					
ш	ANALYSIS OF SOIL	15				
	(i) Determination of pH of soil.					
	(ii) Total soluble salt					
	(iii) Estimation of calcium, magnesium, phosphate, nitrate					
IV	ION EXCHANGE and SPECTROPHOTOMETRY	15				
	(i) Determination of exchange capacity of cation exchange resins and anion exchange resins.					
	(ii) Separation of metal ions from their binary mixture.					
	(iii) Separation of amino acids from organic acids by ion exchange chromatography.					
	(i). Determination of pKa values of indicator using spectrophotometry.					
	(ii) Structural characterization of compounds by infrared spectroscopy.					
	(iii) Determination of dissolved oxygen in water.					
	(iv) Determination of chemical oxygen demand (COD).					
	(v) Determination of Biological oxygen demand (BOD).					
	(vi) Determine the composition of the Ferric-salicylate/ ferric-thiocyanate complex by Job's					
	method.					
Sugg	ested Readings:					
	endham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.					
	illard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company,	Belmon				
	ornia, USA, 1988.					
	ristian, G.D. <i>Analytical Chemistry</i> , 6th Ed. John Wiley & Sons, New York, 2004.					
	rris, D.C. <i>Exploring Chemical Analysis</i> , 9th Ed. New York, W.H. Freeman, 2016.					
	opkar, S.M. <i>Basic Concepts of Analytical Chemistry</i> . New Age International Publisher, 2009.					
	oog, D.A. Holler F.J. and Nieman, T.A. <i>Principles of Instrumental Analysis</i> , Cengage Learning India Editi ikes, O. & Chalmes, R.A. <i>Laboratory Handbook of Chromatographic & Allied Methods</i> , Elles Harw					
7. IVI						
Lond						

Semester VI

Course	e No:	Course Name:				Course Co	ode:		
		Green Chemistry				SBS CH 02	20601 C 31	04	
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	i.
2022		Integrated B.Sc						per Week:	04
onwar	rds	M.Sc.(Chemistry)	VI	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	on Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE:	30 Marl	ks	Pre-requisit	e of course:	Basic in	troduction	and expla	aining goals	of Green
			Chemistry,	twelve p	rinciples	of Gre	en Chem	istry, Desig	gning of
TEE:	70 Marl	ks	Environmer	ntally safe m	arine and	tifoulant, C	ombinator	ial green.	-
Course	е	Basic introductior	ו n and explai	ining goals	of Gree	n Chemist	ry, twelve	principles of	of Green
Object	tives	Chemistry, Design	ing of Enviror	nmentally sa	fe marin	e antifoula	nt, Combin	atorial green	1.
Course	e	After completing th	nis course, stu	dent is expe	cted to le	arn the foll	owing:		
Outco	mes:	CO1: Green chemis	stry and its pri	nciples.					
		CO2: Green synthe	sis and reaction	ons.					
		CO3: Green chemis	stry for sustair	nable solution	ns.				
		CO4: Understandin	g principles o	f green chem	nistry.				
		CO5: Understandi	ng design of	chemical r	eactions/	chemical s	ynthesis u	sing green o	chemistry
		principles.							
		CO6: Atom econom	וץ and design	of chemical	reactions	using the p	rinciple.		
			C	OURSE SYLL	.ABUS				
NOTE:	:								
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire s	syllabus. I	It will have	four sub-pa	arts and stude	ents need
to ans	wer any t	two. Each part carrie	s three and ha	alf marks.					
ii) Que	estion nos	s. 2 to 5 are to be set	t from all four	units one fro	om each.	Every quest	tion will ha	ve three sub-	parts and
studer	nts need f	to answer any two su	ub-parts of ea	ch question.	Each par	t carries thr	ee and hal	f marks.	
Unit				Conte	nts				Contact
No.									Hrs.
I	INTROD	OUCTION TO GREEN	CHEMISTRY						15
	Basic ir	ntroduction and ex	plaining goal	ls of Green	Chemist	ry. Limitat	ions/Obsta	acles in the	
	pursuit	of the goals of Gree	en Chemistry						
11		PLES OF GREEN CHEN ES DURATION EACH)		DESIGNING A		AL SYNTHE	SIS (12 CLA	SSES OF 60	15
			Chemistry with their explanations and examples and special emphasis nthesis using these principles (Prevention of Waste/ byproducts;						
			itilesis using	these print			wuste/	syproducts,	<u> </u>

	<u> </u>	
	maximum incorporation of the materials used in the process into the final products, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions).	
III	GREEN SYNTHESIS / REACTIONS	15
	1. Green Synthesis of adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis).	
	2. Microwave assisted reactions in water: (Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols) and reactions in organic solvents (Diels-Alder reaction and Decarboxylation reaction).	
	3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to lodine)	
	4 Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO ₂ for precision cleaning and dry cleaning of garments.	
	5 Designing of Environmentally safe marine antifoulant.	
	6 An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.	
	7 Healthier Fats and oil by Green Chemistry: Enzymatic Inter esterification for production of no Trans-Fats and Oils	
IV	FUTURE TRENDS IN GREEN CHEMISTRY	15
	Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C2S3); Green chemistry in sustainable development.	
	ested Readings: uwalia, V.K., Kidwai, M.R. <i>New Trends in Green Chemistry</i> , Anamalaya Publishers (2005).	
	astas, P.T. & Warner, J.K, <i>Green Chemistry- Theory and Practical</i> , Oxford University Press (1998).	
	atlack, A.S. Introduction to Green Chemistry, Marcel Dekker (2001).	
4. Ca	nn, M.C.and Connely, M.E. Real-World cases in Green Chemistry, ACS (2000).	
	an, M.A. and Tinnesand, M. Introduction to Green Chemistry, American Chemical Society, (2002).	
6. Laı	ncaster, M. Green Chemistry: An Introductory Text RSC Publishing, Second Edition, 2010.	

Course	e No:	Course Name:				Course C	ode:		
		Green Chemistry p	ractical			SBS CH 0	20602 C 00	42	
Batch:		Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	•
2022		Integrated B.Sc						per Week:	04
onwar	ds	M.Sc. Chemistry	VI	0	0	4	2	Total Hrs.:	60
Total E	valuatio	n Marks: 100	Examinatio	n Duration:		6 Hrs.			
CIE:	15 Marl	/ S	Pre-requisit	e of course:	Prepara	tion and ch	aracterizat	ion of nanopa	articles of
CIL.	13 101011	6	-					range peel us	
TEE:	35 Marl	<s< td=""><td></td><td>ed form dry i</td><td></td><td></td><td></td><th>enone to ben</th><td></td></s<>		ed form dry i				enone to ben	
				-					
Course	?	Preparation and a	haracterizati	on of nano	particles	of gold us	ing tea lea	aves, Extracti	on of D-
Object	tives	limonene from o	range peel	using liquid	I CO₂ pr	epared fo	rm dry ic	e, photoredi	iction of
		benzophenone to	benzopinacol	in presence	of sunlig	ht.			
Course	9	After completing th	nis course, stu	dent is expe	cted to le	arn the fol	owing:		
Outco	mes:	CO1: Preparation o	f biodiesel fro	om vegetable	e/ waste o	ooking oil.			
		CO2: Benzoin cond	ensation usin	g Thiamine H	lydrochlo	ride as a ca	italyst (inste	ead of cyanide	e).
		CO3: Solvent free, I	microwave as	sisted one p	ot synthe	sis of phtha	alocyanine (Cu(II) complex	ά.
		CO4: Use of molec	ular model ki	it to stimula	te the rea	action			
		CO5: Preparation a	and character	rization of n	anopartio	cles of gold	l using tea	leaves	
		CO6: Mechanoche	mical solvent	free synthe	esis of azo	omethines			
			C	OURSE SYL	LABUS				
NOTE:									
i)Ques	tion no. :	1 is compulsory and	to be set fron	n the entire	syllabus.	lt will have	four sub-pa	arts and stude	ents need
to ans	wer any t	wo. Each part carrie	s three and ha	alf marks.					
ii) Que	stion nos	s. 2 to 5 are to be set	from all four	units one fr	om each.	Every ques	tion will ha	ve three sub-	parts and
studen	its need t	o answer any two su	ub-parts of ea	ch question.	Each par	t carries th	ree and hal	f marks.	
Unit				Conte	nts				Contact
No.									Hrs.
I		ATIONS AND STUDY		-					15
	-	ration and characte		-	-	ng tea leav	es.		
		ration of biodiesel f	-		-		_		
		of molecular model	kit to stimula	te the react	ion to in	vestigate h	ow the ato	m economy	
		es Green Chemistry.							
		ions like addition, eli		stitution and	d rearrang	gement ma	y also be sti	udied for the	
	calculat	ion of atom econom	у.						
II	PREPAR	ATIONS AND STUDY	OF REACTIO	NS-I					
		oin condensation usi			e as a cat	alyst (inste	ad of cyanio	de).	
		tion of D-limonene	-	-			-		
				is of azomet		•	•		

4. Solvent free, microwave assisted one pot synthesis of phthalocyanine Cu(II) complex.	
5. Photoreduction of benzophenone to benzopinacol in presence of sunlight.	
Suggested Readings:	
1. Anastas, P.T & Warner, J.C. Green Chemistry: Theory and Practice, Oxford University Press (1998).
2. Kirchoff, M. & Ryan, M.A. Greener approaches to undergraduate chemistry experiment. Am	verican Chemical
Society, Washington DC (2002).	
3. Ryan, M.A. Introduction to Green Chemistry, Tinnesand; (Ed), American Chemical Society, Washi	ngton DC (2002).
4. Sharma, R.K.; Sidhwani, I.T. and Chaudhari, M.K. I.K. Green Chemistry Experiment: A monogra	ph, International
Publishing ISBN 978-93-81141-55-7 (2013).	
5. Cann, M.C. and Connelly, M. E. Real world cases in Green Chemistry, American Chemical Society	(2008).
6. Cann, M. C. and Thomas, P. Real world cases in Green Chemistry, American Chemical Society (20	08).
7. Lancaster, M. Green Chemistry: An Introductory Text RSC Publishing, Second Edition, 2010.	
8 Pavia D. L. Lampman G.M. Kriz G.S. & Engel R.G. Introduction to Organic Laboratory Technique	ies. A Microscale

8. Pavia, D. L., Lampman, G.M., Kriz, G.S. & Engel, R.G. *Introduction to Organic Laboratory Techniques: A Microscale and Macro Scale Approach,* W.B.Saunders, 1995.

Course	e No:	Course Name:				Course C	Code:		
		Materials Chemistr	у			SBS CH C)20603 C 31	04	
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.
2022		Integrated B.Sc						per Week:	04
onwar	ds	M.Sc. Chemistry	VI	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE:	30 Mar	ks				•	•	sis and charac	terization,
TEE:	70 Marl	<s< td=""><td>application</td><td>of various m</td><td>aterials s</td><td>uch as zeol</td><td>ites.</td><td></td><td></td></s<>	application	of various m	aterials s	uch as zeol	ites.		
Course	2	Crystalline solids, c	rystal system	s, Bravais la	ttices, co	ordination	number, In	ntroduction to	Zeolites,
Object	tives	Preparation of inc	rganic solids,	Overview of	of nanos	tructures d	and nano-n	naterials, Intr	oduction,
		limitations of conve	entional engin	eering mate	rials.				
Course	е	After completing th	nis course, stu	dent is expe	cted to le	earn the fol	lowing:		
Outco	mes:	CO1: Crystalline so	lids – parame	ters, symme	try.				
		CO2: Silica based m	naterials in ap	plications.					
		CO3: Technological	•				aterials– us	ing sol-gel teo	chnique.
		CO4: Nano-structur			led struc	ture.			
		CO5: Composites a							
		CO6: Understandin				olids, symm	netry and cry	ystal structure	es.
			C	OURSE SYLI	LABUS				
NOTE:									
		1 is compulsory and			syllabus.	It will have	e four sub-pa	arts and stude	ents need
	•	wo. Each part carrie							
-		s. 2 to 5 are to be set							parts and
	nts need t	to answer any two su	ub-parts of ea			t carries th	iree and hal	t marks.	
Unit				Conte	nts				Contact
No.	DAGIOG								Hrs.
1		OF CRYSTALLINE SO						f	15
		ine solids, crystal s	•					0	
		nexagonal, diamono					-		
		ns, types of bondin			-				
		Symmetry elemer	-		-				
		equivalent position	•		es, voids	, crystal st	ructures, Pa	auling rules,	
		in crystals, polymo	rphism, twinr	ning.					
II	SILICA B	ASED MATERIALS							15
	Introdu	ction to Zeolites,	metallosilica	tes, silicalit	es and	related i	microporous	s materials,	
	Mesopo	orous silica, metal o	oxides and re	elated funct	ionalized	mesopor	ous materia	ls: Covalent	
	-	frameworks, Organi			-	-	rous organc	silica, metal	
	organic	frameworks: H ₂ /CO	2 gas storage	and catalytic	applicat	ions.			

III	INORGANIC SOLIDS/IONIC LIQUIDS OF TECHNOLOGICAL IMPORTANCE	15
	Preparation of inorganic solids: Conventional heat and beat methods, Co-precipitation	
	method, Sol-gel methods, Hydro-thermal method, Ion-exchange and Intercalation methods.	
	Introduction to Solid electrolytes, inorganic liquid crystals. Ionic liquids, forces responsible for	
	ionic liquids, synthesis and application of imidazolium and phosphonium based ionic liquids.	
	Host-guest chemistry (elementary ideas).	
IV	NANOMATERIALS and COMPOSITE MATERIALS	15
	Overview of nanostructures and nano-materials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nano-architecture-one dimensional control. Carbon nanotubes and inorganic nanowires.	
	Introduction, limitations of conventional engineering materials, role of matrix in composites,	
	classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix	
	composites, fibre-reinforced composites, environmental effects on composites, applications of	
C	composites.	
	e sted Readings: ins P, Overton T., Rourke J. Weller M. and Armstrong F <i>Shriver and Atkins. Inorganic Chemistry</i> Oxford U	niversity
	, Fifth Edition, 2012.	Thersity
	am, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry. John Wiley,	1974
	ble, C.P. & Owens, F.J. Introduction to Nanotechnology John Wiley 2003.	1971.
4 Poo		

Cours	e No:	Course Name:				Course C	ode:		
		Materials Chemistr	y Practical			SBS CH 02	20604 C 00	42	
Batch		Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	.
2022		Integrated B.Sc						per Week:	04
onwar	rds	M.Sc. Chemistry	VI	0	0	4	2	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		6 Hrs.			
CIE:	15 Mar	ks	Pre-requisit	e of course:	Preparat	ions of nov	/alac resin/	/resol resin, S	Synthesis
			of materials	s/porous ma	aterials, A	Analysis of 2	XRD patter	n of crystals,	
TEE:	35 Marl	ks	Preparation	n of silver na	ino mate	rial.			
Course	е	Preparations of nov	valac resin/re	sol resin, Syı	nthesis of	materials/	porous mat	terials, Analys	sis of XRD
Objec	tives	pattern of crystals,	Preparation o	of silver nand	o materia	Ι.			
Course	e	After completing th	nis course, stu	dent is expe	cted to le	arn the foll	owing:		
Outco	mes:	CO1: Preparation o	f urea-formal	dehyde resii	n				
		CO2: Analysis of XI	RD pattern of	crystals.					
		CO3: Interpretation	n of FTIR, NMI	R and UV-Vis	data of g	jiven mater	ial.		
		CO4: Determination	n of hydratior	number IR	spectra.				
		CO5: Preparations	of novalac re	esin/resol re	sin.				
		CO6: Preparation of	of silver nano	material.					
			C	OURSE SYL	LABUS				
NOTE									
i)Ques	stion no.	1 is compulsory and	to be set fron	n the entire	syllabus.	It will have	four sub-pa	arts and stude	ents need
		wo. Each part carrie			,				
		s. 2 to 5 are to be set			om each.	Every ques	tion will ha	ve three sub-	parts and
-		to answer any two su							
Unit				Conte	nts				Contact
No.									Hrs.
I	PREPAR	ATIONS OF MATERIA	ALS						30
	1. Prepa	aration of urea-form	haldehyde re	sin					
	2. Prepa	arations of novalac	resin/resol re	sin					
		hesis of materials/			el, hydro	thermal, n	nicrowave)). (Similarly,	
	-	naterials synthesis c	-	. –	, ,	,	,		
		aration of silver n	-		. other i	nano mate	rials of ot	ther metals	
		is can be designed)			, ether i				
	Synthes	is can be designed							
11	CHARA	CTERIZATION OF MA	TERIALS						30
	-	sis of XRD pattern (
		pretation of FTIR, N		/is data of a	iven mat	erial			
		nation of particle siz		-					
		ity measurement of			iniques.				
		•	•	von ionic lie	uide				
		rmining dynamic vis	-	-	uius				
	o. Dete	rmination of hydrat	ion number l	n spectra.					

67 | P a g e

1. Atkins P, Overton T., Rourke J. Weller M. and Armstrong F *Shriver and Atkins. Inorganic Chemistry* Oxford University Press, Fifth Edition, 2012.

3. Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry. John Wiley, 1974.

4. Poole, C.P. & Owens, F.J. Introduction to Nanotechnology John Wiley 2003.

5. Rodger, G.E. Inorganic and Solid-State Chemistry, Cengage Learning, 2002.

Sr.	Name of the course	Course Code	L	T/	P	Credits
No.				P		
1	English for Communication	SBS CH 0201 AE 3104	3	1	0	4
2	History of Indian Science	SBS CH 0202 AE 3104	3	1	0	4
3	Good Laboratory Practices	SBS CH 0203 AE 3104	3	1	0	4
4	Cheminformatics	SBS CH 0204 AE 3104	3	1	0	4
5	Research methodology	SBS CH 0205 AE 3104	3	1	0	4
6	Chemistry in Everyday life	SBS CH 0206 AE 3104	3	1	0	4

List of Ability Enhancement Courses

Cours	e No:	Course Name:				Course C	ode:		
		English for Commu	nication			SBS CH	0201 AE 31	104	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	•
2022		Integrated B.Sc						per Week:	04
Onwa	rds	M.Sc. Chemistry	1/11	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE:	30 Mar	ks			: Idea o	f general I	English, Eng	glish gramma	ır, English
TEE:	70 Marl	ks	sentence fra	aming.					
Course	е	To skill students in	n English con	nmunication,	in Engli	sh writing,	technical v	writing in End	glish and
Objec	tives	scientific or genera	-		-	0.		5	-
Cours	e	After completing th	nis course, stu	dent is expe	cted to le	arn the foll	owing:		
Outco		CO1: Understandin		•			-	ch	
		CO2: Understandin							
		CO3: Understandin		-	-		-		
		CO4: Understandin	-				5		
		CO5: Understandin	g of avoiding	the commor	errors	C C			
		CO6: Understandin	g of making a	scientific pr	esentatio	n			
			C	OURSE SYLI	ABUS				
NOTE	:								
		1 is compulsory and	to be set from	h the entire s	vllabus. It	t will have s	even sub-p	arts and stude	ents need
-		our. Each part carrie					•		
		s. 2 to 5 are to be set			om each.	Every ques	tion will ha	ve three sub-	parts and
studer	nts need t	to answer any two su	ub-parts of ea	ch question.	Each par	t carries se	ven marks.		
Unit			-	Conte	nts				Contact
No.									Hrs.
I	СОММ	JNICATION							15
		ge and communicatic features of writing.	on, differences	s between sp	eech and	writing, dis	tinct featur	es of speech,	
11	WRITIN	G SKILLS							15
	Selectio	n of topic, thesis	statement.	developing	the the	sis: introd	uctory. de	velopmental.	
		onal and concluding					•	•	
		e, expository and ar		-	,,		,		
			5	0					
III	TECHNI	CAL WRITING							15
	Scientif	c and technical si	ubjects; form	nal and info	ormal w	ritings; for	mal writin	gs/reports,	
	handbo	oks, manuals, letter	s, memorand	um, notices	, agenda,	minutes;	common ei	rrors to be	
	avoided								
IV	PRESEN	TATION SKILL							15
	Scientifi	c presentation, pres	entations rela	ited to gener	al topic c	of science, a	nimation, e	editing.	

- 5. O. Blackswan, Language, Literature and Creativity (2013).
- 6. Business English, Pearson (2008).
- 7. Fluency in English-Part II, Oxford University Press (2006).
- 8. Dr. G. Mishra, Dr. R. Kaul and Dr. B. Biswas, Language through Literature (forthcoming) Edition.

Course	e No:	Course Name:				Course C			
		History of Indian So	cience			SBS CH	0202 AE 31	104	
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	
2022		Integrated B.Sc						per Week:	04
Onwar	rds	M.Sc. Chemistry	1/11	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.	-		
CIE:	30 Mar	ks	Pre-requisit contributior					nowledge of	importar
TEE:	70 Marl	<s< td=""><td>contribution</td><td></td><td></td><td></td><td></td><td>ichee.</td><td></td></s<>	contribution					ichee.	
Course Object	-	To provide student independence and	-	-				progress it m	ade afte
Course	P	After completing t	nis course stu	dent is exne	ected to le	arn the foll	owing.		
Outco		CO1: Understandir		-			-	dia	
outto		CO2: Understandir	-		•				
		CO3: Understandir	•	•					rnationa
		level	0 o p						
		CO4: Understandir	ng of history of	f plant tissue	e culture i	n India			
		CO5: Understandir		-			oning and fi	rst genome s	equencir
		CO6: Understandir	• •		-	•	U	U	•
				OURSE SYL					
		1 is compulsory and	to be set from	the entire s	svllabus. I	t will have s	even sub-p	arts and stude	ents need
to ansv ii) Que	stion no. wer any f estion nos	1 is compulsory and our. Each part carrie 5. 2 to 5 are to be se to answer any two s	es three and h t from all four	alf marks. units one fr	om each.	Every ques	tion will ha		
i) Ques to ans ii) Que studer	stion no. wer any f estion nos	our. Each part carrie	es three and h t from all four	alf marks. units one fr ch question	om each. . Each par	Every ques	tion will ha		parts and
i) Ques to ansv ii) Que studer Unit	stion no. wer any f estion nos	our. Each part carrie s. 2 to 5 are to be se	es three and h t from all four	alf marks. units one fr	om each. . Each par	Every ques	tion will ha		parts and
i) Ques to ansv ii) Que	stion no. wer any f estion nos nts need f	our. Each part carrie s. 2 to 5 are to be se	es three and h t from all four ub-parts of ea	alf marks. units one fr ch question Conte	om each. . Each par	Every ques	tion will ha		parts and
i) Ques to ansv ii) Que studer Unit No.	stion no. wer any f estion nos nts need f SCIENCI History India, U Influenc	our. Each part carries 2 to 5 are to be set to answer any two s IN ANCIENT AND N of development in a se of copper, bronze ce of the Islamic worl	es three and h t from all four ub-parts of ea MEDIEVAL IND stronomy, ma e and iron in A d and Europe	alf marks. units one fr <u>ch question</u> Conte IA thematics, e ncient India, on developn	rom each. . Each par ents engineerir . The geog nents in th	Every ques t carries se ng and med graphy in lit ne fields of f	tion will ha ven marks. icine subjec erature of A mathematic	ve three sub-	parts and Contac Hrs. 15
i) Ques to ansv ii) Que studer Unit No.	stion no. wer any f estion nos nts need f SCIENCI History India, U Influenc astrono	our. Each part carries 2 to 5 are to be set to answer any two s E IN ANCIENT AND N of development in a se of copper, bronze ce of the Islamic worl my and medicine,	es three and h t from all four ub-parts of ea MEDIEVAL IND stronomy, ma e and iron in A d and Europe	alf marks. units one fr <u>ch question</u> Conte IA thematics, e ncient India, on developn	rom each. . Each par ents engineerir . The geog nents in th	Every ques t carries se ng and med graphy in lit ne fields of f	tion will ha ven marks. icine subjec erature of A mathematic	ve three sub-	parts and Contac Hrs. 15
i) Ques to ans ii) Que studer Unit No. I	stion no. wer any f estion nos nts need f History India, U Influenc astrono techniq INDIAN Introdu	our. Each part carries 2 to 5 are to be set to answer any two s IN ANCIENT AND N of development in a se of copper, bronze ce of the Islamic worl my and medicine, ues of irrigation. SCIENCE IN BEFORE ction of different sur	es three and h t from all four ub-parts of ea MEDIEVAL IND stronomy, ma and iron in An d and Europe innovations AND AFTER I rveyors, botan	alf marks. units one fr ch question Conte MA thematics, en ncient India, on developm in the field NDEPENDEP ists and doc	rom each. . Each par ents engineerin The geog nents in th I of agric NCE tors as ea	Every ques t carries se ng and med graphy in lit the fields of fi culture-new rly scientist	tion will ha ven marks. icine subjec erature of A mathematic crop intr	ve three sub- cts in Ancient Ancient India. cs, chemistry, oduced new India, Indian	Contac Hrs. 15
i) Ques to ans ii) Que studer Unit No. I	stion no. wer any f estion nos nts need f SCIENCI History India, U Influence astrono techniq INDIAN Introduc percept researcl	our. Each part carries a 2 to 5 are to be set to answer any two set IN ANCIENT AND N of development in a se of copper, bronze ce of the Islamic work my and medicine, ues of irrigation. SCIENCE IN BEFORE ction of different sur- ion and adoption foon n organizations like	es three and h t from all four ub-parts of ea AEDIEVAL IND stronomy, ma and iron in Ai d and Europe innovations AND AFTER I veyors, botan r new scientif CSIR, DRDO	alf marks. units one fr ch question Conte TA thematics, en cient India, on developm in the field NDEPENDEN ists and doc ic knowledg and ICAR a	engineerin The geog nents in the of agric NCE tors as ea e in Mode	Every ques t carries se ng and med graphy in lit re fields of f culture-new rly scientist ern India, E , Establish	tion will ha ven marks. icine subjec erature of A mathematic crop intr in Colonial stablishme	ve three sub- ets in Ancient Ancient India. es, chemistry, oduced new India, Indian nt of premier	Contac Hrs. 15
i) Ques to ans ii) Que studer Unit No. I	stion no. wer any f estion nos nts need f History India, U Influence astrono techniq INDIAN Introduc percept research Commis	our. Each part carries 2 to 5 are to be set to answer any two set IN ANCIENT AND N of development in a se of copper, bronze the Islamic work my and medicine, ues of irrigation. SCIENCE IN BEFORE ction of different sur- ion and adoption for n organizations like ssion, Launching of t	Area Sthree and h t from all four ub-parts of ea AREDIEVAL IND stronomy, ma and iron in Ar d and Europe innovations AND AFTER I veyors, botan r new scientif CSIR, DRDO he space satel	alf marks. units one fr ch question Conte TA thematics, en cient India, on developm in the field NDEPENDEN ists and doc ic knowledg and ICAR a	engineerin The geog nents in the of agric NCE tors as ea e in Mode	Every ques t carries se ng and med graphy in lit re fields of f culture-new rly scientist ern India, E , Establish	tion will ha ven marks. icine subjec erature of A mathematic crop intr in Colonial stablishme	ve three sub- ets in Ancient Ancient India. es, chemistry, oduced new India, Indian nt of premier	Contac Hrs. 15
i) Ques to ans ii) Que studer Unit No. I	stion no. wer any f estion nos nts need f SCIENCI History India, U Influenc astrono techniq INDIAN Introduc percept researcl Commis	our. Each part carries a 2 to 5 are to be set to answer any two set E IN ANCIENT AND N of development in a se of copper, bronze the Islamic work my and medicine, ues of irrigation. SCIENCE IN BEFORE ction of different sur- ion and adoption for n organizations like ssion, Launching of t	es three and h t from all four ub-parts of ea MEDIEVAL IND stronomy, ma and iron in Ai d and Europe innovations AND AFTER I veyors, botan r new scientif CSIR, DRDO he space satel TISTS	alf marks. units one fr ch question Conte TA thematics, en cient India, on developm in the field NDEPENDEN ists and doc ic knowledg and ICAR a lites, Botani	rom each. . Each par ents engineerin The geog nents in ti I of agric NCE tors as ea e in Mod and ICMR cal survey	Every ques t carries se ng and med graphy in lit the fields of i culture-new rly scientist ern India, E , Establishi y of India.	tion will ha ven marks. icine subject erature of A mathemation crop intr in Colonial stablishmen ment of At	ve three sub- ets in Ancient Ancient India. cs, chemistry, oduced new India, Indian nt of premier omic Energy	Contac Hrs. 15
i) Ques to ansv ii) Que studer Unit No.	stion no. wer any f estion nos nts need f SCIENCI History India, U Influence astrono techniq INDIAN Introduc percept research Commis Eminem	our. Each part carries a 2 to 5 are to be set to answer any two set IN ANCIENT AND N of development in a se of copper, bronze te of the Islamic work my and medicine, ues of irrigation. SCIENCE IN BEFORE ction of different sur- ion and adoption for n organizations like asion, Launching of t NENT INDIAN SCIEN t scholars in math	es three and h t from all four ub-parts of ea AEDIEVAL IND stronomy, ma and iron in Ai d and Europe innovations AND AFTER I veyors, botan r new scientif CSIR, DRDO he space satel TISTS ematics and	alf marks. units one fr ch question Conte TA thematics, en cient India, on developm in the field NDEPENDEN ists and doc ic knowledg and ICAR a lites, Botani	engineerin The geog nents in the of agric NCE tors as ea e in Mode and ICMR cal survey Baudha	Every ques t carries se ng and med graphy in lit re fields of f culture-new rly scientist ern India, E , Establish yof India.	tion will ha ven marks. icine subject erature of A mathematic r crop intr : in Colonial stablishmen ment of At	ve three sub- ets in Ancient Ancient India. es, chemistry, oduced new India, Indian nt of premier omic Energy rahmgupta,	Contac Hrs. 15
i) Ques to ans ii) Que studer Unit No. I	stion no. wer any f estion nos nts need f SCIENCI History India, U Influenc astrono techniq INDIAN Introduc percept research Commis Eminen Bhaskar	our. Each part carries a 2 to 5 are to be set to answer any two set E IN ANCIENT AND N of development in a se of copper, bronze the Islamic work my and medicine, ues of irrigation. SCIENCE IN BEFORE ction of different sur- ion and adoption for n organizations like ssion, Launching of t	es three and h t from all four ub-parts of ea AEDIEVAL IND stronomy, ma and iron in Ai d and Europe innovations AND AFTER I veyors, botan r new scientif CSIR, DRDO he space satel TISTS ematics and nira, and Naga	alf marks. units one fr ch question Conte TA thematics, en cient India, on developm in the field NDEPENDEN ists and doc ic knowledg and ICAR a lites, Botani astronomy: rjuna, Medi	rom each. . Each par ents engineerin The geog nents in th I of agric NCE tors as ea e in Mod and ICMR cal survey Baudha cal scienc	Every ques t carries se ng and med graphy in lit ne fields of i culture-new rly scientist ern India, E , Establishi y of India.	tion will ha ven marks. icine subject erature of A mathematic crop intr in Colonial stablishmen ment of At bhtatta, Br it India (Ay	ve three sub- ets in Ancient Ancient India. es, chemistry, oduced new India, Indian nt of premier omic Energy ahmgupta, urveda and	Contac Hrs. 15
IV	PROMINENT RESEARCH IN PLANT SCIENCES IN REPUBLIC OF INDIA History of plant tissue culture from India, Green revolution in India: causes, details, and outcomes. First gene cloning in plants, First genome sequencing from India. Premier Plant Research institutes and scientists in India, GM Mustard. Allelopathy Plant research in India.	15							
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Sugge	sted Readings:								
1.	Kuppuram G (1990) History of Science and Technology in India, South Asia Books.								
2.	2. Handa O. C. (2014) Reflections on the history of Indian Science and Technology, Pentagon Press								
3.	3. Basu A (2006) Chemical Science in Colonial India: The Science in Social History, K.P. Bagchi & Co.								
4.	4. Habib I, (2016.) A people's history of India 20: Technology in Medieval India, 5th Edition, Tulika E	Books.							
5.	5. A. Rahman et al (1982) Science and Technology in Medieval India – A Bibliography of Source Ma	terials in							
	Sanskrit, Arabic and Persian, New Delhi: Indian National Science Academy.								
6.	6. B. V. Subbarayappa & K. V. Sarma (1985), Indian Astronomy — A Source Book, Bombay.								
7.	7. Srinivasan S, Ranganathan S (2013) Minerals and Metals heritage of India, National Institute of A	Advanced							
	Studies.								
8.	8. Srinivasiengar C N, (1967) The History of Ancient Indian Mathematics, World Press Private Ltd. C	Calcutta.							
9.	9. Bhardwaj H C (2000) Metallurgy in Indian Archaeology. Tara Book Agency								

Course	e No:	Course Name:				Course C	ode:		
		Good Laboratory P	ractices			SBS CH	0203 AE 31	104	
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	
2022		Integrated B.Sc						per Week:	04
Onwai	rds	M.Sc. Chemistry	1/11	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE: TEE:	30 Marl 70 Marl		•	small expe	•		-	cience laborat ratory equipr	
Course		To skill students in			ument us	ane safet	, nractice li	ike handling a	icids with
Object		care	ιασοιατοι γ ρι	uctices, msti	ument us	suge, sujer	, pructice ii	ike nununing u	
-									
Course		After completing th		•	cted to lea	arn the foll	owing:		
Outco	mes:	CO1: Understandin	-				مراجع مراجع	a a la vitu i	
		CO2: Understandin	• • •			erent norm	hality and m	noiarity	
		CO3: Understandin	-						
		CO4: Understandin	• • •	•	•	oratory			
		CO5: Understandin CO6: Understandin				•			
		COD : Understandin	ig of importan	ice of cleanin	liess III iai	Julatory			
			C	OURSE SYLL	ABUS				
NOTE:	:		C		ABUS				
		1 is compulsory and		OURSE SYLL		will have s	even sub-p	arts and stude	ents need
i) Que	stion no.	1 is compulsory and our. Each part carrie	to be set from	OURSE SYLL		will have s	even sub-p	arts and stude	ents need
i) Ques to ans	stion no. wer any f	our. Each part carrie	to be set from es three and h	OURSE SYLL the entire so alf marks.	yllabus. It		-		
i) Ques to ans ii) Que	stion no. wer any f estion nos		to be set from es three and h t from all four	OURSE SYLL the entire so alf marks. units one fro	yllabus. It om each.	Every ques	tion will ha		
i) Ques to ans ii) Que	stion no. wer any f estion nos	our. Each part carries. 2 to 5 are to be set	to be set from es three and h t from all four	OURSE SYLL the entire so alf marks. units one fro	yllabus. It om each. Each part	Every ques	tion will ha		
i) Ques to ans ii) Que studer	stion no. wer any f estion nos	our. Each part carries. 2 to 5 are to be set	to be set from es three and h t from all four	OURSE SYLL the entire so alf marks. units one fro ch question.	yllabus. It om each. Each part	Every ques	tion will ha		parts and
i) Ques to ans ii) Que studer Unit	stion no. wer any f estion nos nts need f	our. Each part carries. 2 to 5 are to be set	to be set from es three and h t from all four ub-parts of ea	OURSE SYLL the entire so alf marks. units one fro ch question.	yllabus. It om each. Each part	Every ques	tion will ha		parts and Contact
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- 1. Seiler, J.P. (2005). Good Laboratory Practices: the why and how. Springer-Verlag Berlin and Heidelberg GmbH & Co. K; 2nd ed.
- 2. Garner, W.Y., Barge M.S., Ussary. P.J. (1992). Good Laboratory Practice Standards: Application for field and Laboratory studies. Wiley VCH.

	e No:	Course Name:				Course C			
		Cheminformatics				SBS CH	0204 AE 31	104	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	i.
2022		Integrated B.Sc						per Week:	04
Onwa	rds	M.Sc. Chemistry	1/11	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:	1	3 Hrs.	1		
CIE:	30 Mar	ks	Pre-requisit		: Knowled	lge of com	puter aideo	d support in (Chemistry,
TEE:	70 Mar	<s< td=""><td>Telated Soft</td><td>wares.</td><td></td><td></td><td></td><th></th><td></td></s<>	Telated Soft	wares.					
Course	е	To skill students ab	out chemoinfo	ormatics, no	menclatu	re, reaction	classificati	on, proper sed	arching of
Objec	tives	chemical structures	s and its appli	cations					
Cours	e	After completing th	nis course stu	dent is exne	cted to le	arn the fol	owing.		
Outco		CO1: Understandin		•					
- 4100		CO2: Understandin							
		CO3: Understandin	-						
		CO4: Understandin	•				and proper	ty relations	
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			C	OURSE SYL	LABUS				
NOTE	:								
i) Que	stion no.	1 is compulsory and	to he set from						
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ιυ ans	swer any f				yllabus. I	t will have s	even sub-p	arts and stude	ents need
		our. Each part carrie	s three and h	alf marks.	-		-		
ii) Que	estion nos	our. Each part carrie 5. 2 to 5 are to be set	es three and h t from all four	alf marks. units one fr	om each.	Every ques	tion will ha		
ii) Que studer	estion nos	our. Each part carrie	es three and h t from all four	alf marks. units one fr ch question	om each. Each par	Every ques	tion will ha		parts and
ii) Que studer Unit	estion nos	our. Each part carrie 5. 2 to 5 are to be set	es three and h t from all four	alf marks. units one fr	om each. Each par	Every ques	tion will ha		parts and Contact
ii) Que studer Unit No.	estion nos nts need t	our. Each part carrie 5. 2 to 5 are to be set to answer any two su	es three and h t from all four ub-parts of ea	alf marks. units one fr ch question Conte	om each. Each par	Every ques	tion will ha		parts and Contact Hrs.
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ii) Que studer Unit No.	estion nos nts need t INTROD History,	our. Each part carrie s. 2 to 5 are to be set to answer any two su DUCTION TO CHEMO	es three and h t from all four ub-parts of ea INFORMATIC informatics, N	alf marks. units one fr <u>ch question</u> Conte S Aolecular M	om each. . Each par nts odelling a	Every ques t carries se nd Structu	tion will ha ven marks.	ve three sub-	parts and Contact Hrs.
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ii) Que studer Unit No. I II	INTROD History, REPRES Nomen Molfiles SEARCH Full stru search r data vis APPLICA Predicti Propert	OUCTION TO CHEMO Prospects of chemo ENTATION OF MOLE Clature, Different type and Sdfiles, Librarie IING CHEMICAL STRU Jucture search, sub-se methods, basics of co ualization.	es three and h t from all four ub-parts of ea INFORMATIC informatics, N CULES AND C bes of notatic s and toolkits UCTURES structure sear omputation of Compounds; or Analysis; N	alf marks. units one fr <u>ch question</u> Conte S Molecular M HEMICAL RI ons, SMILES , Different e rch, basic ic f physical an Linear Free Iodel Buildir	om each. Each par ints odelling a EACTIONS coding, N lectronic leas, sim d chemic e Energy ng; Model	Every ques t carries se and Structur datrix repre effects, Rea ilarity sear al data and Relations; ing.	tion will ha ven marks. re elucidations, action classi ch, three d structure c Quantitativ	ve three sub- on. Structure of ification. limensional descriptors, e Structure-	parts and Contact Hrs. 15 15 15
ii) Que studer Unit No. I II	INTROD History, REPRES Nomen Molfiles SEARCH Full stru search r data vis APPLICA Predicti Propert Toxicity	OUCTION TO CHEMO Prospects of chemo ENTATION OF MOLE Clature, Different type and Sdfiles, Librarie IING CHEMICAL STRU Jucture search, sub-se methods, basics of co ualization. ATIONS on of Properties of y Relations; Descript ; Structure-Spectra	es three and h t from all four ub-parts of ea INFORMATIC informatics, N COLLES AND C bes of notatic s and toolkits UCTURES structure sear omputation of Compounds; or Analysis; N correlations;	alf marks. units one fr ch question Conte S Molecular M HEMICAL RI ons, SMILES , Different e rch, basic ic f physical an Linear Free Iodel Buildir Prediction	om each. Each par ints odelling a EACTIONS coding, N lectronic leas, sim d chemic e Energy ng; Model of NMR,	Every ques t carries se and Structur fatrix repre effects, Rea ilarity sear al data and Relations; ing. IR and M	re elucidation esentations, action classi ch, three d structure c Quantitativ ass spectra	ve three sub- on. Structure of ification. limensional descriptors, e Structure- a; Computer	parts and Contact Hrs. 15 15 15
ii) Que studer Unit No. I II	INTROD History, REPRES Noment Molfiles SEARCH Full stru search r data vis APPLICA Predicti Propert Toxicity Assisted	our. Each part carries 2 to 5 are to be set to answer any two su DUCTION TO CHEMO Prospects of chemo ENTATION OF MOLE clature, Different type and Sdfiles, Libraries ING CHEMICAL STRU ucture search, sub-se methods, basics of co ualization. ATIONS on of Properties of y Relations; Descript ; Structure-Spectra d Structure elucidation	es three and h t from all four ub-parts of ea INFORMATIC informatics, N CULES AND C bes of notation is and toolkits UCTURES Structure sear omputation of Compounds; or Analysis; N correlations; ons; Compute	alf marks. units one fr ch question Conte S Molecular M HEMICAL RI ons, SMILES , Different e rch, basic ic f physical an Linear Free Iodel Buildir Prediction r Assisted Sy	om each. Each par ints odelling a ACTIONS coding, N lectronic leas, sim d chemic e Energy ng; Model of NMR, nthesis D	Every ques t carries se and Structur fatrix repre effects, Rea ilarity sear al data and Relations; ing. IR and M esign, Intro	tion will ha ven marks. re elucidations, action classi ch, three d structure of Quantitativ ass spectra oduction to	ve three sub- on. Structure of ification. limensional descriptors, e Structure- a; Computer drug design;	parts and Contact Hrs. 15 15 15
ii) Que studer Unit No. I II	INTROD History, REPRES Nomena Molfiles SEARCH Full stru search r data vis APPLIC/ Predicti Propert Toxicity Assisted Target I	OUCTION TO CHEMO Prospects of chemo ENTATION OF MOLE clature, Different type and Sdfiles, Librarie UNG CHEMICAL STRI Jucture search, sub-se methods, basics of co ualization. ATIONS on of Properties of y Relations; Descript ; Structure-Spectra d Structure elucidatic dentification and Va	es three and h t from all four ub-parts of ea INFORMATIC informatics, M CULES AND C bes of notatic s and toolkits UCTURES structure sear omputation of Compounds; or Analysis; M correlations; ons; Compute lidation; Lead	alf marks. units one fr ch question Conte S Molecular M HEMICAL RI ons, SMILES , Different e rch, basic ic f physical an Linear Free Iodel Buildir Prediction r Assisted Sy Finding and	om each. Each par ints odelling a ACTION Coding, N lectronic leas, sim d chemic e Energy ng; Model of NMR, inthesis D d Optimiz	Every ques t carries se nd Structur latrix repre effects, Rea ilarity sear al data and Relations; ing. IR and M esign, Intro ation; Analy	tion will ha ven marks. re elucidations, action classi ch, three d structure of Quantitativ ass spectra oduction to ysis of HTS of	ve three sub- on. Structure of ification. limensional descriptors, e Structure- a; Computer drug design; data; Virtual	parts and Contact Hrs. 15 15 15
ii) Que studer Unit No. I II	INTROD History, REPRES Nomena Molfiles SEARCH Full stru search r data vis APPLIC/ Predicti Propert Toxicity Assisted Target I	OUCTION TO CHEMO Prospects of chemo ENTATION OF MOLE Clature, Different type and Sdfiles, Librarie IING CHEMICAL STRU Jucture search, sub-se methods, basics of co ualization. ATIONS on of Properties of y Relations; Descript ; Structure-Spectra d Structure elucidatic dentification and Va ng; Design of Combin	es three and h t from all four ub-parts of ea INFORMATIC informatics, M CULES AND C bes of notatic s and toolkits UCTURES structure sear omputation of Compounds; or Analysis; M correlations; ons; Compute lidation; Lead	alf marks. units one fr ch question Conte S Molecular M HEMICAL RI ons, SMILES , Different e rch, basic ic f physical an Linear Free Iodel Buildir Prediction r Assisted Sy Finding and	om each. Each par ints odelling a ACTION Coding, N lectronic leas, sim d chemic e Energy ng; Model of NMR, inthesis D d Optimiz	Every ques t carries se nd Structur latrix repre effects, Rea ilarity sear al data and Relations; ing. IR and M esign, Intro ation; Analy	tion will ha ven marks. re elucidations, action classi ch, three d structure of Quantitativ ass spectra oduction to ysis of HTS of	ve three sub- on. Structure of ification. limensional descriptors, e Structure- a; Computer drug design; data; Virtual	parts and Contact Hrs. 15 15 15

- 1. Andrew R. Leach and Valerie, J. Gillet (2007) An introduction to Chemoinformatics. Springer: The Netherlands.
- 2. Gasteiger, J. and Engel, T. (2003) Chemoinformatics: A text-book. Wiley-VCH.
- 3. Gupta, S. P. (2011) QSAR & Molecular Modeling. Anamaya Pub.: New Delhi.

	se No:	Course Name:				Course			
		Research methodo	logy			SBS CH	0205 AE 3	104	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	•
2022		Integrated B.Sc						per Week:	04
Onwa	rds	M.Sc. Chemistry	1/11	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE:	30 Mar	ks	Pre-requisit	e of course:	Knowled	ge of resea	rch, good pr	actices in rese	arch, idea
TEE:	70 Marl	(\$	of journals a	and publicati	ions.				
Cours		To skill students a	hout researci	h. different	types of	research	data collect	tion and nuhl	lishina of
Objec	-	research work		i) aljjerene	cypes oj	100001011)			isining oj
Cours		After completing th	nis course stu	dont is ovno	ctod to le	orn the fol	lowing:		
Outco		CO1: Understandin		•			lowing.		
Guill		CO2: Understandin	-			lology			
		CO3: Understandin	-			•••	orv record		
		CO4: Understandin	-			-	oryrecord		
		CO5: Understandin	-			-	esearch		
		CO6: Understandin	-						
				OURSE SYL					
NOTE									
	•								
	stion no	1 is compulsory and	to be set from	the entire c	vilabus I	t will have	sovon sub-n	orts and stude	onts need
		1 is compulsory and			syllabus. I	t will have	seven sub-p	oarts and stude	ents need
to ans	wer any f	our. Each part carrie	es three and h	alf marks.	-		-		
to ans ii) Que	wer any f	our. Each part carries. 2 to 5 are to be se	es three and h t from all four	alf marks. units one fr	om each.	Every que	stion will ha	ive three sub-j	
to ans ii) Que stude	wer any f	our. Each part carrie	es three and h t from all four	alf marks. units one fr ch question.	om each. . Each par	Every que	stion will ha	ive three sub-j	parts and
to ans ii) Que studer Unit	wer any f	our. Each part carries. 2 to 5 are to be se	es three and h t from all four	alf marks. units one fr	om each. . Each par	Every que	stion will ha	ive three sub-j	parts and Contact
to ans ii) Que studer Unit No.	wer any f estion nos nts need f	our. Each part carries s. 2 to 5 are to be se to answer any two s	es three and h t from all four ub-parts of ea	alf marks. units one fr ch question.	om each. . Each par	Every que	stion will ha	ive three sub-j	parts and Contact Hrs.
to ans ii) Que studer Unit	wer any f estion nos nts need f BASIC C	our. Each part carries s. 2 to 5 are to be set to answer any two se ONCEPTS OF RESEA	es three and h t from all four ub-parts of ea RCH	alf marks. units one fr <u>ch question</u> . Conte	om each. . Each par ents	Every que t carries se	stion will ha	ive three sub-	parts and Contact
to ans ii) Que studer Unit No.	ewer any f estion nos nts need f BASIC C Researc	our. Each part carries s. 2 to 5 are to be se to answer any two s	es three and h t from all four ub-parts of ea RCH pes of resear	alf marks. units one fr <u>ch question.</u> Conte	om each. . Each par ents tive vs a	Every quest carries se	stion will ha even marks. applied vs f	ive three sub-j fundamental;	parts and Contact Hrs.
to ans ii) Que studer Unit No.	wer any f estion nos nts need f BASIC C Researc quantita	our. Each part carries 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua	alf marks. units one fr <u>ch question.</u> Conte ch (Descrip [*] l vs empiri	om each. <u>. Each par</u> ents tive vs a ical). Res	Every quest t carries se nalytical; a earch me	stion will ha even marks. applied vs f thods vs r	ive three sub-j fundamental; nethodology.	parts and Contact Hrs.
to ans ii) Que studer Unit No.	wer any f estion nos nts need f BASIC C Researc quantita Literatu	our. Each part carries 5. 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty ative vs. qualitative	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua nsolidation; Li	alf marks. units one fr <u>ch question.</u> Conte cch (Descript l vs empiri brary resear	om each. . Each par ents tive vs a ical). Res rch; field r	Every que t carries se nalytical; a earch me research; la	stion will ha even marks. applied vs f thods vs r	ive three sub-j fundamental; nethodology.	parts and Contact Hrs.
to ans ii) Que studen Unit No. I	BASIC C Researc quantita DATA C	our. Each part carries s. 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty ative vs. qualitative re-review and its co	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua nsolidation; Li CUMENTATIC	alf marks. units one fr ch question. Conte ch (Descrip l vs empiri brary resear DN OF OBSEI	om each. . Each par ents tive vs a ical). Res rch; field r RVATION	Every que t carries se nalytical; a earch me research; la S	stion will ha even marks. applied vs f thods vs r aboratory re	fundamental; methodology. esearch.	Contact Hrs. 15
to ans ii) Que studen Unit No. I	BASIC C Researc quantita Literatu Maintai	our. Each part carries 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty ative vs. qualitative re-review and its co OLLECTION AND DO	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua nsolidation; Li CUMENTATIC cord; Tabulatio	alf marks. units one fr ch question. Conte ch (Descript l vs empiri brary resear DN OF OBSEI on and gene	om each. . Each par ents tive vs a ical). Res ch; field r RVATION ration of g	Every que t carries se nalytical; a earch me research; la S	stion will ha even marks. applied vs f thods vs r aboratory re	fundamental; methodology. esearch.	Contact Hrs. 15
to ans ii) Que studen Unit No. I	BASIC C Researc quantita Literatu DATA C Maintai and app	our. Each part carries 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty ative vs. qualitative re-review and its co OLLECTION AND DO ning a laboratory rec	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua nsolidation; Li CUMENTATIC cord; Tabulatio s. The art of fig	alf marks. units one fr. ch question. Conte ch (Descript l vs empiri brary resear ON OF OBSEI on and gener eld photogra	om each. . Each par ents tive vs a ical). Res cch; field r RVATION ration of r aphy.	Every que t carries se nalytical; a earch me research; la graphs. Ima	stion will ha even marks. applied vs f thods vs r aboratory re	fundamental; methodology. esearch.	Contact Hrs. 15
to ans ii) Que studer Unit No. I	BASIC C Researc quantita Literatu DATA C Maintai and app	our. Each part carries 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty ative vs. qualitative re-review and its co OLLECTION AND DO ning a laboratory reco vilication of scale bars	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua nsolidation; Li CUMENTATIC cord; Tabulatio s. The art of fic N TO CHEMIS	alf marks. units one fr ch question. Conte ch (Descript l vs empiri brary resear DN OF OBSEI on and gener eld photogra TRY RELATEI	om each. . Each par ents tive vs a ical). Res cch; field r RVATION ration of r aphy.	Every que t carries se nalytical; a earch me research; la graphs. Ima	stion will ha even marks. applied vs f thods vs r aboratory re	fundamental; methodology. esearch.	Contact Hrs. 15 15
to ans ii) Que studen Unit No. I	BASIC C BASIC C Researc quantita Literatu DATA C Maintai and app OVERVI Key che	our. Each part carries 2 to 5 are to be set to answer any two set ONCEPTS OF RESEA h-definition and ty ative vs. qualitative re-review and its co OLLECTION AND DO ning a laboratory rec lication of scale bars EW OF APPLICATIOI mistry research area	es three and h t from all four ub-parts of ea RCH pes of resear e; conceptua nsolidation; Li CUMENTATIC cord; Tabulatio s. The art of fic N TO CHEMIS as, chemoinfor	alf marks. units one fr. ch question. Conte ch (Descript l vs empiri brary resear DN OF OBSEI on and gener eld photogra FRY RELATEI matics.	om each. . Each par ents tive vs a ical). Res ical). Res ich; field r RVATION ration of g aphy. D PROBLE	Every que t carries se nalytical; a earch me esearch; la s graphs. Ima	stion will ha even marks. applied vs f thods vs r aboratory re aging of tissu	fundamental; methodology. esearch.	Contact Hrs. 15 15
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- 1. A. Fink, Conducting Research Literature Reviews: From the Internet to Paper, Sage Publications, 2009.
- 2. M. Graziano, A.M. Anthony and M. L. Raulin, Research Methods: A Process of Inquiry, Allyn and Bacon., 2009.
- 3. W. M. K. Trochim, Research Methods: the concise knowledge base, Atomic Dog Publishing, 2005.
- 4. P. D. Leedy and J. E. Ormrod, Practical Research: Planning and Design, Prentice Hall, 2004.
- 5. B. L. Garg, R. Karadia, F. Agarwal and U. K. Agarwal, An introduction to Research Methodology, RBSA Publishers, 2002.
- 6. R. A. Day, How to Write and Publish a Scientific Paper, Cambridge University Press, 1992.
- 7. C. R. Kothari, Research Methodology: Methods and Techniques, New Age International, 1990.

Cours	e No:	Course Name:				Course C	ode:		
		Chemistry in Every	day life			SBS CH	0206 AE 3	104	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	•
2022		Integrated B.Sc						per Week:	04
Onwa	rds	M.Sc. Chemistry	1/11	2	0	2	4	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examination	Duration		3 Hrs.		1	
			LXammation			51115.			
CIE:	30 Mar	ks	Pre-requisite	e of course	Knowled	lge of differ	ent chemic	al processes p	eonle use
.	70.14.1		in their ever			•		• •	
TEE:	70 Mar			nistruis an	intogral	art of our		o impost of r	dicals on
Cours Objec		To teach students l human health, vita		•		bart of our e	everyddy lljo	e, impact of ro	aicais on
-							L. •		
Cours		After completing the		•			-		
Outco	mes:	CO1: Understandin	-	-		•	iratory syst	.em	
		CO2: Understandir CO3: Understandir					orking of a	veryday life a	olymoric
		materials			the forma		URING OF EV	veryuay me po	Jymenc
		CO4: Understandir	g role of vitam	nins and mi	nerals in l	ody and th	eir working	mechanism	
		CO5: Understandir	-			-	-	,	
		CO6: Understandir				•			
			<i>z</i> .	DURSE SYL					
NOTE									
		1 is compulsory and	to be set from	the entire	syllabus I	t will have a	ovon sub-n	arts and stude	onts nood
-		our. Each part carrie			synabus. i	t will have s	seven sub-p		ents neeu
		5. 2 to 5 are to be se			rom each	Every ques	tion will ha	we three sub-	narts and
-		to answer any two s				• •			
Unit				Cont					Contact
No.									Hrs.
I	RESPIRA	ATION AND ENERGY	PRODUCTION	I IN HUMA	N BODY				15
		tion, Respiratory en			-				
		ism in body, co-op					•	•	
		production in body			ble for fo	od digesti	on, mechar	nism of food	
		n, active site of cyto						ATERIALC	15
II		AL ASPECTS OF SON							15
		, sickle cell anemia,		•	-		i sugar, art	mus, carbon	
		de poisoning in mine nd Detergents – the		-			d ite utility	ac altornativa	
	•	rce, Fibers: natural f		•			•		
		A; Examples of nati			•		• •		
		tein, corn, zein prot	-						
		ric materials in daily	-	aten protei	ii, syntie	tic blouegi	auable poly	iners. Use of	
	. ,	NS AND MINERALS							15
		r vitamin in body, ty	pes of vitamin	s, water sol	uble and	fat soluble v	vitamins. Vi	tamin B-12	15
		C (Cyanocobalamir							
	remedy		, .,				.sume den		

IV	SIGNIFICANCE OF RADICAL CHEMISTRY IN LIVING SYSTEM Radical production in environment, superoxide and peroxide, health impact, action of radicals, cell mutation, diseases caused by free radical, cancer, radical quencher, anti-oxidants, natural anti- oxidants like vegetables, beverages like tea and coffee, fruits. Radical destroying enzymes: superoxide dismutase, catalase, peroxidase, mechanism of action.	15
Sugge	sted Readings:	
1.	Kaim W, Bioinorganic Chemistry, Vol 4, Brigitte Scwederski, Wiley, 1994.	
2.	Crichton R. H. Biological Inorganic Chemistry – An Introduction, Elsevier, 2008.	
3.	3. Berg J. M., Tymoczeko J. L., Stryer I. Biochemistry, W. H. Freeman, 2008.	
4.	4. Bertini, I., Gray, H. B., Lippard, S. J. and Valentine, J. S. (1994) <i>Bioinorganic Chemistry</i> . Universit Books (1994)	y Science
5.		
6.	6. Polymer science, V. R. Gowariker, N. V.Viswanathan, J. Sreedhar, New Age International.	

List of Skill Enhancement Courses

Sr. No.	Name of the course	Course Code	L/P	т	Ρ	Credits
1	Personality Development	SBS CH 0201 SE 2002	2	0	0	2
2	Computer Applications in Chemistry	SBS CH 0202 SE 2002	2	0	0	2
3	Science Communication and Popularization	SBS CH 0203 SE 2002	2	0	0	2
4	Biofertilizer	SBS CH 0204 SE 2002	2	0	0	2
5	Herbal Science & Technology	SBS CH 0205 SE 2002	2	0	0	2
6	Fermentation Science & Technology	SBS CH 0206 SE 2002	2	0	0	2
7	Environment Impact Analysis	SBS CH 0207 SE 2002	2	0	0	2

course	e No:	Course Name:				Course C					
		Personality Develo	pment			SBS CH 0	208 SE 2002	2			
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs.			
2022		Integrated B.Sc						per Week:	02		
Onwa	rds	M.Sc. Chemistry	1/11	2	0	0	2	Total Hrs.:	30		
Total	Evaluatio	on Marks: 50	Examinatio	n Duration:		2 Hrs.					
CIE:	15 Mar	ks	Pre-requisit	Pre-requisite of course: Mental heuristics, Mental priming, Checklists, Stress							
			managemer				•		, 01, 000		
TEE:	35 Mar		_		-	•	•				
Course Object		Basic psychology s human resources	kills, productiv	ity and time	e managei	nent, deali	ng negativit	ty, critical thin	king and		
Cours	e	After completing t	his course, stu	dent is expe	cted to le	arn the fol	lowing:				
Outco	mes:	CO1: Develop unde	erstanding of t	he concepts	and prin	ciples of ba	asic psychol	ogical skills			
		CO2: Apply technic	ques and meth	ods to enha	nce prod	uctivity and	d time mana	agement			
		CO3: Develop critic	-								
		CO4: Organize hun		with improv	ved leade	rship qualit	ies				
		CO5: Improve logi									
		CO6: Overall perso	nality develop	ment							
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need t ii) Que	to answe estion no	1 is compulsory and r any four. Each part s. 2 to 5 are to be se to answer any two s	carries three t from all four	and half ma units one fr	rks. om each.	Every ques	stion will ha	-			
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No.									Hrs.		
I	BASIC F	SYCHOLOGY SKILLS							8		
	Mental	Heuristics and Primi	ng, Cialdini's s	ix psycholog	gical princ	iples, Chari	isma and ch	arisma			
	enhanc	ements, facing inter	views			-					
11	PRODU	CTIVITY AND TIME I	VANAGEMEN	Г					8		
	Eisenho	ower Matrix, Pomodo	oro Technique	, Dealing wi	th Procras	stination, Jo	ournaling m	ethods,			
		sts, to-do lists and so	heduling the e	events							
	DEALIN										
		G NEGATIVITY							7		
111	Balance	G NEGATIVITY e, stress managemer	it, coping with	failures and	l depressi	on			7		
III IV					l depressi	on			7		

- 1. Bast, F., Crux of time management for students (2016). Available at: https://www.ias.ac.in/article/fulltext/reso/021/01/0071-0088
- 2. Cialdini, R.B., Influence: The Psychology of Persuasion, Revised Edition. Harper Collius (2001).
- 3. Green, C.J.,Leadership and soft skills for students: Empowered to succeed in High School, College and beyond. Dog Ear Publishing (2015).
- 4. Velayudhan, A. and Amudhadevi, N. V., Personality Development for College Students. LAP Lambert Academic Publishing (2012).

Course No: Batch:		Course Name:	i ana in Chani	- 1			Course Code: SBS CH 0209 SE 2002			
<u> </u>		Computer Applicat			1 -					
Batch 2022	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs		
Onwa	urde	Integrated B.Sc M.Sc. Chemistry	1/11	2	0	0	2	per Week: Total Hrs.:	02 30	
		n Marks: 50	1/11	Z	0	0	Z	Total Hrs.:	30	
TUtai	Evaluatio		Examination	n Duration:		2 Hrs.				
CIE:	15 Mar	ks	Pre-requisit	e of cou	rse: Snr	eadsheet	Google	search Sub	scription	
TFF .		ke	-	Pre-requisite of course: Spreadsheet, Google search, Subscriptio Bibliography, MS office, Image processing						
TEE: Cours	35 Mar	ks Spreadsheet Applic	cations Intern	et Resource	s Biblioar	anhy mana	aement Ot	hersoftware	resources	
Objec		Spredusiteet Applic	utions, intern		s, bibliogr		gement, Ot		23001223	
Cours		After completing t	his course, stu	dent is expe	ected to le	arn the foll	owing:			
Outco		CO1: Apply the bas					- 0			
		CO2: Recognize ad	vanced resour	ces for acce	essing scho	olarly litera	ture from ir	nternet		
		CO3: Utilize bibliog						-		
		CO4: Operate vario	ous software r	esources wi	th advanc	ed function	is and its op	pen office sub	stitutes	
			C	OURSE SYL	LABUS					
NOTE	:									
i) Que	estion no.	1 is compulsory and			-	It will have	seven sub-	parts and stud	dents	
i) Que need t	estion no. to answe	r any four. Each part	carries three	and half ma	irks.					
i) Que need t ii) Que	estion no. to answe estion no	r any four. Each part s. 2 to 5 are to be se	carries three t from all four	and half ma units one fi	irks. rom each.	Every ques	tion will ha			
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1. User manual and online user manual of respective soft wares for the most updated content

2. Published books are not recommended as versions keep on updating very frequently; therefore, it is not easy to follow.

	e No:	Course Name:				Course C			
		Science Communic	ation and Popularization Semester: L T		T	SBS CH 0	2010 SE 200	02	
Batch	:	Programme:	Semester:	L	т	Р	Credits	Contact Hrs	
2022		Integrated B.Sc						per Week:	02
Onwa		M.Sc. Chemistry	1/11	2	0	0	2	Total Hrs.:	30
Total I	Evaluatio	n Marks: 50	Examination	Duration:		2 Hrs.			
CIE:	15 Mar	ks	Pre-requisit	e of course:	Print sci	ence Visua	al media. In	ternet	
TEE:	Pre-requisite of course: Print science, Visual media, Internet 35 Marks								
Course	e	Print Science Com	munication, V	isual Medi/	a Science	Communi	cation, Inte	ernet Science	
Object	tives	Communication, S	cience Outrea	ach Talks ar	nd Public	Sensitizati	on		
Course	е	After completing th	nis course, stu	dent is expe	cted to le	earn the fol	lowing:		
Outco	mes:	CO1: Identify the	need and role	of science	commun	ication in h	numan deve	elopment	
		CO2: utilize visual							es
		CO3: Contribute in				•	•		
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-	PRINT S Need fo impact at natio case stu works o Riddley VISUAL Advanc accessin resourc INTERN Science	CIENCE COMMUNIC or Science Journalis on technology. Role onal and internatio udies of celebrated of Bill Bryson, Richa , importance for co MEDIA SCIENCE CO ed Google search o ng scholarly literatu ces and podcasts, RS ET SCIENCE COMMU e outreach through i	t from all four ub-parts of ear CATION m: Science hat of science an nal levels. Wr works of scie rd Dawkins, R mmunication MMUNICATIO perators and re from Interr SS/XML Feeds JNICATION nternet: Socia	units one fr ch question Conte as potential d technolog riting and c ence comm lichard Feyn through re N Boolean fur het, Fake Ne and feed s al media, W	om each. <u>Each par</u> ents for brea gy in hum ommunic unicators nman, Isa gional lar nctions, Ir ews and s ubscriptic /ebsites,	king news, han develop cating pop s including hac Asimov nguages. htroduction potting the on using a Blogs, Yout	ven marks. , impact on pment. Fran ular article: Cosmos by , Carl Zimm n to Google e fake news feed reade tube, Podca	Human life, ming policies s effectively, / Carl Sagan, her and Matt s Scholar and , multimedia r.	Contac Hrs. 8
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1. Selected works of Carl Sagan, works of Bill Bryson, Richard Dawkins, Richard Feynman, Isaac Asimov, Carl Zimmer and Matt Riddley.

2. Gigante, E. Marie (2018). Introducing Science Through Images: Cases of Visual Popularization (Studies in Rhetoric/Communication), University of South Carolina Press.

	e No:	Course Name:			Course C						
		Biofertilizers	T			SBS CH 0	2011 SE 200				
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	•		
2022		Integrated B.Sc						per Week:	02		
Onwa	rds	M.Sc. Chemistry	1/11	2	0	0	2	Total Hrs.:	30		
Total	Evaluatio	n Marks: 50	Examinatio	n Duration:		2 Hrs.					
CIE:	15 Mar	ks	•	Pre-requisite of course: Useful microbes, Cyanobacteria, Mycorrhiza, Organic farming, Recycling, Vermicompost							
TEE:	35 Mar	ks	farming, Red	cycling, Verr	nicompos	t					
Cours Objec		Useful microbes, C	yanobacteria,	Mycorrhiza	, Organic	farming, Re	ecycling, Vei	rmicompost			
Cours	e	After completing t	his course. stu	dent is expe	ected to le	arn the fol	lowing:				
Outco		CO1: Develop their					-				
		CO2: Identify the d		•	•						
		CO3: Compose the									
		CO4: Develop the i					ction by usi	ng both nitrog	genous		
		and phosphate bio	fertilizers					-			
			C	OURSE SYL	LABUS						
NOTE											
need	to answei	1 is compulsory and any four. Each part	carries three	and half ma	rks.						
need i ii) Que	to answei estion no:		carries three t from all four	and half ma units one fr	rks. om each.	Every ques	stion will ha				
need ii) Que stude Unit	to answei estion no:	r any four. Each part s. 2 to 5 are to be se	carries three t from all four	and half ma units one fr	rks. om each. . Each par	Every ques	stion will ha		parts and Contac		
need i ii) Que	to answei estion no: nts need	r any four. Each part s. 2 to 5 are to be se to answer any two s	carries three t from all four	and half ma units one fr ch question	rks. om each. . Each par	Every ques	stion will ha		parts and		
need t ii) Que studer Unit No.	to answer estion not nts need UNIT -1 Genera identifi Azospir differer	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and nt microorganisms	carries three t from all four ub-parts of ea the microbe ltiplication, mass multipl . Azotobacte	and half ma units one fr <u>ch question</u> Conte es used as carrier-bas lication – ca r: classifica	rks. rom each. <u>Each par</u> ents s biofert ed inocu arrier-bas ition, cha	Every ques <u>t carries se</u> ilizer – F ulants, A ed inocula aracteristic	stion will ha even marks. Rhizobium ctinorrhizal int, associa	ve three sub- – isolation, symbiosis. tive effect of	Contac Hrs. 8		
need f ii) Que studer Unit No. I	to answer estion not nts need UNIT -1 Genera identifi Azospir differer	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and nt microorganisms acter inoculum, ma	carries three t from all four ub-parts of ea the microbe ltiplication, mass multipl . Azotobacte	and half ma units one fr <u>ch question</u> Conte es used as carrier-bas lication – ca r: classifica	rks. rom each. <u>Each par</u> ents s biofert ed inocu arrier-bas ition, cha	Every ques <u>t carries se</u> ilizer – F ulants, A ed inocula aracteristic	stion will ha even marks. Rhizobium ctinorrhizal int, associa	ve three sub- – isolation, symbiosis. tive effect of	Contac Hrs. 8		
need t ii) Que studer Unit No. I	to answer estion no: nts need UNIT -1 Genera identifi Azospir differer Azotob	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and nt microorganisms acter inoculum, ma	carries three t from all four ub-parts of ea the microbe ltiplication, mass multipl . Azotobacted intenance and	and half ma units one fr ch question Conte es used as carrier-bas lication – ca r: classifica d mass mult	rks. Fom each. Each par ents s biofert ed inocu arrier-bas ation, cha tiplicatior	Every ques t carries se ilizer – F ulants, A ed inocula aracteristic	stion will ha even marks. Rhizobium ctinorrhizal ent, associa es – crop	ve three sub- – isolation, symbiosis. tive effect of response to	Contac Hrs. 8		
need t ii) Que studer Unit No. I	to answer estion nos nts need UNIT -1 Genera identifi Azospir differer Azotob UNIT -2 Cyanob	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and nt microorganisms acter inoculum, ma	carries three t from all four <u>ub-parts of ea</u> the microbe ltiplication, mass multipl Azotobacted intenance and algae), Azolla	and half ma units one fr ch question Conte es used as carrier-bas lication – ca r: classifica d mass mult a and Anab	rks. om each. <u>Each par</u> ents s biofert ed inocu arrier-bas ation, cha tiplicatior aena azo	Every ques <u>t carries se</u> ilizer – F ulants, A ed inocula macteristic n.	stion will ha even marks. Rhizobium ctinorrhizal int, associa is – crop ation, nitro	ve three sub- – isolation, symbiosis. tive effect of response to	Contac Hrs. 8		
need f ii) Que studer Unit No. I	to answer estion nos nts need UNIT -1 Genera identifi Azospir differer Azotob UNIT -2 Cyanob	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and nt microorganisms acter inoculum, ma acteria (blue green affecting growth, b	carries three t from all four <u>ub-parts of ea</u> the microbe ltiplication, mass multipl Azotobacted intenance and algae), Azolla	and half ma units one fr ch question Conte es used as carrier-bas lication – ca r: classifica d mass mult a and Anab	rks. om each. <u>Each par</u> ents s biofert ed inocu arrier-bas ation, cha tiplicatior aena azo	Every ques <u>t carries se</u> ilizer – F ulants, A ed inocula macteristic n.	stion will ha even marks. Rhizobium ctinorrhizal int, associa is – crop ation, nitro	ve three sub- – isolation, symbiosis. tive effect of response to	parts an Contac Hrs. 8		
need f ii) Que studer Unit No. I	to answer estion no: nts need UNIT -1 Genera identifi Azospir differer Azotob UNIT -2 Cyanob factors UNIT -3 Mycorr distribu	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and nt microorganisms acter inoculum, ma acteria (blue green affecting growth, b hizal association, ition, phosphorus r	carries three t from all four ub-parts of ea the microbe ltiplication, mass multipl Azotobacte intenance and algae), Azolla lue green alga types of my nutrition, grow	and half ma units one fr ch question Conte es used as carrier-bas dication – ca r: classifica d mass multi a and Anab ae and Azol vcorrhizal a vth and yie	rks. Fom each. Each par ents s biofert ed inocu arrier-bas ition, cha tiplication aena azo la in rice associatio Id – colo	Every ques t carries se ilizer – F ulants, A ed inocula aracteristic n. Ilae associ cultivation n, taxono nization of	stion will ha even marks. Rhizobium ctinorrhizal ent, associa as – crop ation, nitro my, occur f VAM – isc	ve three sub- – isolation, symbiosis. tive effect of response to gen fixation, rence and plation and	Contac Hrs. 8		
need t ii) Que studer Unit No.	to answer estion no: nts need UNIT -1 Genera identifi Azospir differer Azotob UNIT -2 Cyanob factors UNIT -3 Mycorr distribu	r any four. Each part s. 2 to 5 are to be se to answer any two s l account about cation, mass mu illum: isolation and at microorganisms acter inoculum, ma acteria (blue green affecting growth, b hizal association, ition, phosphorus r m production of VA	carries three t from all four ub-parts of ea the microbe ltiplication, mass multipl Azotobacte intenance and algae), Azolla lue green alga types of my nutrition, grow	and half ma units one fr ch question Conte es used as carrier-bas dication – ca r: classifica d mass multi a and Anab ae and Azol vcorrhizal a vth and yie	rks. Fom each. Each par ents s biofert ed inocu arrier-bas ition, cha tiplication aena azo la in rice associatio Id – colo	Every ques t carries se ilizer – F ulants, A ed inocula aracteristic n. Ilae associ cultivation n, taxono nization of	stion will ha even marks. Rhizobium ctinorrhizal ent, associa as – crop ation, nitro my, occur f VAM – isc	ve three sub- – isolation, symbiosis. tive effect of response to gen fixation, rence and plation and	Contac Hrs. 8		

1. Dubey, R.C. (2005). A Text book of Biotechnology S.Chand & Co, New Delhi.

2. John Jothi Prakash, E. (2004). Outlines of Plant Biotechnology. Emkay Publication, New Delhi.

3. Kumaresan, V.(2005). Biotechnology, Saras Publications, New Delhi.

4. NIIR Board. (2012). The complete Technology Book on Biofertilizer and organic farming. 2nd Edition. NIIR Project Consultancy Services.

5. Sathe, T.V. (2004) Vermiculture and Organic Farming. Daya publishers.

6. Subba Rao N.S. (2017). Biofertilizers in Agriculture and Forestry. Fourth Edition. Medtech.

7. Vayas, S.C, Vayas, S. and Modi, H.A. (1998). Bio-fertilizers and organic Farming Akta Prakashan, Nadiad.

Course	e No:	Course Name: Herbal Science & T	echnology			Course C SBS CH 0	ode: 2012 SE 20	02	
Batch: 2022	:	Programme: Integrated B.Sc	Semester:	L	т	Р	Credits	Contact Hrs per Week:	02
Onwa	rds	M.Sc. Chemistry	1/11	2	0	0	2	Total Hrs.:	30
Total I	Evaluatio	n Marks: 50	Examination	Duration:		2 Hrs.			
CIE: TEE:	15 Marl 35 Marl	<s< td=""><td>Pharmacogn</td><td>osy, Adulte</td><td>ration, Se</td><td>condary me</td><td>etabolites</td><th>cts, Biopesticio</th><td></td></s<>	Pharmacogn	osy, Adulte	ration, Se	condary me	etabolites	cts, Biopesticio	
Course Object		Herbal medicines, metabolites	Plant products	, Biopestici	des, Pharı	macognosy,	Adulterati	on, Secondary	1
Outco	mes:	After completing th CO1: Develop their CO2: Define and de CO3: List the major CO4: Evaluate the o CO5: Formulate the medicine CO6: Develop the s quality control	understandin escribe the prin herbs, their b drug adulterat e value-added	g on Herba nciple of cu otanical na ion through processing	l Technold ltivation c me and ch the biolc / storage	pgy of herbal pro nemical con ogical testin / quality co	oducts. Istituents. g Introl for th		
			CC	OURSE SYL	LABUS				
need t ii) Que	stion no. to answer estion nos	1 is compulsory and any four. Each part 5. 2 to 5 are to be set to answer any two si	carries three a from all four	and half ma units one fr	irks. om each.	Every ques	tion will ha	ve three sub-	
Unit				Conte			ven marks.		Contact
No. I		Technology: Defini	•	•		•			Hrs. 8
		s of medicine, and ion - harvesting - p			•			f Medicine);	
II	UNIT -2 Value a as herba		s: Herbs and I ceuticals, cosn	herbal proc neticals and	ducts reco	ognized in I	ndia; Majo		8
=	the foll <i>roseus,</i>	icognosy - Systema owing herbs: Tulsi, <i>Withania somnif</i> ora), Saravar. Herba	Ginger, Curc era, Centella	uma, Fenu a <i>asiatica,</i>	ıgreek, İn <i>Achyraı</i>	idian Goose hthes aspe	eberry, Ca	tharanthus	7

	UNIT -4 Analytical pharmacognosy: Morphological and microscopic examination of herbs, Evaluation of drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds). Plant gene banks, Cultivation of Plants and their value- added processing / storage / quality control for use in herbal formulations, Introductory knowledge of Tissue culture and Micro propagation. of some medicinal plants (Withania somnifera, neem and tulsi),
1. Aga	e sted Readings: arwal, P., Shashi, Alok., Fatima, A. and Verma, A. (2013). Current scenario of Herbal Technology lwide: An overview. Int J Pharm Sci Res; 4(11): 4105-17.
2. Art	per, Agnes. (1999). Herbal Plants and Drugs. Mangal Deep Publications, Jaipur.
	rzakas, T., Zakynthinos, G, and Francis Verpoort, F. (2016). Plant Food Residues as a Source of aceuticals and Functional Foods. Foods 5: 88.
4. Abı	urjai, T. and Natsheh, F.M. (2003). Plants Used in Cosmetics. Phytotherapy Research 17 :987-1000.
	tri, F. and Silano, V. (2002). Plants in cosmetics: Plants and plant preparations used as ingredients for etic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.
Unani	USH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy i, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha Iomoeopathy (AYUSH), Ministry and Family Welfare, Government of India.
7. Eva	ans, W.C. (2009): Trease and Evans PHARMACOGNOSY. 16th Edition, SAUNDERS / Elsevier.
	arajan, V.V. and India, B. (1994). Ayurvedic Drugs and Their Plant Sources. Oxford & IBH Publishing bany, 1994 - Herbs - 570 pages.
	ller, L. and Miller, B. (2017). Ayurveda & Aromatherapy: The Earth Essential Guide to Ancient Wisdom Aodern Healing. Motilal Banarsidass,; Fourth edition .
10. Ka	okate, C.K. (2003). Practical Pharmacognosy. Vallabh Prakashan, Pune.

Cours	e No:	Course Name:				Course C	ode:		
		Fermentation Scier	nce & Technol	ogy		SBS CH 0	2013 SE 200	02	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	
2022		Integrated B.Sc						per Week:	02
Onwa	rds	M.Sc. Chemistry	1/11	2	0	0	2	Total Hrs.:	30
Total	Evaluatio	n Marks: 50	Examinatio	n Duration:		2 Hrs.			
CIE:	15 Mar	ks	-					on, Metabolii	:es,
TEE:	35 Marl	ks	Fermented	products, E	nzyme pr	oduction,	Bioproduct	recovery	
Cours Objec	-	Microbial culture, Bioproduct recove		n, Metaboli	tes, Ferm	ented prod	ducts, Enzy	me productio	on,
Outco	ines.	CO1: Employ the p CO2: Analyze the v production CO3: Demonstrate enzymes: amylase	various aspec e proficiency i	ts of the fei in the exper	mentatio	on technolo echniques	ogy and app	oly for Ferme	
NOTE i) Que		1 is compulsory and		OURSE SYL		lt will have	seven sub-	parts and stud	lents
ii) Que	estion nos	any four. Each part 5. 2 to 5 are to be set	t from all four	units one fr	om each.	• •		ve three sub-	parts and
Unit	nts need i	to answer any two su	ub-parts of ea	Conte		t carries se	ven marks.		Contact
				Conte	ents				
No.									Hrs.
I		ation of microbial cu provement of indus				n of fermei	ntation me	dia. Isolation	8
II	UNIT -2 Mainte		ition of micro	organisms,	Metaboli	•	ons and ove	erproduction	8
III	UNIT -3 Scope a solid st alcohol	nd opportunities o ate, batch, fed-bat (ethanol, wine, be c acid) and antibiot	f fermentatio tch and cont eer), acids (ci	n technolog inuous cult tric acid ar	gy. Princi ure. Ferr nd glucor	oles of ferr nentative	productior	of vinegar,	7
IV	UNIT -4 Microbi	al production of en	zymes: Amyla	ase and Pro	tease. Bio	oproduct re	ecovery.		

1. Waites M.J. (2008). Industrial Microbiology: An Introduction, 7th Edition, Blackwell Science, London, UK.

2. Prescott S.C., Dunn C.G., Reed G. (1982). Prescott & Dunn's Industrial Microbiology, 4th Edition, AVI Pub. Co., USA.

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6. Pelczar M.J., Chan E.C.S. and Krieg N.R. (2003) Microbiology. 5th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

cours	e No:	Course Name:			Course Code:									
		Environment Impa			I	SBS CH 02	2014 SE 200							
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	•					
2022		Integrated B.Sc						per Week:	02					
Onwa		M.Sc. Chemistry	1/11	2	0	0	2	Total Hrs.:	30					
Total	Evaluatio	n Marks: 50	Examinatior	Duration:		2 Hrs.								
CIE:	15 Mar	ks		-			-	issessment, P	-					
TEE:	35 Marl	<s< td=""><td>proponent,</td><td>Consultant,</td><td>Environi</td><td>mental aud</td><td>it, RISK ass</td><td>essment, Leg</td><td>islation</td></s<>	proponent,	Consultant,	Environi	mental aud	it, RISK ass	essment, Leg	islation					
Cours	е	Environmental ma	anagement, Er	nvironment	al impact	assessme	nt, Project	proponent,						
Objec	tives	Consultant, Enviro	onmental audi	t, Risk asses	ssment, l	egislation								
Cours	e	After completing t	his course, stu	dent is expe	cted to le	arn the foll	owing:							
Outcomes: CO1: Have critical understanding of environm							-							
		CO2: Learn impor		-		-								
		CO3: Interpret the	•	•	l and pro	cedures in	India.							
				OURSE SYLI	ABUS									
NOTE														
need i ii) Que	to answer estion nos	1 is compulsory and any four. Each part 5. 2 to 5 are to be se	carries three a trom all four	and half mar units one fro	rks. om each.	Every ques	tion will ha							
	nts need t	to answer any two s	ub-parts of ea			t carries sev	ven marks.							
Unit				Conte	nts			lents need to answer any two sub-parts of each question. Each part carries seven marks.						
No.			_						Contact					
I			ORIGIN AND DEVELOPMENT											
	•	Purpose and aim, core values and principles, History of EIA development, Environmental												
	Management Plan, Environmental Impact Statement, Scope of EIA in Project planning and													
	Implementation.													
	Implem	ement Plan, Enviror entation.	ues and princi	• •	•	•	•		Hrs. 8					
11	Implem EIA PRC	ement Plan, Enviror entation. ICESS	ues and princi nmental Impa	ct Statemer	nt, Scope	of EIA in Pr	oject plan	ning and	Hrs.					
II	Implem EIA PRC Compo	ement Plan, Enviror entation. ICESS nents of EIA, EIA Me	ues and princi nmental Impa ethodology- So	ct Statemer	oping, Ba	of EIA in Pr	roject plan a, Impact Ic	ning and lentification,	Hrs. 8					
II	Implem EIA PRC Compose Predicti	ement Plan, Enviror entation. ICESS nents of EIA, EIA Me ion, Evaluation and	ues and princi nmental Impa ethodology- So Mitigation, A	ct Statemer creening, Sc Appendices	oping, Ba and For	of EIA in Pr aseline data ms of App	a, Impact Ic	ning and lentification, echniques of	Hrs. 8					
II	Implem EIA PRC Compor Predicti Assessr	ement Plan, Enviror entation. CESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit	ues and princi nmental Impa ethodology- So Mitigation, A Analysis, Mat	ct Statemer creening, Sc Appendices rices, Chec	oping, Ba and For klist, Ove	of EIA in Pr aseline data ms of App erlays, Imp	a, Impact Ic lication, Te pact on En	ning and lentification, echniques of vironmental	Hrs. 8					
II	Implem EIA PRC Compor Predicti Assessr	ement Plan, Enviror entation. ICESS nents of EIA, EIA Me ion, Evaluation and	ues and princi nmental Impa ethodology- So Mitigation, A Analysis, Mat	ct Statemer creening, Sc Appendices rices, Chec	oping, Ba and For klist, Ove	of EIA in Pr aseline data ms of App erlays, Imp	a, Impact Ic lication, Te pact on En	ning and lentification, echniques of vironmental	Hrs. 8					
11	Implem EIA PRC Compor Predicti Assessr compor	ement Plan, Enviror entation. CESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit	ues and princi nmental Impa ethodology- So d Mitigation, A Analysis, Mat eer, land, biolo	ct Statemer creening, Sc Appendices rices, Chec	oping, Ba and For klist, Ove	of EIA in Pr aseline data ms of App erlays, Imp	a, Impact Ic lication, Te pact on En	ning and lentification, echniques of vironmental	Hrs. 8					
	Implem EIA PRO Compor Predicti Assessr compor MAIN P Role of	ement Plan, Environ entation. OCESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit nent: air, noise, wat ARTICIPANTS IN EIA Project proponer	ethodology- So Mitigation, A Analysis, Mat PROCESS	ct Statemer creening, Sc Appendices rices, Chec gical, social	oping, Ba and For klist, Ove and envi	of EIA in Pr aseline data ms of Appl erlays, Imp ronmental	a, Impact Ic lication, Te pact on En factors. El	ning and lentification, echniques of vironmental A Document.	Hrs. 8 8					
	Implem EIA PRC Compor Predicti Assessr compor MAIN P	ement Plan, Environ entation. OCESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit nent: air, noise, wat ARTICIPANTS IN EIA Project proponer	ethodology- So Mitigation, A Analysis, Mat PROCESS	ct Statemer creening, Sc Appendices rices, Chec gical, social	oping, Ba and For klist, Ove and envi	of EIA in Pr aseline data ms of Appl erlays, Imp ronmental	a, Impact Ic lication, Te pact on En factors. El	ning and lentification, echniques of vironmental A Document.	Hrs. 8 8					
111	Implem EIA PRC Compor Predicti Assessr compor MAIN P Role of particip	ement Plan, Environ entation. OCESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit nent: air, noise, wat ARTICIPANTS IN EIA Project proponer ation.	ues and princi nmental Impa ethodology- So Mitigation, A Analysis, Mat er, land, biolo PROCESS It, environme	ct Statemer creening, Sc Appendices rices, Chec gical, social ntal consul	oping, Ba and For klist, Ov and envi tant, PC	of EIA in Pr aseline data ms of Appl erlays, Imp ronmental Bs, PCCs, I	a, Impact Ic lication, Te pact on En factors. El	ning and lentification, echniques of vironmental A Document.	Hrs. 8 8					
	Implem EIA PRO Compor Predicti Assessr compor MAIN P Role of particip	ement Plan, Enviror entation. OCESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit nent: air, noise, wat ARTICIPANTS IN EIA Project proponer ation.	ues and princi nmental Impa- ethodology- So d Mitigation, A Analysis, Mat er, land, biolo PROCESS nt, environme ALAND PROC	ct Statemer creening, Sc Appendices rices, Chec gical, social ental consul	nt, Scope coping, Ba and For klist, Ove and envi tant, PC NDIA AN	of EIA in Pr aseline data ms of Appl erlays, Imp ronmental Bs, PCCs, I D EIA	noject plan a, Impact Ic lication, Te pact on En factors. El/ public and	ning and lentification, echniques of vironmental A Document. IAA. Public	Hrs. 8 8					
111	Implem EIA PRC Compor Predicti Assessr compor MAIN P Role of particip ENVIRO Method	ement Plan, Environ entation. OCESS nents of EIA, EIA Me ion, Evaluation and nent-Cost-benefit nent: air, noise, wat ARTICIPANTS IN EIA Project proponer ation. NMENTAL APPRAIS dology, indicators	ues and princi nmental Impa- ethodology- So d Mitigation, A Analysis, Mat er, land, biolo PROCESS nt, environme AL AND PROC and mitigatic	ct Statemer creening, Sc Appendices rices, Chec gical, social ental consul EDURES IN I	oping, Ba and For klist, Ove and envi tant, PC NDIA AN mental A	of EIA in Pr aseline data ms of Appl erlays, Imp ronmental Bs, PCCs, I D EIA Audit of di	noject plan a, Impact Ic lication, Te bact on En factors. El/ public and	ning and lentification, echniques of vironmental A Document. IAA. Public vironmental	Hrs. 8 8					
111	Implem EIA PRC Compor Predicti Assessr compor MAIN P Role of particip ENVIRO Method	ement Plan, Enviror entation. OCESS nents of EIA, EIA Me on, Evaluation and nent-Cost-benefit nent: air, noise, wat ARTICIPANTS IN EIA Project proponer ation. NMENTAL APPRAIS dology, indicators es, Risk Analysis, S	ues and princi nmental Impa- ethodology- So d Mitigation, A Analysis, Mat er, land, biolo PROCESS nt, environme AL AND PROC and mitigatic	ct Statemer creening, Sc Appendices rices, Chec gical, social ental consul EDURES IN I	oping, Ba and For klist, Ove and envi tant, PC NDIA AN mental A	of EIA in Pr aseline data ms of Appl erlays, Imp ronmental Bs, PCCs, I D EIA Audit of di	noject plan a, Impact Ic lication, Te bact on En factors. El/ public and	ning and lentification, echniques of vironmental A Document. IAA. Public vironmental	Hrs. 8 8					

PRACTICAL

1. Prepare a Matrix of every environmental existing resource of your college or your hostel/mohalla or any defined area and evaluate each component using established methods and make audit analysis

2. Prepare a case report of Environmental impact of any area under development

Suggested Readings:

1. Kulkarni V and Ramachandra TV, (2006). Environmental Management, Capital Pub. Co. New Delhi.

2. Petts, J. (2005) Handbook of Environmental Impact Assessment- Volume 1 and 2. Blackwell Publishers, UK.

3. Glasson, J. Therivel, R. and Chadwick, (2006) A. Introduction to Environmental Impact Assessment. Routledge, London.

4. Canter, W. L. (1995) Environmental Impact Assessment, McGraw-Hill Science/ Engineering/ Math, New York;

Morris, P. and Therivel, R. (1995) Methods of Environmental Impact Assessment, UCL Press, London;
 Petts, J. (1999) (ed) Handbook of Environmental Impact Assessment, volume 1 and 2, Blackwell Science, Oxford;

7. Therivel, R. and Partidario, M. R. (1996) (eds) The Practice of Strategic Environmental Assessment, Earthscan, London;

8. Vanclay, F. and Bronstein, D. A. (1995) (eds) Environmental and Social Impact Assessment, Wiley & Sons, Chichester

Sr. No.	Name of the Course	Course Code	L	Т	Р	Credits
1	Medicinal Chemistry	SBS CH 0201 DSE 3104	3	1	0	4
2	Medicinal Chemistry Practical	SBS CH 0202 DSE 0042	0	0	4	2
3	Electrochemistry	SBS CH 0203 DSE 3104	3	1	0	4
4	Electrochemistry Practical	SBS CH 0204 DSE 0042	0	0	4	2
5	Advanced Material Chemistry	SBS CH 0205 DSE 3104	3	1	0	4
6	Material Chemistry Practical	SBS CH 0206 DSE 0042	0	0	4	2
7	Advanced Analytical Chemistry	SBS CH 0207 DSE 3104	3	1	0	4
8	Analytical Chemistry Practical	SBS CH 0208 DSE 0042	0	0	4	2
9	Organic Spectroscopy	SBS CH 0209 DSE 3104	3	1	0	4
10	Organic Spectroscopy Practical	SBS CH 0210 DSE 0042	0	0	4	2
11	Heterocyclic Chemistry	SBS CH 0211 DSE 3104	3	1	0	4
12	Heterocyclic Chemistry Practical	SBS CH 0212 DSE 0042	0	0	4	2
13	Organometallics and Bioinorganic Chemistry	SBS CH 0213 DSE 3104	3	1	0	4
14	Organometallics and Bioinorganic Chemistry Practical	SBS CH 0214 DSE 0042	0	0	4	2
15	Introduction to Nanochemistry & Applications	SBS CH 0215 DSE 3104	3	1	0	4
16	Nanochemistry Practical	SBS CH 0216 DSE 0042	0	0	4	2

List of Discipline Specific Elective Courses

Course	e No:	Course Name: Medicinal Chemisti	<u>.</u>			Course C	ode: 201 DSE 31	04			
Batch:		Programme:	Semester:	L	т	<u>звз Сп 0.</u> Р	Credits	Contact Hrs			
2022	•	Integrated B.Sc	Semester.	L	· ·	F	creuits	per Week:	04		
Onwai	rds	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60		
		n Marks: 100				0		Total III3	00		
			Examination	n Duration:		3 Hrs.					
CIE:	30 Mar	ks	Pre-requisit	e of cours	e: The b	asics of n	nedicinal	chemistry, b	iophysical		
			• •		-		-	with bond len	•		
TEE:	70 Marl	<s< td=""><td colspan="9">angle and dihydral angle, Concept of stereochemistry in terms of biologica</td></s<>	angle and dihydral angle, Concept of stereochemistry in terms of biologica								
			response w								
Course	-		licinal chemistry, biophysical properties, Understanding of the 3D-structure								
Object	tives	along with bond le	-	-	hydral an	gle, Concep	ot of stered	ochemistry in	terms of		
		biological respons	•								
Course	-	After completing th		•			owing:				
Outco	mes:	C O1: The basics of medicinal chemistry, biophysical properties									
		CO3: Drug metabol									
		-		roperties of	enzymes,	hormones	, vitamins				
		CO5: Concept of ra		d chemical properties of enzymes, hormones, vitamins onal drug design							
		•	-	paration and purification of medicinal compounds							
			C	OURSE SYL	LABUS						
NOTE:	:										
		1 is compulsory and			-	It will have	seven sub-	parts and stu	dents		
		any four. Each part				_					
-		s. 2 to 5 are to be set				• •		ve three sub-	parts and		
Unit	its need i	to answer any two su	ub-parts of ea	Ch question		t carries se	ven marks.		Contact		
No.				Conte	ints				Hrs.		
I	BIO-PH	SICOCHEMICAL PRO	OPERTIES						113.		
•		Basicity, Solubility,		/drophobic	propertie	s. Hydroph	nilic proper	ties, Lipinski	13		
	-	rug-like properties,	-	-				-			
	-	C50, IC50, CC50, ADMI		-				, ,			
II	-	URAL PROPERTIES A			RSTANDI	NG			15		
	Isosteri	sm, Bioisosterism,	Nonclassical	isosteres,	Understa	nding of t	he 3D-stru	cture along			
	with bo	nd length, bond ang	gle and dihyd	ral angle, C	oncept of	Configurat	tion and Co	onformation			
	with ex	amples, Concept o	f stereochem	istry in ter	ms of bio	ological res	ponse wit	h examples,			
	Stereos	elective receptors	or enzymes	such as mi	uscarinic	receptor, S	Stereocher	nically pure			
	drug an	d recemates, Exam	ples such as c	atecholami	ines, etc.						
		olism, Drug metab	olism, Anti-r	metabolite,	Enzyme	inhibitor,	Agonist,	Antagonist,			
	Example										
Ш		NAL CHEMISTRY OF							15		
		re, Chemistry, Mod						•			
	-	such as Anti-infect	-								
	-	Irugs, Adrenergic A	-				cular, local	anesthetic			
	agent, A	Analgesic Agents, Hi	istamine and	Antihistam	ine agent	S					

IV	STEROIDS, PROSTAGLANDINS, ENZYME, HORMONE AND VITAMINS, RATIONAL DRUG DESIGN	15
	Biophysico-chemical properties, Steroid Hormone Receptors, Chemical Contraceptive agents, COX-2 inhibitors, Prostaglandins for Ophthalmic use, pharmaceutically important enzyme products such as Pancreatin, Trypsin, Insulin. Classification of vitamins with examples.	
	Structure activity relationship, Drug-receptor understanding, Molecular modeling, Structure based drug design. QSAR.	
Sugge	sted Readings:	
1.	Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical by Charles Owens V	Vilson,
	John H. Block, Ole Gisvold, John Marlowe Beale	
2.	Foye's Principles of Medicinal Chemistry by David A. Williams, Thomas L. Lemke, William O. Fo	ye
	(2008), Kluwer publication.	
3.	Remington: The Science and Practice of Pharmacy Vol 1, Ed. 19 by Joseph Price Remington, All Gennaro. (1995), MACK Publishing.	fonso R.
4.	Burgers Medicinal Chemistry by Manfred E. Wolff, Alfred Burger	
5.	Burgers Medicinal Chemistry and Drug Discovery by Abraham D. J., Lewis F. L., Burger A., vol.5 Edn., 2003, Hoboken N.J.Wiley,	, 6 th
6.	The Organic Chemistry of Drug Design and Drug Action by Silverman R. B., 2nd Edn., Academic 2012.	Press.
7.	Exploring QSAR: Fundamental and applications in Chemistry and Biology by Hansch C. and Leo American Chemical Society (1995)	<i>),</i> А
8.	Patrick, G. Medicinal Chemistry, Oxford.University Press (2000)	

Course No:	Course Name:				Course C			
	Medicinal Chemist	ry Practical			SBS CH (0202 DSE 00)42	
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs	•
2022	Integrated B.Sc						per Week:	04
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60
Total Evalu	ation Marks: 50	Examinatio	n Duration:	6 Hrs.				
CIE: 15	Marks	-					chemistry, bi	
		• •		-		-	vith bond leng	
TEE: 35	Marks	angle and c response wi			ot of stere	ochemistry	in terms of t	biological
Course	The basics of medi	cinal chemistr	y, biophysic	al propert	ies, Unders	tanding of	the 3D-struct	ure along
Objective	with bond length,	bond angle an	d dihydral d	ingle, Con	cept of ster	eochemisti	ry in terms of L	oiological
	response with exa	mples						
Course	After completing t		•			owing:		
Outcomes:				ohysical pr	operties			
	CO2: Biological act		ers					
	CO3: Drug metabo				h	, ito mino		
	CO4: Biophysical a CO5: Concept of ra	•	•	enzymes,	normones	, vitamins		
	CO6: Synthesis, pro	•	•	of modici	nal compo	unde		
	COO. Synthesis, pr					unus		
			COURSE SYL	LABUS				
NOTE: Two guesti	ons will be set, one from	n each of the l	JNIT. The ca	andidates a	are require	d to attem	ot all the ques	tions.
Unit No.	,		Content		•			Contact
								Hrs.
I	PURIFICATION AND PR	REPARATION						30
	1.Purification Techniqu	ues of Solvents	s by Fractior	hal Distilla	tion and Va	cuum Disti	llation	
	2.Thin Layer Chromato		•			cially availa	ble	
	drugs/Synthesized Cor	•			•			
	3. Preparation of Acid/		-	valuation	of their Phy	ysicochemi	cal	
	Properties. (Benzilic Ad	cid & Sodium I	Benzoate)					
II	SYNTHESIS AND COM	PUTATIONAL	MODELING					30
	Synthesis & Purificatio	n of following	Compound	s using:				
	(i)Precipitation or Recr	ystallization.						
	(ii)Synthesis of Benzim	idazole.						
	(iii)Synthesis of Anthra							
	(iv)Synthesis of Sulpha							
	(v)Synthesis of benzoid							
	(vi)Synthesis of 1,4 – d	ihydropyridin	е.					
	Computational modeli students.	ng of drug des	sign/use of s	softwares	may be der	nonstrated	to	

- 1. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J. D. Barnes, M. J. K Thomas, 6th Edition, Pearson's Education Ltd.
- 2. Advanced Practical Medicinal Chemistry, Ashutosh Kar, New Age International Ltd. (2004).
- 3. Vogel"s Textbook of Practical Organic Chemistry, B. S. Furniss, A. J. Hannaford, P.W.G. Smith, A. R Tatchell, 5th edition (2008), Pearson's Education Ltd.

Cours	e No:	Course Name: Electrochemistry				Course C	ode: 203 DSE 31	04	
Batch 2022	:	Programme: Integrated B.Sc	Semester:	L	Т	P	Credits	Contact Hrs	04
Onwa	rds	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	on Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE: TEE:	30 Mai 70 Mar		Pre-requisit electrochem				-	trochemistry,	idea of
Cours Objec		Basic principle of la understanding of p		•		-		ells and their f	unction,
Cours Outco		After completing th CO1: Basic principle CO2: Understandin CO3: Understandin CO4: Understandin CO5: Designing elec CO6: Use of electro	e of laws of el g about chem g about electi g about poter ctrochemical o	ectrochemis ical cells and rodes, EMF r ntiometric ti- cell.	try. d their fui neasuren trations a	nction nent. nd their ap	plications.		
			C	OURSE SYL	LABUS				
ii) Que stude	estion no	r any four. Each part ps. 2 to 5 are to be set to answer any two su	from all four	units one fr	om each.			ve three sub-	
Unit No.				Conte	nts				Contact Hrs.
I	and the dilution Wien e determ transfe conduc of wat	ius theory of electro eir variation with dilu n. Kohlrausch law of effect, Debye-Falken ninations, transferen erence numbers us ctance measuremen er (iii) solubility anc ons, and (v) hydrolysi	tion for weak independen hagen effect, ce numbers a ing Hittorf t: (i) degree o solubility pr	and strong t migration Walden's r and their rel and Movir of dissociati roduct of sp	electroly of ions. rules. lor ation to ng Boun on of we	vtes. Molar Debye-Hüc ic velocitie ionic mobil dary meth eak electrol	conductivi kel-Onsage s, mobilitie ities, deter nods. App ytes, (ii) ic	ty at infinite er equation, es and their mination of lications of onic product	15
II	Unit-II Quanti based cells, r measu to diff energy	tative aspects of Fa on half-cell potentia eversible and irreve rement, Nernst equa erent kinds of half- r, enthalpy and entro nydrogen, quinone-h	raday's laws ls, application ersible cells v ation; Standa cells. Applica opy of a cell r	of electrol ns of electro with examp rd electrod ation of EN eaction, (ii)	olysis in n les. Elect e (reduct IF measu equilibri	netallurgy a cromotive ion) poten irements in um constan	and industr force of a tial and its n determin nts, and (iii	ry. Chemical cell and its application ning (i) free) pH values,	15

	with and without transference, liquid junction potential; determination of activity coefficients	
	and transference numbers. Qualitative discussion of potentiometric titrations (acid-base,	
	redox, precipitation).	
III	ELECTROANALYTICAL METHODS	15
	Classification of electroanalytical methods, basic principle of pH metric, potentiometric and	
	conductometric titrations. Techniques used for the determination of equivalence points.	
	Techniques used for the determination of pKa values.	
IV	ELECTRICAL & MAGNETIC PROPERTIES OF ATOMS AND MOLECULES	15
	Structure, Chemistry, Mode of action and adverse effect of the representative therapeutic	
	agents such as Anti-infective agent, Antimalarials, Antibacterial, Antiviral, Anticancer, CNS	
	acting drugs, Adrenergic Agents, Cholinergic Drugs, Diuretics, Cardivascular, local anesthetic	
	agent, Analgesic Agents, Histamine and Antihistamine agents	
Sugg	ested Readings:	
1.Atk	kins, P.W & Paula, J.D. Physical Chemistry, 10th Ed., Oxford University Press (2014).	
2.Cas	stellan, G. W. Physical Chemistry 4th Ed., Narosa (2004).	
3.Mc	ortimer, R. G. Physical Chemistry 3rd Ed., Elsevier: NOIDA, UP (2009).	
4.Bar	rrow, G. M., Physical Chemistry 5th Ed., Tata McGraw Hill: New Delhi (2006).	
5.Eng	gel, T. & Reid, P. Physical Chemistry 3rd Ed., Prentice-Hall (2012).	
6.Ro	gers, D. W. Concise Physical Chemistry Wiley (2010).	
7.Silk	bey, R. J.; Alberty, R. A. & Bawendi, M. G. Physical Chemistry 4th Ed., John Wiley & Sons, Inc. (2005	5).

Course No:	Course Name:Course Code:Electrochemistry PracticalSBS CH 0204 DSE 0042							
Batch: 2022	Programme: Integrated B.Sc	Semester:	L	Т	Р	Credit	Contact Hrs per Week:	04
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60
Total Evaluat	tion Marks: 50	Examinatio	n Duration:	6 Hrs.	·			
CIE: 15 M	arks	Pre-requisit				-	trochemistry,	idea of
TEE: 35 M			•		-			
Course Objectives	Basic principle of la understanding of p		-		-		ells and their f	unction,
Course Outcomes:	After completing the CO1: Basic principle CO2: Understandine CO3: Understandine CO4: Understandine CO4: Understandine CO5: Designing ele CO6: Use of electro	e of laws of el g about chem g about elect g about poter ctrochemical	ectrochemi nical cells ar rodes, EMF ntiometric t cell.	stry. nd their fui measuren itrations a	nction nent. nd their ap	plications.		
		(OURSE SYI	LABUS				
NOTE: Two question	ns will be set, one from	each of the l	JNIT. The ca	andidates	are require	d to attemp	ot all the ques	tions.
Unit No.			Conten	ts				Contact Hrs.
	DETERMINATION OF p 1.Determination of pH 2. Determination of cel 3. Determination of eq constant of weak acid.	of a given sol I constant.	ution using	-		and dissoci	ation	30
	 CONDUCTOMETRIC AND POTENTIOMETRIC TITRATION 1. Conductometric titration: strong acid vs. strong base, weak acid vs. strong base. 2. Potentiometric titration: strong acid vs. strong base, weak acid vs. strong base, potassium dichromate vs. mohr's salt. 							30
2. Ahlu 3. Garla New	la, B. D.; Garg, V. C. & (walia, V.K. & Aggarwal and, C. W.; Nibler, J. W York (2003). ern, A. M. & McBane,	, R. Comprehe /. & Shoemak	ensive Pract er, D. P. Ex	ical Organ periments	ic Chemistr in Physica	y, Universi I Chemistry	ties Press. / 8th Ed.; McG	iraw-Hill:

Course	e No:	Course Name:				Course C			
		Advanced Material	s Chemistry		- -	SBS CH 0	205 DSE 31	04	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	i.
2022		Integrated B.Sc						per Week:	04
Onwa		M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examinatio	n Duration:		3 Hrs.			
CIE:	30 Mar	ks	Pre-requisit	e of course:	Idea of s	ingle crysta	ls and X-ra	y diffraction,	synthesis
TEE:	70 Mar	ks	of nanoma microscopie		their	characteriz	ation, kno	owledge of	different
Course	е	Introduction of Gro	-	•					
Objec	tives	spacing formula,	•				•		
		Nanomaterials Cha and EDX) of nanom							I, HRTEM
Course	•	After completing th						iners.	
Outco		CO1: Advanced ide		•			owing.		
		CO2: Structure solu	tion by X-ray	diffraction					
		CO3: Synthesis and	characterizat	ion of nano	materials				
		CO4: Use of nanom	aterials in ma	agnetism					
		CO5: Knowledge of			S				
		CO6: Idea of biodeg	gradable poly	mers					
			C	OURSE SYL	LABUS				
NOTE	:								
		1 is compulsory and			-	It will have	seven sub-	parts and stud	dents
		r any four. Each part				_			
-		s. 2 to 5 are to be set						ve three sub-	parts and
	nts need '	to answer any two su	ib-parts of ea			t carries se	ven marks.		Contost
Unit No.				Conte	ents				Contact Hrs.
1	CRYSTA	L STRUCTURE OF SO	LIDS						15
	Fundan	nental of lattices, ur	it cell, atomi	c coordinat	es, Brava	is lattices,	crystal dire	ction and	_
		types of close pack			•		•		
	structu								
	Synthe	sis of Inorganic solid	s; solid state	, solution pl	nase and	vapor phas	se synthesi	s;	
	precipit	ation, hydrotherma	l, sol-gel, sur	factant-bas	ed synthe	esis. Growt	h of single	crystals.	
	Crystal	structure determina	ation by X-ray	y diffraction	, d-spaci	ng formula	, symmetri	cally absent	
	-	ons, Multiplicities, S			-	-	-	-	
		diffraction. Electro	-				-	•	
		copy techniques.							
II	NANON	ATERIAL FUNDAME	NTALS						15
	Synthe	sis: Bottom-up vs. To	op-down Met	thods. Solut	ion phas	e synthetic	methods.	Role of	
	surfact	ant in shape and size	e control of n	anomateria	ls. Synth	esis of nan	owires and	nanotubes	
		and MOCVD metho			•				
		aterials Characteriz		nanomater	ials, Elec	tron micros	scopy (SEN	1 <i>,</i> TEM,	
		and EDX) of nanom						-	
	Nanom					propertie	es of na	noparticles;	
	•	• •	••		-	• •			•

	superparamagnetism, ferromagnetism in antiferromagnetic nanoparticles and single domain	
	to multidomain transition. magnetic nanoparticles as MRI contrast agents.	
	POLYMER SCIENCE AND TECHNOLOGY	15
	Conducting polymers: basic principles of conducting polymers, delocalized electronic states	
	of conjugated polymers, polyanilines, polyacetylenes, polythiophene, applications of	
	conducting polymers.	
	Rubber: Compounding and elastomeric properties, vulcanization, reinforcement.	
IV	BIODEGRADABLE POLYMERS	15
	Biodegradable polymers: Definition classification of natural biodegradable polymers,	
	cellulose, cellulose acetate, cellophane, soy protein, corn, zein protein, wheat gluten protein,	
	synthetic biodegradable polymers, polyhydroxy alkanoates, polycarpolactone, poly(vinyl	
	alcohol), polyacetic acid, application of biodegradable and biomedical polymers, contact lens,	
	dental polymers, artificial heart, kidney, skin, and blood cells.	
	Fibers: natural fibers, cotton, wool, silk, rayon, artificial fibers, polyamides, acrylic acid, PVC,	
	PVA.	
Sugg	ested Readings:	
1. Zh	en Guo and Li Tan, Fundamentals and Applications of Nanomaterials.2009, Artech House, Londor	1
Publi	ication.	
2. Ph	ysical methods for chemistry: R. S. Drago, 1992, Saunders college publication.	
3. Po	lymer science, V. R. Gowariker, N. V.Viswanathan, J. Sreedhar, New Age International (P) Ltd., 201	15.
4. P.	J. Flory, Principle of polymer chemistry, Cornell University Press.	
5. Po	lymer Science and technology, Plastics, Rubber and composites, P. Ghosh, Tata McGraw Hill.	
	Gowriker, N. V. Viswanathan, J. Sreedhar, Polymer Science, New Age Int. Publication, 2019.	

Course No:	Course Name:	Course Code:								
	Materials Chemistr	Materials Chemistry Practical					SBS CH 0206 DSE 0042			
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact H	rs.		
2022	Integrated B.Sc						per Week:	04		
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60		
Total Evalu	ation Marks: 50	Examinatio	n Duration:	6 Hrs.						
CIE: 15	Marks	Pre-requisit	e of course	: Idea of s	ingle crysta	ls and X-ra	y diffraction	, synthesis		
		of nanoma	aterials and	d their	characteriz	ation, kno	wledge of	different		
TEE: 35	Marks	microscopie	es.				-			
Course Introduction of Gro		owth of single	e crystals, C	rystal stru	icture dete	rmination	by X-ray diff	raction, d-		
Objectives	spacing formula,	Synthesis of	f nanowire	s and na	anotubes	by CVD a	nd MOCVD	method,		
	Nanomaterials Cha	racterization	: XRD of na	nomateria	ls, Electror	n microscoj	oy (SEM, TEI	√I, HRTEM		
	and EDX) of nanom						mers.			
Course	After completing the		-	ected to le	arn the foll	owing:				
Outcomes:	CO1: Advanced ide	CO1: Advanced idea of X-ray diffraction								
	CO2: Structure solu	CO2: Structure solution by X-ray diffraction								
	CO3: Synthesis and	l characterizat	tion of nano	materials						
	CO4: Use of nanom	naterials in ma	agnetism							
	CO5: Knowledge of	CO5: Knowledge of various types of polymers								
	CO6: Idea of biode	CO6: Idea of biodegradable polymers								
		(COURSE SYL	LABUS						
NOTE:						_				
	ons will be set, one from	each of the l			are require	d to attemp	ot all the que			
Unit No.			Content	LS				Contact Hrs.		
1	PREPARATION OF NAM	IOMATERIALS		MERS				30		
-	1. Preparation of gold									
		Interfacial polymerization, preparation of polyester from isophthaloyl chloride								
	(IPC) and phenolphtha		· · · · .	,						
11	X-RAY DIFFRACTION A	ND CHARACT	ERIZATION	OF NANO	MATERIALS	5		30		
	1. Analysis of XRD pat	tern of few se	elected crys	tals like N	aNO₃, CaCl	2, etc.; Ind	exing of a			
	given powder diffraction	on pattern of a	a cubic cryst	alline syst	em.					
	2. Interpretation of FTI			-						
	3. Estimation of particl	e size from th	e BET, SEM	technique	S.					
Suggested	-									
	nlman, B.D. Materials Ch		-							
	I. Flory, Principle of poly						.			
	ymer Science and techn			•						
4. V. (Gowriker, N. V. Viswanat	nan, J. Sreedl	har, Polyme	r Science,	ivew Age Ir	it.Publicatio	on, 2019.			

Course	e No:	Course Name:					Course Code:				
		Advanced Analytic	SBS CH 0207 DSE 3104								
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.		
2022		Integrated B.Sc						per Week:	04		
Onwa	rds	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60		
Total I	Evaluatio	on Marks: 100	Examinatio	n Duration:		3 Hrs.					
CIE:	30 Mar	ks									
CIL.	30 10101		-			-	-	emistry, idea	of errors		
TEE:	70 Mar	ks	and deviation	on, knowle	dge of cha	aracterizat	ion of mate	erials.			
Course			neory of erro	r and trea	tment of	quantitati	ve data, ac	curacy and p	orecision		
Object	tives	Introduction of Theory of error and treatment of quantitative data, accuracy and pre- qualitative and quantitative applications, instruments and applications of theromogravi									
,		analysis, Principles of chromatography.									
Course	е	After completing t	-		ected to le	earn the fol	lowing:				
Outco	mes:	CO1: Statistical me					U				
		CO2: Polarography									
		CO3: Atomic spect									
		CO4: Thermal analysis									
		CO5: Chromatography									
		CO6: Analysis of fuel and drugs									
		COU. Analysis of tu	ei anu ui ugs								
			C	OURSE SYL	LABUS						
NOTE:	:		C	OURSE SYL	LABUS						
		1 is compulsory and				It will have	seven sub-	parts and stud	dents		
i) Que	stion no.	1 is compulsory and r any four. Each part	to be set from	n the entire	syllabus.	It will have	seven sub-	parts and stud	dents		
i) Que need t	stion no. to answe		to be set from carries three	n the entire and half ma	syllabus. Irks.			-			
i) Que need t ii) Que	stion no. to answe estion no	r any four. Each part	to be set fron carries three t from all four	n the entire and half ma units one fi	syllabus. Irks. rom each.	Every ques	stion will ha	-			
i) Que need t ii) Que	stion no. to answe estion no	r any four. Each part s. 2 to 5 are to be se	to be set fron carries three t from all four	n the entire and half ma units one fi	syllabus. Irks. Tom each. I. Each par	Every ques	stion will ha	-	parts and		
i) Que need t ii) Que studer	stion no. to answe estion no	r any four. Each part s. 2 to 5 are to be se	to be set fron carries three t from all four	n the entire and half ma units one fi ch question	syllabus. Irks. Tom each. I. Each par	Every ques	stion will ha	-	parts and		
i) Que need t ii) Que studer Unit	stion no. to answe estion no nts need	r any four. Each part s. 2 to 5 are to be se	to be set from carries three t from all four ub-parts of ea	n the entire and half ma units one fi ch question Cont e	syllabus. Irks. Tom each. I. Each par	Every ques	stion will ha	-	parts and		
i) Que need t ii) Que studer Unit No.	estion no. to answe estion no nts need STATIS	r any four. Each part s. 2 to 5 are to be se to answer any two s	to be set from carries three t from all four ub-parts of ea	n the entire and half ma units one fi ch question Conte ALYSIS	syllabus. Irks. rom each. I. Each par ents	Every ques t carries se	stion will ha	ve three sub-	parts and Contac Hrs.		
i) Que need t ii) Que studer Unit No.	stion no. to answe estion no nts need STATIS Theory	r any four. Each part s. 2 to 5 are to be se to answer any two s FICAL METHODS IN (to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit	n the entire and half ma units one fi ch question Conte ALYSIS cative data,	syllabus. rks. com each. . Each par ents accuracy	Every ques t carries se and precis	stion will ha even marks. ion, ways o	ve three sub-	parts and Contac Hrs.		
i) Que need t ii) Que studer Unit No.	stion no. to answe estion no nts need STATIS Theory accurat	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN G of error and treatm	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit	n the entire and half ma units one fi ch question Conte ALYSIS tative data, curve and	syllabus. om each. . Each par ents accuracy its equat	Every ques t carries se and precis tion. Usefu	ion will ha wen marks. ion, ways o il statistica	f expressing tests with	parts and Contac Hrs.		
i) Que need t ii) Que studer Unit No.	stion no. to answe estion no nts need STATIS Theory accurac equatic	r any four. Each part s. 2 to 5 are to be se to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit lormal error nce, the F-te	n the entire and half ma units one fi <u>ch question</u> Conto ALYSIS cative data, curve and st, the stu	syllabus. irks. rom each. <u>Each par</u> ents accuracy its equat dents t-te	Every ques <u>t carries se</u> and precis tion. Usefu	ion will ha even marks. ion, ways o il statistica ni-test, the	ove three sub- of expressing l tests with correlation	parts and Contac Hrs.		
i) Que need t ii) Que studer Unit No.	stion no. to answe estion no nts need STATIS Theory accurac equatic coeffici	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit lormal error nce, the F-te it of the mea	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and st, the stu n, comparis	syllabus. rks. om each. <u>Each par</u> ents accuracy its equat dents t-to son of two	Every quest t carries se and precist tion. Usefu est, the Cl o standard	ion, ways o stion, ways o statistica ni-test, the values, col	ove three sub- of expressing l tests with correlation mparison of	parts and Contac Hrs.		
i) Que need t ii) Que studer Unit No.	stion no. to answe estion no nts need STATIS Theory accurac equatic coeffici two sta	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN (of error and treatm cy and precision, N on, test of significa ent, confidence lim	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit lormal error nce, the F-te it of the mea parison of sta	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and est, the stu n, comparis andard devi	syllabus. rom each. <u>Each par</u> ents accuracy its equat dents t-te son of two ation wit	Every ques t carries se and precis tion. Usefu est, the Cl o standard h average	ion, ways o stion, ways o statistica ni-test, the values, col	ove three sub- of expressing l tests with correlation mparison of	parts and Contact Hrs.		
i) Que need t ii) Que studer Unit No.	stion no. to answe estion no nts need STATIS Theory accurac equatic coeffici two sta of mea	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantia lormal error nce, the F-te it of the mea parison of star regression an	n the entire and half ma units one fi ch question Conto ALYSIS cative data, curve and st, the stu n, comparis andard devi alysis (least	syllabus. rom each. <u>Each par</u> ents accuracy its equat dents t-te son of two ation wit	Every ques t carries se and precis tion. Usefu est, the Cl o standard h average	ion, ways o stion, ways o statistica ni-test, the values, col	ove three sub- of expressing l tests with correlation mparison of	parts and Contac Hrs.		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurac equatic coeffici two sta of mea POLARC	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, r	to be set from carries three t from all four <u>ub-parts of ea</u> CHEMICAL AN ent of quantit lormal error nce, the F-te it of the mea parison of star regression an	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and st, the stu n, comparis indard devi alysis (least SCOPY	syllabus. rks. om each. <u>Each par</u> ents accuracy its equat dents t-to fon of two fation wit square n	Every quest t carries se and precist tion. Usefu est, the Cl o standard h average nethod).	ion, ways o lon, ways o l statistica ni-test, the values, con deviation,	ove three sub- of expressing l tests with correlation mparison of comparison	parts and Contac Hrs. 15		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurac equatio coeffici two sta of mea POLARC Curren	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, I OGRAPHY AND ATO	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantif lormal error nce, the F-te it of the mea parison of sta regression an MIC SPECTRO ip, theory of p	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and st, the stu n, comparis indard devi alysis (least SCOPY	syllabus. rks. om each. <u>Each par</u> ents accuracy its equat dents t-to fon of two fation wit square n	Every quest t carries se and precist tion. Usefu est, the Cl o standard h average nethod).	ion, ways o lon, ways o l statistica ni-test, the values, con deviation,	ove three sub- of expressing l tests with correlation mparison of comparison	parts and Contact Hrs. 15		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurate equatic coeffici two sta of mea POLARC Curren and qu	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, to DGRAPHY AND ATO t-voltage relationsh	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit lormal error nce, the F-te it of the mea parison of sta regression an MIC SPECTRO ip, theory of pons.	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and st, the stu n, comparis indard devi alysis (least SCOPY polarograph	syllabus. rks. om each. <u>Each par</u> ents accuracy its equat dents t-te son of two ation wit square n nic waves	Every quest t carries se and precist tion. Usefu est, the Cl o standard h average nethod).	ion, ways o lion, ways o ll statistica ni-test, the values, con deviation, ntation, qu	ove three sub- of expressing l tests with correlation mparison of comparison	parts and Contac Hrs. 15		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurate equatic coeffici two sta of mea POLARC Curren and qu Atomic	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN (of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, to DGRAPHY AND ATO t-voltage relationsh antitative applicatio	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantif lormal error nce, the F-te it of the mea parison of star regression an MIC SPECTRO ip, theory of pons. scopy, theory	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and st, the stu n, comparis indard devi alysis (least SCOPY polarograph v and applic	syllabus. rks. om each. <u>Each par</u> ents accuracy its equat dents t-te son of two ation wit square n nic waves	Every quest t carries se and precist tion. Usefu est, the Cl o standard h average nethod).	ion, ways o lion, ways o ll statistica ni-test, the values, con deviation, ntation, qu	ove three sub- of expressing l tests with correlation mparison of comparison	parts and Contac Hrs. 15		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurac equatic coeffici two sta of mea POLARC Curren and qu Atomic THERM	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN (of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, com DGRAPHY AND ATO t-voltage relationsh antitative application absorption spectro	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantit lormal error nce, the F-te it of the mea parison of sta regression an MIC SPECTRO ip, theory of pons. scopy, theory HROMATOGR	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and ast, the stu n, comparis andard devi alysis (least SCOPY polarograph cand applic APHY	syllabus. irks. com each. . Each par ents accuracy its equat dents t-te son of two fation wit square n nic waves	Every ques t carries se and precis tion. Usefu est, the Cl o standard h average nethod). , instrume th some ex	ion, ways o ion, ways o il statistica ni-test, the values, con deviation, ntation, qu	ove three sub- of expressing l tests with correlation mparison of comparison alitative	Contact Hrs. 15		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurate equatic coeffici two sta of mea POLARC Curren and qu Atomic THERM Theory	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, to DGRAPHY AND ATO t-voltage relationsh antitative application absorption spectro AL ANALYSIS AND C	to be set from carries three t from all four <u>ub-parts of ea</u> CHEMICAL AN ent of quantit lormal error nce, the F-te it of the mea parison of star regression an MIC SPECTRO ip, theory of pons. scopy, theory HROMATOGR	n the entire and half ma units one fi ch question Conte ALYSIS cative data, curve and st, the stu n, comparis indard devi alysis (least SCOPY polarograph v and applic APHY and applic	syllabus. rks. om each. <u>Each par</u> ents accuracy its equat dents t-to son of two fation wit square n hic waves ation (wir ations o	Every ques t carries se and precis tion. Usefu est, the Cl o standard h average nethod). , instrume th some ex	ion, ways o ion, ways o il statistica ni-test, the values, con deviation, ntation, qu	ove three sub- of expressing l tests with correlation mparison of comparison alitative	Contact Hrs. 15		
i) Que need t ii) Que studer Unit No. I	stion no. to answe estion no nts need STATIS Theory accurate equatio coeffici two sta of mea POLARC Curren and qu Atomic THERM Theory (TGA/D	r any four. Each part s. 2 to 5 are to be set to answer any two s FICAL METHODS IN C of error and treatm cy and precision, N on, test of significa ent, confidence lim andard values, com n with true values, r OGRAPHY AND ATO t-voltage relationsh antitative applicatio absorption spectro AL ANALYSIS AND C , methodology, ir	to be set from carries three t from all four ub-parts of ea CHEMICAL AN ent of quantial lormal error nce, the F-te it of the mea parison of star regression an MIC SPECTRO ip, theory of pons. scopy, theory HROMATOGR astruments and al scanning ca	n the entire and half ma units one fi ch question Conte ALYSIS tative data, curve and est, the stu n, comparis andard devi alysis (least SCOPY polarograph r and applic APHY and applic lorimetry (I	syllabus. rom each. <u>Each par</u> ents accuracy its equat dents t-to son of two fation with square n hic waves ration (wire ations of DSC).	Every ques t carries se and precis tion. Usefu est, the Cl o standard h average nethod). , instrume th some ex f theromo	ion, ways o ion, ways o il statistica ni-test, the values, con deviation, ntation, qu camples).	ove three sub- of expressing l tests with correlation mparison of comparison alitative	Contact Hrs. 15		
IV	ANALYSIS OF FUEL AND DRUGS	15									
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	Fuel analysis: Solid, liquid and gaseous fuels, ultimate and proximate analysis of solid fuel,										
	Determination of calorific value of solid, liquid and gaseous fuels, Flash point and fire point.										
	Drug analysis: Classification of drugs, Analysis of some standard drug using various										
	chromatographic techniques.										
Sugge	ested Readings:										
1.	Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.										
2.	Willard, H.H. et al.: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Californ	ia, USA,									
	1988.										
3.	Christian, G.D, Analytical Chemistry, 6th Ed. John Wiley & Sons, New York, 2004.										
4.	Harris, D.C.: Exploring Chemical Analysis, 9th Ed. New York, W.H. Freeman, 2016.										
5.	Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis										
6.	Mikes, O. Laboratory Hand Book of Chromatographic & Allied Methods, Elles Harwood										
7.	John Wiley 1979.										
8.	Ditts, R.V. Analytical Chemistry; Methods of separation, van Nostrand, 1974.										
9.	Khopkar, S. M., Basic Concepts of Analytical Chemistry, New Age (Second edition) 1998										

Course No:					Course C			
	Analytical Chemist	r – – – – – – – – – – – – – – – – – – –				208 DSE 00	-	
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact H	
2022	Integrated B.Sc						per Week:	
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60
Total Evalu	ation Marks: 50	Examination	Duration	6 Hrs.				
CIE: 15 M	Marks	Pre-requisite	a of course	. Knowled	ge of analy	tical chami	stry idea of	errors and
TEE: 35 M	Marks	deviation, kr					stiy, luea ol	
Course	Introduction of Th	heory of erro	r and trea	tment of	quantitativ	ve data, ad	curacy and	precision,
Objectives	qualitative and qu	•			•		•	•
	analysis, Principles						C C	
Course	After completing th	nis course, stu	dent is exp	ected to le	arn the foll	lowing:		
Outcomes:	CO1: Statistical me	thods in chem	ical analys	is		-		
	CO2: Polarography							
	CO3: Atomic spect	roscopy						
	CO4: Thermal analy							
	CO5: Chromatogra	•						
	CO6: Analysis of fu							
		C	OURSE SY	LABUS				
NOTE:								
	ons will be set, one from	each of the U			are require	d to attemp	ot all the que	
Unit No.			Conten	ts				Contact Hrs.
I	CHROMATOGRAPHY							30
	1. Study the effect on	pH of additio	on of HCI/I	VaOH to s	olutions of	acetic acid	d, sodium	
	acetate and their mix	•				• •	i. Sodium	
	acetate-acetic acid, ii.				•			
	2. Principles involve	d in chroma	atographic	separati	ons. Pape	r chromat	tographic	
	separation of							
	following metal ions:							
	i. Ni (II) and Co (II)							
	ii. Fe (III) and Al (III)				.	CI .		
		naration of t	ne active i	ngredient	s of plants	. flowers a	ind juices	
	3.Chromatographic se			Biediene	•	,		
	by TLC.					,		
	by TLC.					,		30
11	by TLC.						nly)	30
11	by TLC. CHARACTRIZATIONS 1. IR/DSC analysis of k	nown polyme	er sample (for studer	nts' demon	stration or		30
11	by TLC. CHARACTRIZATIONS 1. IR/DSC analysis of k 2. Determination of v	nown polyme iscosity index	er sample (, cloud po	for studer	nts' demon	stration or en fuel san	nple.	30
11	by TLC. CHARACTRIZATIONS 1. IR/DSC analysis of k	nown polyme iscosity index	er sample (, cloud po	for studer	nts' demon	stration or en fuel san	nple.	30
11	by TLC. CHARACTRIZATIONS 1. IR/DSC analysis of k 2. Determination of v 3. Determination of	nown polyme iscosity index calorific value	er sample (, cloud po e of giver	for studer int, pour p n fuel sam	nts' demon	stration or en fuel san	nple.	30

Suggested Readings:

- 1. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis 6th Ed., Pearson, 2009.
- 2. Jain, P.C. & Jain, M. Engineering Chemistry Dhanpat Rai & Sons, Delhi.
- 3. Khopkar, S.M. Basic Concepts of Analytical Chemistry. New Age International Publisher, 2009
- 4. Skoog, D.A. Holler F.J. and Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Edition.

Į.	e No:	Course Name:				Course C	ode:		
		Organic Spectrosco	ру			SBS CH 0	209 DSE 310	04	
Batch:	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	.
2022		Integrated B.Sc						per Week:	04
Onwar	rds	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60
Total I	Evaluatio	n Marks: 100				<u> </u>			
			Examinatio	n Duration:		3 Hrs.			
CIE:	30 Mar	ks	Pre-requisit	e of course:	Knowledg	ge of radiati	on and its ir	nteraction wit	h matter,
			idea of ele	ectronic leve	els in at	oms and	molecules,	theory of r	nolecular
TEE:	70 Marl	<s< th=""><th>spectroscop</th><th>у.</th><th></th><th></th><th></th><th></th><th></th></s<>	spectroscop	у.					
Course	2	Application of visib	le, ultraviolet	and infrare	d spectro	scopy in or	ganic mole	cules, Identifi	ication of
Object	tives	Functional groups	of various of	classes of o	rganic c	ompounds,	Applicatio	n of Chemic	al Shifts,
		Application of frag							
Course	e	After completing th		-	cted to le	arn the foll	owing:		
Outco	mes:	CO1: Basic Principle	es of UV Spect	troscopy					
		CO2: Basic principl	·	troscopy					
		CO3: NMR (¹ H and	¹³ C NMR)						
		CO4: Basic principle	es Mass Spect	rometry					
		CO5: Use of spectro	oscopy in chai	acterizing m	olecules				
		CO6: Study of unkn	own compou	nds					
		· · ·	C	OURSE SYLI	LABUS				
NOTE:									
		A ¹ · · · · · · · · · · · · · · · · · · ·							
		1 is compulsory and	to be set fror	n the entire	syllabus.	lt will have	seven sub-	parts and stud	dents
need t		any four. Each part			•	lt will have	seven sub-	parts and stud	dents
	o answer		carries three	and half mai	rks.				
ii) Que	o answer	any four. Each part	carries three from all four	and half mai units one fro	rks. om each.	Every ques	tion will ha		
ii) Que	o answer	any four. Each part 5. 2 to 5 are to be set	carries three from all four	and half mai units one fro	rks. om each. Each par	Every ques	tion will ha		
ii) Que studer	o answer	any four. Each part 5. 2 to 5 are to be set	carries three from all four	and half mai units one fro ch question.	rks. om each. Each par	Every ques	tion will ha		parts and
ii) Que studer Unit	to answer estion nos nts need to BASIC P	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP	carries three from all four ib-parts of ea ECTROSCOPY	and half man units one fro ch question. Conte	rks. om each. Each par nts	Every ques t carries se	tion will ha ven marks.	ve three sub-	parts and Contact
ii) Que studer Unit No.	to answer estion nos nts need t BASIC P Applica	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward-	carries three from all four ib-parts of ea b-parts of ea ECTROSCOPY Fiser rule in	and half man units one fro ch question. Conte interpretati	rks. om each. <u>Each par</u> nts on of Org	Every ques t carries se ganic comp	tion will ha ven marks. pounds: Ap	ve three sub-	parts and Contact Hrs.
ii) Que studer Unit No.	estion nos nts need t BASIC P Applica visible,	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra	carries three from all four ib-parts of ea ECTROSCOPY Fiser rule in ired spectros	and half man units one fro <u>ch question.</u> Conte interpretati copy in orga	rks. om each. <u>Each par</u> nts on of Organic mole	Every ques t carries se ganic comp cules. Elec	tion will ha ven marks. pounds: Ap tromagnet	ve three sub- pplication of ic radiation,	parts and Contact Hrs.
ii) Que studer Unit No.	BASIC P Applica visible, electror	r any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra nic transitions, λn	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in red spectros nax & emai	and half man units one fro ch question. Conte interpretati copy in orga x, chromop	rks. om each. Each par nts on of Org anic mole ohore, a	Every ques <u>t carries se</u> ganic comp cules. Elec uxochrome	tion will ha ven marks. bounds: Ap tromagnet e, bathoch	ve three sub- oplication of ic radiation, nromic and	parts and Contact Hrs.
ii) Que studer Unit No.	BASIC P Applica visible, electroi	r any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra nic transitions, λ n nromic shifts. App	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ured spectros nax & εma: lication of	and half man units one fro ch question. Conte interpretati copy in orga k, chromop electronic s	rks. om each. Each par nts on of Organic mole phore, a spectroso	Every ques t carries se ganic comp cules. Elec uxochrome copy and	tion will ha ven marks. bounds: Ap tromagnet e, bathoch Woodward	ve three sub- oplication of ic radiation, nromic and	parts and Contact Hrs.
ii) Que studer Unit No.	BASIC P Applica visible, electron hypsocl	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra nic transitions, λn nromic shifts. App ting λmax of conjuga	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ared spectros hax & emai lication of ated dienes a	and half man units one fro ch question. Conte interpretati copy in orga k, chromop electronic s	rks. om each. Each par nts on of Organic mole phore, a spectroso	Every ques t carries se ganic comp cules. Elec uxochrome copy and	tion will ha ven marks. bounds: Ap tromagnet e, bathoch Woodward	ve three sub- oplication of ic radiation, nromic and	parts and Contact Hrs.
ii) Que studer Unit No.	BASIC P Applica visible, electron hypsocl calculat	r any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE	ECTROSCOPY Fiser rule in red spectros hax & Email lication of ated dienes a CTROSCOPY	and half man units one fro ch question. Conte interpretati copy in orga x, chromop electronic s nd α,β – un	rks. om each. Each par nts on of Organic mole phore, a spectroso saturated	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun	tion will ha ven marks. bounds: Ap tromagnet e, bathoch Woodward ds.	ve three sub- oplication of ic radiation, promic and d rules for	parts and Contact Hrs.
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsocl calculat BASIC P Identifie	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ired spectros hax & emai lication of ated dienes a CTROSCOPY groups of va	and half man units one fro ch question. Conte interpretati copy in orga x, chromop electronic s nd α,β – un rious classes	rks. om each. Each par nts on of Organic mole phore, a spectroso saturated	Every ques t carries se ganic comp cules. Elec uxochrome copy and t compoun	tion will ha ven marks. bounds: Ap tromagnet e, bathoch Woodward ds. nds: Infrard	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation	parts and Contact Hrs. 15
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsocl calculat BASIC P Identific and typ	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional pes of molecular vi	ECTROSCOPY Fiser rule in ared spectros ax & email lication of ated dienes a CTROSCOPY groups of va brations, fur	and half man units one fro ch question. Conte interpretati copy in orga x, chromop electronic s nd α, β – un rious classes nctional gro	rks. om each. Each par nts on of Org anic mole bhore, a spectroso saturated s of orgar up and f	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun fingerprint	tion will ha ven marks. bounds: Ap tromagnet e, bathoch Woodward ds. nds: Infrare region. IR	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation & spectra of	parts and Contact Hrs. 15
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsocl calculat BASIC P Identific and typ alkanes	r any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional bes of molecular vi , alkenes and simple	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ired spectros hax & ema: lication of ated dienes a CTROSCOPY groups of va brations, fur e alcohols (int	and half man units one fro ch question. Conte interpretati copy in orga k, chromop electronic s nd α,β – un rious classes nctional gro ter and intra	rks. om each. Each par nts on of Or anic mole ohore, a spectroso saturated sof organ up and f amolecula	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun ic compoun ingerprint ar hydroge	tion will ha ven marks. bounds: Ap tromagneti e, bathoch Woodward ds. nds: Infrard region. IR n bonding)	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation spectra of , aldehydes,	parts and Contact Hrs. 15
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsocl calculat BASIC P Identific and typ alkanes ketones	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional bes of molecular vi , alkenes and simple s, carboxylic acids	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ired spectros hax & ema: lication of ated dienes a CTROSCOPY groups of va brations, fur e alcohols (int	and half man units one fro ch question. Conte interpretati copy in orga k, chromop electronic s nd α,β – un rious classes nctional gro ter and intra	rks. om each. Each par nts on of Or anic mole ohore, a spectroso saturated sof organ up and f amolecula	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun ic compoun ingerprint ar hydroge	tion will ha ven marks. bounds: Ap tromagneti e, bathoch Woodward ds. nds: Infrard region. IR n bonding)	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation spectra of , aldehydes,	parts and Contact Hrs. 15
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsoch calculat BASIC P Identific and typ alkanes ketones absorpt	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional bes of molecular vi , alkenes and simple s, carboxylic acids tions).	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ired spectros hax & ema: lication of ated dienes a CTROSCOPY groups of va brations, fur e alcohols (int	and half man units one fro ch question. Conte interpretati copy in orga k, chromop electronic s nd α,β – un rious classes nctional gro ter and intra	rks. om each. Each par nts on of Or anic mole ohore, a spectroso saturated sof organ up and f amolecula	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun ic compoun ingerprint ar hydroge	tion will ha ven marks. bounds: Ap tromagneti e, bathoch Woodward ds. nds: Infrard region. IR n bonding)	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation spectra of , aldehydes,	Contact Hrs. 15
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsoch calculat BASIC P Identific and typ alkanes ketones absorpt	any four. Each part any four. Each part any four. Each part and any two support RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n promic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional bes of molecular vi , alkenes and simple s, carboxylic acids tions). H AND ¹³C NMR	carries three from all four ub-parts of ea ECTROSCOPY Fiser rule in ired spectros hax & email ication of ated dienes a CTROSCOPY groups of va brations, fur e alcohols (int and their de	and half man units one fro ch question. Conte interpretati copy in orga x, chromop electronic so nd α,β – un rious classes nctional gro ter and intra rivatives (e	rks. om each. Each par nts on of Organic mole ohore, a spectroso saturated sof organ up and f amolecula ffect of	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun ic compou ic compou ingerprint ar hydroge substitutio	tion will ha ven marks. bounds: Ap tromagneti e, bathoch Woodward ds. nds: Infrard region. IR n bonding) n on >C=C	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation spectra of , aldehydes, D stretching	parts and Contact Hrs. 15
ii) Que studer Unit No. I	BASIC P Applica visible, electron hypsoch calculat BASIC P Identific and typ alkanes ketones absorpt NMIR (¹ I Applica	any four. Each part s. 2 to 5 are to be set to answer any two su RINCIPLES OF UV SP tion of Woodward- ultraviolet and infra- nic transitions, λ n nromic shifts. App ting λ max of conjuga RINCIPLES OF IR SPE cation of Functional bes of molecular vi , alkenes and simple s, carboxylic acids tions).	carries three from all four ib-parts of ea ECTROSCOPY Fiser rule in ired spectros hax & emai lication of ated dienes a CTROSCOPY groups of va brations, fur e alcohols (int and their de	and half man units one fro ch question. Conte interpretati copy in orga x, chromop electronic s nd α,β – un rious classes nctional gro ter and intra rivatives (e	rks. om each. Each par nts on of Organic mole ohore, a spectroso saturated sof organ up and f amolecula ffect of	Every ques t carries se ganic comp cules. Elec uxochrome copy and d compoun ic compou ic compou ingerprint ar hydroge substitutio	tion will ha ven marks. bounds: Ap tromagneti e, bathoch Woodward ds. nds: Infrard region. IR n bonding) n on >C=C	ve three sub- oplication of ic radiation, nromic and d rules for ed radiation spectra of , aldehydes, D stretching	Contact Hrs. 15

IV	BASIC PRINCIPLES MASS SPECTROMETRY	15
	Application of fragmentation rule in characterization of organic compounds. Problems on	
	structure elucidation of organic compounds based on spectral data.	
Sugge	sted Readings:	
00		
1.	R.M. Silverstein, G.C. Bassler & T.C. Morrill: Spectroscopic Identification of Organic Compounds, Jo	hn Wiley
	& Sons.	

2. John R. Dyer, Applications of absorption spectroscopy of organic compounds, Prentice Hall India (2012).

	Course Name:		Course C	Course Code:					
	Organic Spectrosco	py Practical			SBS CH 0	210 DSE 00	42		
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact H	rs.	
2022	Integrated B.Sc						per Week:	04	
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60	
Total Evalua	ation Marks: 50	Examinatio	n Duration:	6 Hrs.					
CIE: 15 N	1arks	Pre-requisite of course : Knowledge of radiation and its interaction with matter, idea of electronic levels in atoms and molecules, theory of molecula							
TEE: 35 N	1arks	matter, idea spectroscop		nic levels i	n atoms an	d molecule	es, theory of	molecula	
Course Application of visib			-	od snectro	sconv in or	aanic mole	cules Identi	fication o	
Course Application of visit Objectives Functional groups Application of fragi Course After completing th			-	•	• •	-		· •	
		•	-	-	•		-		
Outcomes:	CO1: Basic Principl		-						
	CO2: Basic princip								
	CO3: NMR (¹ H and								
	CO4: Basic principl	es Mass Spect	rometry						
	CO5: Use of spectr	-	-	nolecules					
	CO6: Study of unkr		-	lioicoures					
		iowii compou	nus						
		C	COURSE SYL	LABUS					
NOTE		C	COURSE SYL	LABUS					
NOTE: Two questic	ons will be set, one from				re require	d to attemr	ot all the que	stions.	
	ons will be set, one from			ndidates a	ire required	d to attemp	ot all the que	Contact	
Two questic	ons will be set, one from	n each of the L	JNIT. The ca	ndidates a	re require	d to attemp	ot all the que		
Two questic Unit No.		n each of the L	UNIT. The ca Content	indidates a : s	· · ·			Contact Hrs.	
Two questic Unit No. I	PURIFICATION OF COM Purification method f chromatorgrapy). CHARACTRIZATIONS	n each of the L APOUNDS For liquid, sol	JNIT. The ca Content id organic	indidates a s	(distillatio	on, recryst	allization,	Contact Hrs.	
Two questic Unit No.	PURIFICATION OF CON Purification method f chromatorgrapy).	APOUNDS For liquid, sol	JNIT. The ca Content id organic	substance d Mass of	(distillations) simple of the operation	on, recryst rganic com ermine ma	allization, npounds. ss of the	Contact Hrs. 30	
Two questic Unit No. I I Suggested F	PURIFICATION OF CON Purification method f chromatorgrapy). CHARACTRIZATIONS Analysis of spectra or Students need to ident molecules (mass-spect teacher. Readings: I. Silverstein, G.C. Bassle	n each of the L APOUNDS for liquid, sol f UV-Vis, FTIF ify/analyze im ra). They can	JNIT. The ca Content id organic R, NMR and portant pea submit a re	substance d Mass of aks/functio	(distillation simple of ponality, det rding their	on, recryst rganic com ermine ma analysis to	allization, npounds. ss of the o course	Contact Hrs. 30 30	

	se No:	Course Name:				Course C	ode:		
		Heterocyclic chemi	istry			SBS CH 0	211 DSE 31	04	
Batch	n:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	5.
2022		Integrated B.Sc						per Week:	04
Onwa	ards	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	n Marks: 100	Examination	n Duration:		3 Hrs.			
CIE:	30 Mar	ks	Pre-requisite			•	•	emistry, synt	hesis and
TEE:	70 Marl	ks	Various reac				is in compo	unus.	
Cours	ie -	Synthetic approach		vities, naturo	al produc	ts: synthesi	s of Penicill	in and cephal	osporine,
Objec	ctives	general synthetic a							
Cours		After completing t		dent is expe	cted to le	earn the fol	lowing:		
Outco	omes:	CO1: Three-memb	-						
		CO2: Three-memb	•		o heteroa	atoms			
		CO3: Four-membe	red heterocycl	les					
		CO4: Five-member	ed aromatic h	eterocycles					
		CO5: Synthesis of h	neterocycles						
		CO6: Knowledge of	f benzofurans	and indoles					
			C	OURSE SYL	LABUS				
need		1 is compulsory and	to be set from						- t t -
-	estion nos	r any four. Each part s. 2 to 5 are to be se to answer any two s	carries three a t from all four	and half ma units one fr	rks. om each.	Every ques	tion will ha		
-	estion nos	• •	carries three a t from all four	and half ma units one fr	rks. om each. . Each pai	Every ques	tion will ha		
stude	estion nos	s. 2 to 5 are to be se	carries three a t from all four	and half ma units one fr ch question.	rks. om each. . Each pai	Every ques	tion will ha		parts and
stude Unit	estion nos	s. 2 to 5 are to be se	carries three a t from all four ub-parts of ea	and half ma units one fr ch question.	rks. om each. . Each pai	Every ques	tion will ha		parts and Contact
stude Unit No.	estion nos nts need t HETERC	s. 2 to 5 are to be se to answer any two s	carries three a t from all four ub-parts of ea	and half ma units one fr <u>ch question</u> Conte	rks. om each. . Each pai . nts	Every ques t carries se	stion will ha ven marks.	ve three sub-	parts and Contact Hrs.
stude Unit No.	estion nos nts need t HETERC Three-n	s. 2 to 5 are to be set to answer any two s OCYCLIC CHEMISTRY	carries three a t from all four ub-parts of ea vith one het	and half ma units one fr <u>ch question.</u> Conte teroatom:	rks. om each. <u>Each pai</u> nts Chemist	Every ques t carries se	stion will ha ven marks.	ve three sub-	parts and Contact Hrs.
stude Unit No.	estion nos nts need t HETERC Three-n episulp Three-n	s. 2 to 5 are to be set to answer any two s OCYCLIC CHEMISTRY nembered rings w hides - synthetic ap nembered heterocyc	carries three a t from all four ub-parts of ea rith one het proaches and cles with two	and half ma units one fr <u>ch question</u> Conte teroatom: I reactivities	rks. om each. <u>Each pai</u> nts Chemist	Every ques t carries se	stion will ha ven marks. ranes, azir	ve three sub-	parts and Contact Hrs.
stude Unit No.	estion nos nts need t HETERC Three-n episulp Three-n synthet	s. 2 to 5 are to be set to answer any two s CYCLIC CHEMISTRY nembered rings w hides - synthetic ap nembered heterocyc ic approaches and	carries three a t from all four ub-parts of ea with one het proaches and cles with two reactivities.	and half ma units one fr <u>ch question</u> Conte teroatom: I reactivities	rks. om each. <u>Each pai</u> nts Chemist	Every ques t carries se	stion will ha ven marks. ranes, azir	ve three sub-	parts and Contact Hrs.
stude Unit No.	HETERC Three-n episulp Three-n synthet	s. 2 to 5 are to be set to answer any two s OCYCLIC CHEMISTRY nembered rings w hides - synthetic ap nembered heterocyc ic approaches and MEMBERED HETERO	carries three a t from all four ub-parts of ea with one het proaches and cles with two reactivities. CYCLES	and half ma units one fr <u>ch question</u> Conte teroatom: I reactivities heteroatom	rks. om each. <u>Each pai</u> nts Chemist 5. ns: oxazir	Every ques t carries se ry of oxi anes, diazi	stion will ha ven marks. ranes, azir ridines and	ve three sub- ridines and l diazirines -	parts and Contact Hrs.
stude Unit No.	estion nos ints need to HETERC Three-n episulp Three-n synthet FOUR-N oxitane	s. 2 to 5 are to be set to answer any two s OCYCLIC CHEMISTRY nembered rings w hides - synthetic ap nembered heterocyc ic approaches and MEMBERED HETERO s, azatidanes and	carries three a t from all four ub-parts of ea with one het proaches and cles with two reactivities. CYCLES I thietanes	and half ma units one fr <u>ch question</u> Conte teroatom: l reactivities heteroatom - synthetic	rks. om each. <u>Each pai</u> nts Chemist S. ns: oxazir approa	Every ques t carries se ry of oxi anes, diazi	stion will ha ven marks. ranes, azir ridines and	ve three sub- ridines and l diazirines -	parts and Contact Hrs. 15
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stude Unit No.	estion nos ints need to HETERC Three-n episulp Three-n synthet FOUR-N oxitane product	s. 2 to 5 are to be set to answer any two s OCYCLIC CHEMISTRY nembered rings w hides - synthetic ap nembered heterocyc ic approaches and MEMBERED HETERO s, azatidanes and	carries three a t from all four ub-parts of ea with one het proaches and cles with two reactivities. CYCLES I thietanes ciline and cep	and half main units one fr ch question. Conte teroatom: I reactivities heteroatom - synthetic chalosporine	rks. om each. <u>Each pai</u> nts Chemist S. ns: oxazir approa	Every ques t carries se ry of oxi anes, diazi	stion will ha ven marks. ranes, azir ridines and	ve three sub- ridines and l diazirines -	parts and Contact Hrs. 15
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stude Unit No. I	estion nos ints need to HETERC Three-n episulp Three-n synthet FOUR-N oxitane product FIVE-MI Applica structur	S. 2 to 5 are to be set to answer any two s OCYCLIC CHEMISTRY nembered rings w hides - synthetic ap nembered heterocyc ic approaches and MEMBERED HETERO s, azatidanes and ts:synthesis of Peni EMBERED AROMAT tion of fragmentati re elucidation of or	carries three a t from all four ub-parts of ea with one hel proaches and cles with two reactivities. CYCLES I thietanes ciline and cep IC HETEROCYC on rule in cha ganic compou	and half man units one fr ch question. Contectivities teroatom: I reactivities heteroatom - synthetic halosporine CLES racterizatio unds based of (CLES	rks. om each. <u>Each par</u> nts Chemist Chemist chemist	Every ques t carries se ry of oxi anes, diazi ches and nic compo	ranes, azir ridines and reactivitie unds. Prob	ve three sub- ridines and l diazirines - es. natural lems on	parts and Contact Hrs. 15 15 15
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Suggested Readings:

- 1. Heterocyclic Chemistry, J.A. Joule, K. Mills, Wiley, 2010.
- 2. The Essence of heterocyclic Chemistry, A. R. Parikh, H. Parikh, R. Khunt, New Age Int. Publication,
- 3. Principles of Modern Heterocyclic Chemistry, L. A. Paquette, W. A. Benjamin, New York, 1968.
- 4. Heterocyclic Chemistry, J.A. Joule and G. F. Smith, van Nostrand, London, 1978.
- 5. Comprehensive Heterocyclic Chemistry. The structure, reactions, synthesis and use of Heterocyclic compounds, (Ed. A.R. Katritzky and C. W. Rees), Vol 1-8, Pergamon Press, 1984.
- 6. Handbook of Heterocyclic Chemistry, A. R. Katritzky, Pergamon Press, 1985.
- 7. Van der plas, H. C. Ring transformations of Heterocycles, Vols 1 and 2, Academic Press, 1974.

Course No:	Course Name:				Course Co			
	Heterocyclic Chem			1	SBS CH 02	212 DSE 00		
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact H	-
2022	Integrated B.Sc						per Week:	
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60
Total Evalua	ation Marks: 50	Examinatio	n Duration:	6 Hrs.				
CIE: 15 N	Marks	Pre-requisit			•	•	nemistry, syn	thesis an
	/larks			-		•		
Course Objectives		Synthetic approaches and reactivities, natural products: synthesis of Penicillin and ceph general synthetic approaches. After completing this course, student is expected to learn the following:						
Course			dent is exp	ected to le	arn the foll	owing:		
Outcomes:	CO1: Three-member	-						
	CO2: Three-member	-		vo heteroa	itoms			
	CO3: Four-member	•						
	CO4: Five-member		eterocycles	5				
	CO5: Synthesis of h	•						
	CO6: Knowledge of	fbenzofurans	and indole	S				
		(COURSE SYI	LABUS				
NOTE:								
-	ons will be set, one from	each of the l	JNIT. The ca	andidates a	are required	to attem	ot all the que	stions.
Unit No.			Conten					Contact
								Hrs.
I	IDENTIFICATION							30
	1. Identification of her	tero atoms (S	, N, X) in gi	iven organ	ic compou	nds in lab.		
	2. Identification/separ	ration of simp	ole organic	compoun	ds containi	ng hetero	atoms	
	using column chromat	torgapy/TLC)	in lab.					
II	SPECTROSCOPIC INDE	NTIFICATION	AND PREPA	RATION				30
	1. Spectroscopic ident	ification of si	mple orgar	nic compou	unds (spect	ra may be	provided	
	to the students and te	eachers may	help the st	udents to	identify th	e compou	nds using	
	spectra). Melting poin	t/boiling poir	nt of the co	ompounds	may be ch	ecked for i	its purity.	
	2. Preparation of Ind	igo (using alo	dol conden	sation rea	action of 2	-nitrobenz	aldehyde	
	with acetone in basic	condition).						
Suggested	•			2010				
	erocyclic Chemistry, J.				احدا اممو	1070		
	erocyclic Chemistry, J.						ico of Lloton	o nalio
	nprehensive Heterocyc npounds, (Ed. A.R. Katr						ise of Heler	JUYUNU
	ndbook of Heterocyclic	•	• ·		-			
4. Har	INDUCK OF HELEFOCYCIIC	chemistry, A	. n. Katritz	ky, Pergan	ion Piess,	1303.		

Cours	e No:	Course Name:	Course Code:						
		Organometallics ar	nd Bioinorgani	c Chemistry		SBS CH 0	213 DSE 31	04	
Batch	:	Programme:	Semester:	L	Т	Р	Credits	Contact Hrs	
2022		Integrated B.Sc						per Week:	04
Onwa	irds	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60
Total	Evaluatio	on Marks: 100	Examination	Duration:		3 Hrs.			
CIE:	30 Mar	ks	Pre-requisit	e of course:	Knowled	ge of meta	l-carbon bo	onds and fund	amenta
TEE:	70 Mar	ks	of organome and enzyme		istry, idea	of metals	in biology,	knowledge of	proteir
Cours	е	Oxidation states o			li and Co	. General	methods o	of preparatio	n (dire
Objec	tives	combination, redu							
-		binuclear carbony							
Cours	e	After completing t							
Outco		CO1: Chemistry of					C		
		CO2: Organometal		5					
		CO3: Bioinorganic	•						
		CO4: Knowledge o		nes and pro	teins in b	iological sv	stems		
		CO5: Ion-transport	-	•		υ,			
		CO6: Use of organi		pounds in ca	Italvsis				
			C	OURSE SYL	LABUS				
NOTE									
i) Que	estion no.	1 is compulsory and	l to be set fron	n the entire	syllabus.	It will have	seven sub-	parts and stud	dents
i) Que need t	estion no. to answe	r any four. Each part	to be set fron carries three a	n the entire and half mai	syllabus. rks.				
i) Que need t ii) Que	estion no. to answe estion no	r any four. Each part s. 2 to 5 are to be se	l to be set fron carries three a t from all four	n the entire and half mai units one fr	syllabus. rks. om each.	Every ques	tion will ha		
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i) Que need t ii) Que studer Unit No. I	estion no. to answe estion no nts need CHEMIS Oxidati (includi K₄[Fe(C ORGAN Definiti Concep monon prepara decom and bin	r any four. Each part s. 2 to 5 are to be set to answer any two s STRY OF 3D METALS on states displayed ing preparation and N)₀], sodium nitropr IOMETALLIC COMPC ion and classificatio of hapticity of org uclear, polynuclear ation (direct combin position) of mono a puclear carbonyls of n of CO to be discus	to be set from carries three a t from all four ub-parts of eac d by Cr, Fe, C d important p russide, [Co(N DUNDS-I n of organom ganic ligands. I and substitut nation, reduct nd binuclear o	n the entire and half man units one fro ch question. Conte Co, Ni and (roperties); I H ₃) ₆]Cl ₃ , Na ₃ etallic comp Metal carbo ed metal carbo ive carbonyls of o and Ni usi	syllabus. rks. om each. . Each par .nts Co. A stu Peroxo co [Co(NO ₂) [Co(NO ₂) [counds of onyls: 18 of onyls: 18 of onyls: 18 of arbonyls c lation, th f 3d serie ing VBT. p	Every ques t carries se dy of the ompounds]. n the basis electron ru of 3d series ermal and s. Structur pi-accepto	following of Cr, K2Cr of bond ty le, electror S. General r photocher es of mono r behaviour	ve three sub- compounds 207, KMnO₄, pe. n count of nethods of nical nuclear of CO (MO	parts an Contac Hrs. 15
i) Que need t ii) Que studer Unit No. I	estion no. to answe estion no nts need CHEMIS Oxidati (includi K₄[Fe(C ORGAN Definiti Concep monon prepara decom and bin diagrar bondin	r any four. Each part s. 2 to 5 are to be set to answer any two s STRY OF 3D METALS on states displayed ing preparation and N)₀], sodium nitropr IOMETALLIC COMPC ion and classificatio of hapticity of org uclear, polynuclear ation (direct combin position) of mono a puclear carbonyls of n of CO to be discus	to be set from carries three a t from all four ub-parts of eac d by Cr, Fe, C d important per cusside, [Co(N DUNDS-I and substitut nation, reduct nd binuclear of cr, Mn, Fe, Co ssed), synergio	n the entire and half man units one fro ch question. Conte Co, Ni and (roperties); I H ₃) ₆]Cl ₃ , Na ₃ etallic comp Metal carbo ed metal carbo ive carbonyls of o and Ni usi	syllabus. rks. om each. . Each par .nts Co. A stu Peroxo co [Co(NO ₂) [Co(NO ₂) [counds of onyls: 18 of onyls: 18 of onyls: 18 of arbonyls c lation, th f 3d serie ing VBT. p	Every ques t carries se dy of the ompounds]. n the basis electron ru of 3d series ermal and s. Structur pi-accepto	following of Cr, K2Cr of bond ty le, electror S. General r photocher es of mono r behaviour	ve three sub- compounds 207, KMnO₄, pe. n count of nethods of nical nuclear of CO (MO	parts an Contac Hrs. 15
i) Que need t ii) Que studer Unit No. I	estion no. to answe estion no nts need CHEMIS Oxidati (includi K₄[Fe(C ORGAN Definiti Concep monon prepara decom and bin diagrar bondin	Trany four. Each part s. 2 to 5 are to be set to answer any two s TRY OF 3D METALS on states displayed ing preparation and N)₀], sodium nitropr OMETALLIC COMPC fon and classificatio of hapticity of org uclear, polynuclear ation (direct combin position) of mono a nuclear carbonyls of n of CO to be discus g.	to be set from carries three a t from all four ub-parts of eac d by Cr, Fe, C d important p russide, [Co(N DUNDS-I n of organom ganic ligands. I and substitut nation, reduct nd binuclear of Cr, Mn, Fe, Co ssed), synergio	n the entire and half man units one fro ch question. Conte Co, Ni and Conte coperties); H ₃) ₆]Cl ₃ , Na ₃ etallic comp Metal carbo ed metal carbo ed metal carbo ive carbonyls of o and Ni usi c effect and	syllabus. rks. om each. <u>Each par</u> nts Co. A stu Peroxo co [Co(NO ₂) counds o onyls: 18 o rbonyls co lation, th f 3d serie ing VBT. p use of IR	Every quest t carries se ady of the ompounds]. In the basis electron ru of 3d series ermal and s. Structur pi-acceptor data to ex	following of Cr, K ₂ Cr of bond ty lle, electror s. General r photocher es of mono r behaviour	ve three sub- compounds ² 0 ⁷ , KMnO ₄ , pe. n count of nethods of nical nuclear of CO (MO at of back	parts an Contac Hrs. 15

	 Metal Alkyls: Important structural features of methyl lithium (tetramer) and trialkyl aluminium (dimer), concept of multicentre bonding in these compounds. Role of triethylaluminium in polymerisation of ethene (Ziegler – Natta Catalyst). Species present in ether solution of Grignard reagent and their structures, Schlenk equilibrium. Ferrocene: Preparation and reactions (acetylation, alkylation, metallation, Mannich Condensation). Structure and aromaticity. Comparison of aromaticity and reactivity with that of benzene. Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p-acceptor behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies). Organometallic compounds of Mg and Li – Use in synthesis of 	
IV	organic compounds. BIOINORGANIC CHEMISTRY A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na+, K+ and Mg2+ ions: Na/K pump; Role of Mg2+ ions in energy production and chlorophyll. Role of Ca2+ in blood clotting, stabilization of protein structures and structural role (bones).	15
1.Lipp 2. Cot 3. Bas	ested Readings: Dard, S.J. & Berg, J.M. Principles of Bioinorganic Chemistry Panima Publishing Company 1994. Eton, F.A. & Wilkinson, G, Advanced Inorganic Chemistry Wiley-VCH, 1999 Solo, F, and Pearson, R.C. Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967. enwood, N.N. & Earnshaw A. Chemistry of the Elements, Butterworth-Heinemann, 1997.	

Course No:	Course Name:				Course Co	ode:		
	Organometallics an	d Bioinorgani	ic chemistry	Practical	SBS CH 02	14 DSE 00	42	
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact H	rs.
2022	Integrated B.Sc						per Week	04
onwards	M.Sc. Chemistry	V/VI	0	0	4	2	Total Hrs.:	60
Total Evaluati	on Marks: 50	Examinatio	Duration	6 Hrs.				
CIE: 15 Ma	rks	Pre-requisit		-	-			
		-		nistry, idea	of metals i	n biology,	knowledge o	of proteins
TEE: 35 Ma		and enzyme						
Course	Oxidation states d							
Objectives	combination, redu							
	binuclear carbonyl						ructural role	(bones).
Course	After completing th		dent is exp	ected to le	arn the follo	owing:		
Outcomes:	CO1: Chemistry of							
	CO2: Organometall	•	S					
	CO3: Bioinorganic o	chemistry						
	CO4: Knowledge of	various enzy	mes and pro	oteins in bi	ological sys	tems		
	CO5: Ion-transport							
	CO6: Use of organo	metallic com	pounds in c	atalysis				
		C	COURSE SYL	LABUS				
NOTE:								
	s will be set, one from	each of the I	INIT The ca	undidates a	re required	to attemr	nt all the que	stions
Unit No.			Conten		rerequired	to attemp		Contact
			content					Hrs.
I G	RIGNARD REAGENT							30
1.	Rection of metal wit	h halide – pr	eparation c	of Grignard	l reagent. (only		
de	emonstration purpos	e)		-		·		
2.	Grignard preparatio	n of dye (ma	lachite gree	en (using r	nethylbend	oate)/cryst	tal violet	
(ι	ising diethylcarbonat	e) (starting r	naterial as	p-bromo N	I, N-dimeth	nyl aniline) (only	
d	emonstration purpos	se)		-		-		
II P	REPARATION OF CON	/IPLEXES						30
1.	Preparation of vari	ous Schiff ba	ise-metal c	omplexes	and their i	dentificat	ion using	
	pectroscopy.							
2.	Preparation of any t	wo of the fo	llowing con	nplexes an	d measure	ment of tl	neir	
	onductivity measurer							
	tetraamminecarbon	•	-					
	tetraamminecopper							
	potassium trioxalato	oferrate (III) t	rihydrate					
Suggested Re	-							
•	esis of organometalli	•	•	-	•	Viley.		
	ogel: Qualitative Inor						<i>c</i> -	_
	, A.I., Tatchell, A.R., F	urnis, B.S., H	lannaford,	A.J. & Smit	:h, P.W.G.,	Textbook	of Practical	Organic
Chem	istry, Prentice-Hall.							

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Course	e No:	Course Name:				Course Co	ode:		
		Introduction to Nar	ochemistry &	Application	S		215 DSE 31	04	
Batch:		Programme:	Semester:	L	Т	P	Credits	Contact Hrs	5.
2022	-	Integrated B.Sc		_	-	-		per Week:	04
Onwar	rds	M.Sc. Chemistry	V/VI	3	1	0	4	Total Hrs.:	60
		n Marks: 100							
			Examinatio	n Duration:		3 Hrs.			
CIE:	30 Marl	ks	Pre-requisit	e of course	e: Knowl	edge of n	anomateria	als, its synth	nesis and
			•			•		graphene etc.	
TEE:	70 Marl	KS							
Course	e	Introduction to na	noscience, El	ectrical, Opt	ical (Surfa	ace Plasmo	n resonand	ce), variation	in colors
Object	tives	(Blue shift & Red s	nift), Magnet	ic, thermal a	nd cataly	tic properti	ies, Brief in	troduction at	oout Top-
<u> </u>		down and Bottom-	up approache	s, Electron m	nicroscop	ic technique	e.		
Course	e	After completing th	is course, stu	dent is expe	cted to le	arn the foll	owing:		
Outco	mes:	CO1: Introduction t	o nanoscienc	e					
		CO2: Calculation of	percentage o	of surface ato	om and su	Irface to vo	lume ratio	of spherical, v	wire, rod,
		and disc shapes nar	noparticles.						
		CO3: Examples of p	reparation of	gold and silv	ver metal	lic nanopar	ticles,		
		CO4: Material chara	acterization to	echniques					
		CO5: Advanced app	lication of na	nomaterials					
		CO6: Knowledge of	quantum dot	S					
			C	OURSE SYLI	ABUS				
NOTE:	•								
		1 is compulsory and	to be set fror	n the entire	svllabus.	It will have	seven sub-	parts and stud	dents
		any four. Each part			-				
		s. 2 to 5 are to be set				Every quest	tion will ha	ve three sub-	parts and
-		o answer any two su				• •			•
Unit				Conte	nts				Contact
No.									Hrs.
I	INTROD	UCTION							25
	Introdu	ction to nanoscien	ce, nanostru	cture and n	anotechr	hology (bas	sic idea), C	Overview of	
	nanostr	uctures and nand	-materials,	classificatio	n, (clust	er, colloid	l, nanopai	rticles, and	
	nanostr	uctures -Spheroid,	Wire, Rod, T	ube, and Qu	iantum D	ot); Calcula	ation of pe	ercentage of	
	surface	atom and surfac	e to volum	e ratio of	spherica	l, wire, r	od, and d	disc shapes	
	nanopa	rticles.							
II	PROPER	TIES OF NANOMATI	RIALS						20
	Size de	pendent properties	of nanomate	erials (basic	idea witł	n few exam	ples only)	: Quantum	
. !	confine	ment, Electrical, Op	tical (Surface	Plasmon re		, variation	in colors (E	Blue shift &	
1			al and catal		sonance)				1
	Red shi	ft), Magnetic, therm	lai and cataly	<u>tic properti</u>					
111	SYNTHE	SIS OF NANOMATER	RIALS	•	es.				
III	SYNTHE		RIALS	•	es.	wn and Bo	ttom-up a	oproaches	
	SYNTHE Synthes	SIS OF NANOMATER	RIALS Brief introd	luction abou	es. It Top-do				
111	SYNTHE Synthes & self-a	SIS OF NANOMATER	RIALS Brief introd of nanopart	uction abou	es. It Top-do sis, Solvo	thermal pr	ocess, Exa	mples of	
111	SYNTHE Synthes & self-a prepara	SIS OF NANOMATER sis of Nanomaterials ssembly techniques	RIALS Brief introd of nanopart ver metallic n	uction abou icles synthe anoparticles	es. It Top-do sis, Solvo s, self-ass	thermal pr sembled na	ocess, Exa inostructu	mples of res-	

IV	CHARACTERIZATION OF NANOMATERIALS	
	Material characterization techniques (basic idea of use of following instruments in	
	nanomaterial characterization need to be emphasized): Electron microscopic technique,	
	diffraction technique, photoelectron spectroscopy, zeta-potential measurement; Examples of	
	use of nanomaterials in environmental remediation and biology (few practical examples of	
	use of materials can be discussed).	
Sugg	ested Readings:	
1.C. N	N. R. Rao, A. Muller, A. K. Cheetam, The Chemistry of Nanomaterials: Synthesis, Properties and	
Appli	cations, Willey-VCH Verlag, Germany, 2005.	
2.G. (Cao, Nanostructures and Nanomaterials: Synthesis, Properties and Appications, Imperial College Pr	ress,
Lond	on, 2004	
3.R. \	N. Kelsall, I. W. Hameley, M. Geoghegan, Nanoscale Science and Technology, John Wiley & Sons,	
Engla	and, 2005	
4.Cha	arles P. Poole and Frank J Owens, Introduction to nano technology, Wiley Interscience, 2003.	
5. Pra	adeep, T., A text of book of nanoscience and nanotechnology, Tata McGraw Hill Education Pvt. Ltd.	., New
Delhi	i, 2012.	

Course No:	Course Name: Course Code:										
	Nanochen	nistry Pra	ctical			SBS CH 02	216 DSE 00	42			
Batch:	Programn	ne:	Semester:	L	Т	Р	Credit	Contact H	Irs.		
2022	Integrated	d B.Sc						per Weeł	<: 04		
onwards	M.Sc. Che	mistry	V/VI	0	0	4	2	Total Hrs	.: 60		
Total Evalu	ation Marks: 5	50	Examinatio	n Duration:	6 Hrs.						
CIE: 15	Marks		Pre-requisite of course : Knowledge of nanomaterials, its synthesis and characterizations, idea of carbon nanotubes, fullerene, graphene etc.								
TEE: 35	Marks		characteriz	ations, idea	of carbo	n nanotube	es, fullerei	ne, grapher	ie etc.		
Course	Introducti	on to nar	noscience, Ele	ectrical, Op	tical (Surfa	ace Plasmo	n resonan	ce), variatic	on in color		
Objectives	(Blue shift	t & Red sl	nift), Magneti	ic, thermal a	and cataly	tic properti	es, Brief in	ntroduction	about Top		
			ip approache	p approaches, Electron microscopic technique.							
Course	urse After completing this course, student is expected to learn the following:										
Outcomes	: CO1: Intro	oduction t	o nanoscienc	e							
	CO2: Calc	CO2: Calculation of percentage of surface atom and surface to volume ratio of spherical, wire, rod,									
	and disc s	hapes nar	oparticles.								
	CO3: Examples of preparation of gold and silver metallic nanoparticles,										
	CO4: Mate	erial chara	acterization te	echniques							
	CO5: Adva	anced app	lication of na	nomaterial	5						
	CO6: Knov	wledge of	quantum dot	ts							
	I		C	COURSE SYL	LABUS						
NOTE:											
Two questi	ions will be set,	one from	each of the L	JNIT. The ca	ndidates a	ire required	d to attemp	ot all the qu	estions.		
Unit No.				Content	ts				Contact Hrs.		
I	SYNTHESIS OF	F NANOPA	RTICLES						30		
	1.Synthesis o	f ZnO nar	oparticles.								
	2. Preparation of Silver nanoparticles.										
	(diverse nand	particles	can be prepa	ared by var	ious route	s)					
	BEER-LAMBE								30		
II	Verfification of		ambert law u	sing nano-p	particles (a	ibove prep	ared nano	-particles	50		
	may be used	for the st	udy).								
	 Readings: adeep T., A text	t book of	nanoscience	and nanot	echnology	, Tata McG	Graw Hill E	ducation P	vt. Ltd.,		
Ne	w Delhi, 2012 e	edition.									

Sr. No.	Name of the course	Course Code	L	Т	Р	Credits
1	GE: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	SBS CH 020101 GE 4004	4	0	0	4
2	GE-Lab: Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	SBS CH 020102 GE 0042	0	0	4	2
3	GE: Chemical Energetics, Equilibria & Functional Organic Chemistry-I	SBS CH 020103 GE 4004	4	0	0	4
4	GE Lab: Chemical Energetics, Equilibria & Functional Organic Chemistry-I	SBS CH 020104 GE 0042	0	0	4	2
5	Solutions, Phase Equilibria, Conductance, Electrochemistry, & Functional Group Organic Chemistry	SBS CH 020201 GE 4004	4	0	0	4
6	GE Lab: Solutions, Phase Equilibria, Conductance, Electrochemistry, & Functional Group Organic Chemistry	SBS CH 020202 GE 0042	0	0	4	2
7	GE: Transition Metal & Coordination Chemistry, States of Matter & Chemical Kinetics	SBS CH 020203 GE 4004	4	0	0	4
8	GE Lab: Transition Metal & Coordination Chemistry, States of Matter & Chemical Kinetics	SBS CH 020204 GE 0042	0	0	4	2
9	Organometallics, Bio-inorganic Chemistry, Polynuclear Hydrocarbons & UV, IR Spectra	SBS CH 020301 GE 4004	4	0	0	4
10	GE Lab: Organometallics, Bio- inorganic Chemistry, Polynuclear Hydrocarbons & UV, IR Spectra	SBS CH 020302 GE 0042	0	0	4	2
11	GE: Quantum Chemistry, Spectroscopy & Photochemistry	SBS CH 020303 GE 4004	4	0	0	4
12	GE Lab: Quantum Chemistry, Spectroscopy & Photochemistry	SBS CH 020304 GE 0042	0	0	4	2
13	Molecules of Life	SBS CH 020401 GE 4004	4	0	0	4

List of GE Courses To Be Offered To The Other Departments

14	GE Lab: Molecules of Life	SBS CH 020402 GE 0042	0	0	4	2
	Chemistry of Main Group Elements, Theories of Acids & Bases	SBS CH 020403 GE 4004	4	0	0	4
	GE Lab: Chemistry of Main Group Elements, Theories of Acids & Bases	SBS CH 020404 GE 0042	0	0	4	2

Note:

- 1. University/Department may include more options or delete some from this list.
- 2. The courses will be offered according to faculty strength and as per availability of faculty members.

Course	e No:	Course Name: GE: Atomic Structu	re. Bonding. G	ieneral Org	anic	Course (Code: 20101 GE 4	004		
		Chemistry & Alipha	-	-	Janne	000 011 0				
Batch: 2022		Programme: Integrated B.Sc	Semester:	L	Т	Р	Credits	Contact Hi per Week:		
Onwar	ds	M.Sc.	I	4	0	0	4	Total Hrs.:	60	
Total E	valuatio	n Marks: 100	Examination	Duration:		3 Hrs.				
CIE:	30 Mar		Pre-requisite	e of course	: None					
TEE:	70 Mar									
Course Object										
need to ii) Ques	tion no. o answer	After completing the CO1: The wave function CO2: Structures and diagrams CO3: Importance and chemical forces and CO4: The nature and CO5:Mechanisms substitution/addition CO6: The fundamentiation any four. Each part s. 2 to 5 are to be set to answer any two set	ction ad geometries and applicatio d their effect d behavior of of several on ntal concepts o CO to be set from carries three a from all four	of molecu n of chem organic cor organic <u>of stereoch</u> URSE SYI n the entire and half ma units one fr	ules using ical bond mpounds reactio emistry LLABUS syllabus. rom each.	Radius Ra s, inter-mo ons incluo It will have Every ques	tio Rules, N blecular and ding free seven sub-	d intramolec radical/el parts and stu	cular weak ectrophilic	
Unit No.				Contents					Contact Hrs.	
	INORG	ANIC CHEMISTRY-1								
I	Review Broglie approa What i various Radial variatio angula most p	IC STRUCTURE of Bohr's theory a s's relation, Heisenber och to Atomic structur is Quantum mechar is terms in it. Signifi and angular parts ons for 1s, 2s, 2p, 3s r nodes and their si probable distance wi um numbers, orbital	rg Uncertainter ure. hics? Time inc cance of $ψ$ ar of the hydro c, 3p and 3d o gnificance. Ra th special refe	y principle. dependent nd ψ^2 , Sch genic wav rbitals (On idial distrib grence to 1.	Hydroger Schroding rödinger efunctions ly graphic bution fun s and 2s a	a atom spece ger equation f s (atomic cal represent actions and atomic orbin	ctra. Need c on and mea or hydroge orbitals) an ntation). Ra the concep tals. Signific	of a new aning of n atom. nd their dial and ot of the cance of	14	

	of <i>s</i> , <i>p</i> and <i>d</i> atomic orbitals, nodal planes. Discovery of spin, spin quantum number(<i>s</i>) and magnetic spin quantum number (m_s).	
	Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.	
II	 CHEMICAL BONDING AND MOLECULAR STRUCTURE Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character. Covalent Bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds. 	16
	MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for <i>s-s, s-p</i> and <i>p-p</i> combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of <i>s-p</i> mixing) and heteronuclear diatomic molecules such as CO, NO and NO ⁺ . Comparison of VB and MO approaches.	
	ORGANIC CHEMISTRY-1	
III	 FUNDAMENTALS OF ORGANIC CHEMISTRY Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule. Stereochemistry: Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; <i>cis-trans</i> nomenclature; CIP Rules: R/S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems). 	16
IV	ALIPHATIC HYDROCARBONS Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Alkanes: (Upto 5 Carbons) Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic	14

hydrogenation) and trans alkenes (Birch reduction). Reactions: cis addition (alk. KMnO₄) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation. **Alkynes**: (Upto 5 Carbons) Preparation: Acetylene from CaC₂ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: Formation of metal acetylides, addition of bromine and alkaline KMnO₄, ozonolysis and oxidation with hot alk. KMnO₄

Suggested Readings:

- 1. J. Singh, L.D.S. Yadav, Organic Chemistry (Volume I), 14th Edition, Pragati Prakashan, 2019.
- 2. T.W. Graham Solomon, C.B. Fryhle, & S.A. Dnyder, Organic Chemistry, John Wiley & Sons, 2014.
- 3. J.E. McMurry, Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning Edition, 2013.
- 4. S. M. Mukerji, S. P. Singh, K.P.Kapoor and R. Das, Organic Chemistry (Volume I), 2nd Edition, New Age International Publishers, 2010.
- 5. R.T. Morrison & R.N. Boyd, Organic Chemistry, Pearson, 2010.
- 6. A. Bahl, & B.S. Bahl, S. Chand, Advanced Organic Chemistry, 2010.
- 7. J.E. Huheey, E.A. Keiter, R.L. Keiter, & O.K. Medhi, Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- 8. E.L. Eliel, Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
- 9. F.A. Cotton, G. Wilkinson, & P.L. Gaus, Basic Inorganic Chemistry, 3rd Edition, Wiley, 1995.
- 10. J.D. Lee, Concise Inorganic Chemistry ELBS, 1991.
- 11. P. Sykes, A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi 1988.
- 12. Cotton, F.A., Wilkinson, G. & Gaus, P.L., Basic Inorganic Chemistry, 3rd Edition, Wiley, 1995.
- 13. Finar, I.L. Organic Chemistry (Volume I & II), E.L.B.S., 1988.

Course No:	Course Name:	Course Name:Course Code:GE-Lab: Atomic Structure, Bonding, General OrganicSBS CH 020102 GE 0042								
	Chemistry & Alipha		-	I Organic	SBS CH 02	20102 GE 0	042			
Batch: 2022	Programme: Integrated B.Sc	Semester:	L	Т	Р	Credit	Contact H per Week		04	
Onwards	M.Sc.	I	0	0	4	2	Total Hou		60	
Total Evaluat	ion Marks: 50	Examinatio	n Duration:	6 Hrs.						
CIE: 15 Ma	arks	Pre-requisite of course: None								
TEE: 35 Ma										
CourseTo inculcate the common skills required for performing simple inorganic and organic chObjectivepracticals.								chen	nistry	
Course Outcomes:										
		CO	URSE SY	LLABUS						
NOTE:										
Two questions Unit No.	will be set, one from eac	ch of the UNIT.	The candida Content	-	ired to atter	npt all the c	questions.	Con	tact	
Office No.			content	.5					rs.	
IINORGANIC CHEMISTRY VOLUMETRIC ANALYSISi. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.ii. Estimation of oxalic acid by titrating it with KMnO4.iii. Estimation of water of crystallization in Mohr's salt by titrating with KMnO4.iv. Estimation of Fe (II) ions by titrating it with K2Cr2O7 using internal indicator.v. Estimation of Cu (II) ions iodometrically using Na2S2O3.									0	
t ((DRGANIC CHEMISTRY QUAILITATIVE ANALYS i. Detection of extra erection of extra erection of extra elements). ii. Separation of mix combination of two co a) Identify and separ glycine, aspartic acid chromatography.	elements (N, atures by Chi compounds to rate the com	S, Cl, Br, I) romatograp be given) nponents of	in organic hy: Measu a given i	ire the Rf mixture of	value in e two amir	each case	3	0	

	(b) Identify and separate the sugars present in the given mixture by paper chromatography.
Sugge	ested Readings:
1.	G. Svehla, Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2.	J. Mendham, Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3.	A.I. Vogel, Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic
Chem	istry, Prentice-Hall, 5 th Edition, 1996.
4.	F.G. Mann, & B.C. Saunders, Practical Organic Chemistry Orient-Longman, 1960.

Course	No:	Course Name:				Course 0	Code:			
		GE: Chemical Ene	rgetics, Equ	ilibria & Fu	nctional	SBS CH C	20103 GE	4004		
		Organic Chemistry-I								
Batch:		Programme:	Semester:	L	т	Р	Credits	Contact H		
2022 Onwar	de	Integrated B.Sc M.Sc.	1	4	0	0	4	per Week Total Hrs.		
			-	4	0	0	4	Total Hrs.	: 60	
Total E	valuatio	n Marks: 100	Examination Duration: 3 Hrs.							
CIE:	30 Mar	ks	Pre-requisite of course: None							
TEE:	70 Mar									
Course Object		To provide basic kn phenols, ethers and chemical equilibriu	d carbonyl co	mpounds. To			· •	•		
Course	•	After completing th			cted to lea	arn the foll	owing:			
Outcor	nes:	CO1: Basics of chen		•			0			
		CO2: Basics of chen	•		•					
		CO3 : Chemistry of a CO4 : Chemistry of	•		•	•				
		CO4: Chemistry of	alconois, prie	nois, ethers		биуг сотпро	unus.			
			CO	URSE SYL	LABUS					
NOTE:										
		1 is compulsory and			-	t will have	seven sub-	parts and st	udents	
		any four. Each part 5. 2 to 5 are to be set					tion will be	vo throo cul	n narts and	
-		to answer any two si				•••		ve tillee sui	J-parts and	
Unit				Contents	Lach par				Contact	
No.									Hrs.	
	PHYSI	CAL CHEMISTRY-1								
I	CHEMI	CAL ENERGETICS						T	15	
	Review	of thermodynamics	and the Law	s of Thermo	dynamics	i.				
		ant principles and d			•		of standar	dstate		
	-	andard enthalpies o								
		n. Calculation of bor			-					
		ochemical data. Vari	ation of enth	halpy of a re	action wi	th temper	ature – Kir	chhoff's		
	equation		of thormod	vnamice an	d colcula	tion of a	hcoluto o	ntropios		
		ent of Third Law stances.	or thermou	ylidillics di	u calcula		ibsolute e	intropies		
II		CAL EQUILIBRIUM A							15	
		cal Equilibrium: Fre								
		ion of the law of c	•							
		er's principle. Re	lationships b	etween <i>K_p, I</i>	K_c and K_x	for reaction	ons involvi	ng ideal		
	gases.									

	Ionic Equilibrium: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle	
III	ORGANIC CHEWISTRT-2 AROMATIC HYDROCARBONS Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene). ALKYL AND ARYL HALIDES Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution. Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.	15
IV	ALCOHOLS, PHENOLS AND ETHERS (UPTO 5 CARBONS)Alcohols: Preparation: Preparation of 1 ⁰ , 2 ⁰ and 3 ⁰ alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acidic dichromate, conc. HNO3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement. Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer- Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten - Baumann Reaction. Ethers (aliphatic and aromatic): Cleavage of ethers with HI. Aldehydes and ketones (aliphatic and aromatic): (Formaldehye, acetaldehyde, acetone and benzaldehyde) Preparation: from acid chlorides and from nitriles. Reactions - Reaction with HCN, ROH, NaHSO ₃ , NH ₂ -G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.	15

Suggested Readings:

1. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, Revised Edition. (Revised by S. P. Singh and Om Prakash). TRINITY Press, An Imprint of Laxmi Publications Pvt. Ltd., 2015.

2. T.W. Graham Solomon, C.B. Fryhle, & S.A. Dnyder, Organic Chemistry, John Wiley & Sons, 2014.

3. J.E. McMurry, Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.

4. S. M. Mukerji, S. P. Singh, K.P.Kapoor and R. Das, Organic Chemistry (Volume II), 2nd Edition, New Age International Publishers, 2010.

5. S. M. Mukerji, S. P. Singh, K.P.Kapoor and R. Das, Organic Chemistry (Volume I), 2nd Edition, New Age International Publishers, 2010.

- 6. I.L. Finar, Organic Chemistry (Volume I & II), E.L.B.S.
- 7. R.T. Morrison, & R.N. Boyd, Organic Chemistry, Pearson, 2010.
- 8. A. Bahl, & B.S Bahl, S. Chand, Advanced Organic Chemistry, 2010.

9. J.C. Kotz, P. M. Treichel, & J. R. Townsend, General Chemistry Cengage Learning India Pvt. Ltd., New Delhi, 2009.

- 10. G.M. Barrow, Physical Chemistry, Tata McGraw-Hill, 2007.
- 11. G.W. Castellan, Physical Chemistry, 4th Edition, Narosa, 2004.
- 12. P. Sykes, A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi, 1988.
- 13. B.H Mahan, University Chemistry, 3rd Edition, Narosa, 1998.
- 14. R.H. Petrucci, General Chemistry, 5th Edition, Macmillan Publishing Co.: New York, 1985.

Course No:	o: Course Name: Course Code:									
	GE Lab: Chemical	Energetics,	Equilibria	&	SBS CH ()20104 GE	0042			
	Functional Orgar	nic Chemistr	y-l							
Batch: 2022	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs	5. 04		
2022 Onwards	Integrated B.Sc M.Sc.	1	0	0	4	2	per Week: Total Hrs:	60		
	ation Marks: 50	•				2	Totarms.	00		
		Examinatio	n Duration:	6 Hrs.						
CIE: 15 N	⁄larks									
	A 1	Pre-requisit	e of course	: None						
	Aarks	lls for handl	ina roaction	ac to pror	ara cimpla	organic co	manunda Ta	novida		
Course Objective		To acquire the skills for handling reactions to prepare simple organic compounds. To provide								
Objective	knowledge about the purification techniques for organic compounds and their m.pt determination to the students. To explain the importance and applications of thermochemistry and to calculate the									
	pH of the different	•	ipor cance a			in ochernis	iry and to car			
Course	After completing th					owing:				
Outcomes:	CO1: Thermochem	•	•••		•	nc				
	-	CO2 : Ionic equilibria and measurement of pH of different solutions. CO3 : Purification techniques and their importance								
	CO4: Single-step or	•	•		n of the obt	ained produ	uct			
			- 1-			1				
		CC	OURSE SY	LLABUS						
NOTE:										
	ns will be set, one from eac	ch of the UNIT.			uired to atte	empt all the c	-	<u> </u>		
Unit No.			Conten	ts				Contact Hrs.		
1	PHYSICAL CHEMISTRY							30		
	Thermochemistry									
	1. Determination	n of heat cap	acity of calo	orimeter f	or different	volumes.				
	2. Determination	•	•							
	sodium hydro									
	3. Determination									
	4. Determination	-	• •		-					
	 5. Determination 6. Study of the s 		•		•		н			
	-	Siddinty Of D		in water o			1.1.			
	Ionic equilibria pH measurements									
	Measurement of pH c	of different so	olutions lik	e aerated	drinks. frui	it juices sh	ampoos			
	and soaps (use dilute				-	•	•			
	glass electrode) using		1		- 1					
		ion of buffer	solutions:							
	(i) Sodium ac									
		m chloride-a		-		c				
	Measurement of the	pH of buffe	er solution:	s and co	mparison o	t the valu	es with			
	theoretical values.									
11	ORGANIC CHEMISTRY	,						30		
	1. Purification of		npounds bv	crystalliza	tion (from	water and		20		
	alcohol) and o	-		,	,					
	2. Criteria of Pur		nation of m	elting and	l boiling poi	nts.				
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	 3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done. (a) Bromination of Phenol/Aniline (b) Benzoylation of amines/phenols (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone 	
Delhi (201 2. A Organic Cl	.D. Khosla; V.C.Garg & A. Gulati Senior Practical Physical Chemistry, R. Chand & Chemistry, R. Chemistry, R. Chemistry, R. Chemistry, R. Chemistry, R. Che	
а Г. 	.G. Mann & B.C. Saunders Fractical Organic Chemistry Orient-Longman, 1960.	

Course No:	Course Name:											
	GE: Solutions, Ph	GE: Solutions, Phase Equilibria, Conductance, SBS CH 020201 GE 4004										
	Electrochemistry & Functional Group Organic											
	Chemistry-li											
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs.					
2022	Integrated B.Sc						per Week:	04				
Onwards	M.Sc. Chemistry	П	4	0	0	4	Total Hours:	60				
Total Evalu	ation Marks: 100	Examinatio	n Duration:	3 Hrs.								
CIE: 30 I	Marks	-			nderstandir	ng of solut	ions, phase eq	uilibria,				
TEE: 70 M	Marks	basic organi	c reactions.									
Course	To provide student	ts with basic	concept of	different t	types of bi	nary soluti	ons, phase equ	ilibria ,				
Objective	conductance, orgai	nic reactions.										
Course	After completing th		•			-						
Outcomes:	•	CO1 : Explain the concepts of different types of binary solutions-miscible, partially miscible and										
	immiscible along with their applications											
	CO2 : Explain the thermodynamic aspects of equilibria between phases and draw phase diagrams of simple one component and two component systems											
	CO3 : Explain the factors that affect conductance, migration of ions and application of conductance											
	measurement											
	CO4: Understand different types of galvanic cells, their Nernst equations, measurement of emf											
	calculations of thermodynamic properties and other parameters from the emf measurements											
	CO5: Understand a	and demonstrate how the structure of biomolecules determines their chemical ty and biological uses										
	properties, reactivi											
	CO6: Design newer	synthetic rou	ites for vario	ous organi	c compoun	ds						
		C	COURSE SYL	LABUS								
need to ans ii) Question	no. 1 is compulsory and swer any four. Each part nos. 2 to 5 are to be set ts need to answer any tw	carries three from all four	and half ma units one fr	rks. om each.	Every ques	tion will ha	ve three sub-pa					
Unit No.			Content	S				ontact Hrs.				
I	SOLUTIONS AND PHAS	E EQUILIBRIA	L .					15				
	Solutions											
	Thermodynamics of id	eal solutions	: Ideal solut	ions and	Raoult's la	w, deviatio	ons from					
	Raoult's law – non-id											
	composition curves of	ideal and nor	n-ideal solut	ions. Distil	lation of so	olutions. Le	ver rule.					
	Azeotropes.											
	Partial miscibility of lic	uids: Critical	solution ter	nperature	; effect of i	impurity or	n partial					
	miscibility of liquids. In	mmiscibility c	of liquids- P	rinciple o	f steam o	distillation.	Nernst					
	distribution law and its	applications,	solvent ext	raction.								
	Phase Equilibria											
	Ρασρ											

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	Amino Acids, Peptides and Proteins	
v	AMINO ACIDS, PEPTIDES AND PROTEINS, AND CARBOHYDRATES	15
	Reactions: conversion to benzene, phenol, dyes.	
	Diazonium salts: Preparation: from aromatic amines.	
	Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.	
	Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO ₂ ,	
	reaction.	
	Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide	
	Amines (Aliphatic and Aromatic): (Upto 5 carbons)	
	Amines and Diazonium Salts	
	Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.	
	their interconversion.	
	Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and	
	Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)	
	Reactions: Hell – Vohlard - Zelinsky Reaction.	
	Preparation: Acidic and Alkaline hydrolysis of esters.	
	Carboxylic acids (aliphatic and aromatic)	
	Carboxylic acids and their derivatives	
111	CARBOXYLIC ACIDS AND THEIR DERIVATIVES, AMINES AND DIAZONIUM SALTS	15
	Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).	45
	pH determination using hydrogen electrode and quinhydrone electrode.	
	and without transference. Liquid junction potential and salt bridge.	
	Calculation of equilibrium constant from EMF data. Concentration cells with transference	
	properties: ΔG , ΔH and ΔS from EMF data.	
	Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic	
	Nernst equation and its importance. Types of electrodes. Standard electrode potential.	
	Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell.	
	Electrochemistry	
	Conductometric titrations (only acid- base).	
	products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt.	
	determination of degree of ionization of weak electrolyte, solubility and solubility	
	Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements:	
	and strong electrolytes. Kohlrausch law of independent migration of ions.	
	Conductivity, equivalent and molar conductivity and their variation with dilution for weak	
	Conductance	
II	CONDUCTANCE AND ELECTROCHEMISTRY	15
	and incongruent melting points (lead-silver, FeCl ₃ -H ₂ O and Na-K only).	
	systems (water and sulphur) and two component systems involving eutectics, congruent	
	equation and its importance in phase equilibria. Phase diagrams of one-component	
	Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron	

	Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.
	Reactions of Amino acids: ester of –COOH group, acetylation of –NH ₂ group, complexation with Cu ²⁺ ions, ninhydrin test.
	Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme).
	Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C- activating groups and Merrifield solid-phase synthesis.
	Carbohydrates
	Classification, and General Properties, Glucose and Fructose (open chain and cyclic
	structure), Determination of configuration of monosaccharides, absolute configuration
	of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides.
	Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysacharrides
<u>Cuga</u>	(starch and cellulose) excluding their structure elucidation.
Sugg 1.	e sted Readings: Barrow, G. M. Physical Chemistry Tata McGraw-Hill (2007).
1. 2.	
2. 3.	Kotz, J. C., Treichel, P. M. & Townsend, J. R. General Chemistry, Cengage Learning India Pvt. Ltd.: New
э.	Delhi (2009).
1	Mahan, B. H. University Chemistry, 3rd Ed. Narosa (1998).
4. 5	
5.	Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.: New York (1985).
6.	Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson
7	Education).
7.	Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
8.	Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
9.	Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed., W. H. Freeman.

10. Berg, J. M., Tymoczko, J.L. & Stryer, L. Biochemistry, W.H. Freeman, 2002.

Course No:	Course Name: Course Code:							
	GE Lab: Solution:	GE Lab: Solutions, Phase Equilibria, SBS CH 020202 GE 0042						
	Conductance, Electrochemistry & Functional Group							
	Organic Chemistry	-li						
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hr	
2022	Integrated B.Sc			_	_	_	per Week:	
Onwards	M.Sc. Chemistry	II	0	0	4	2	Total Hrs:	60
Total Evaluation Marks: 50CIE:15 Marks		Examination	Duration:	6 Hrs.				
		Pre-requisite	e of course:	Basic und	erstanding	of transitio	on metals, coo	ordinatic
TEE: 35 M	arks	chemistry, ki	inetic theo	ry of gases	and chemi	cal kinetics		
Course	To provide studer	its with basic	concept o	of transitio	on/inner ti	ransition m	etals and b	onding
Objective	coordination chem	istry. Also get i	idea about	various th	eories of re	action rate	s.	
Course	After completing t	•	•	ected to le	arn the foll	owing:		
Outcomes:	CO1: Determine d CO2 : Determine co		stant					
	CO3: Understand		titrations					
	CO4: Determine q			lysis				
			URSE SY					
NOTE:				LLADUJ				
-	s will be set, one from ea	ch of the UNIT.	The candida	ites are requ	uired to atte	mpt all the o	questions.	
Unit No.			Conten	ts				Contact Hrs.
I I	PHYSICAL CHEMISTRY	,						30
	Distribution							
	Study of the equilibriu	m of one of th	e following	g reactions	by the dis	tribution n	nethod:	
	2(aq) + I ⁻ (aq) = I ₃ ⁻ (aq)						
		I2(aq) + I (aq) = I ₃ (aq)						
	- (ad) + xNH₂(ad)	5 - (
		[Cu(NH ₃) _x] ²⁺						
	Phase equilibria	[Cu(NH ₃) _x] ²⁺						
l	Phase equilibria a) Construction of th		ram of a l	pinary sys	tem (simp	le eutectic) using	
 ;;	Phase equilibria a) Construction of th cooling curves	e phase diagr					_	
	Phase equilibria a) Construction of th cooling curves b) Determination of t	e phase diagr he critical solu	ution temp	perature a			_	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stud	e phase diagr he critical solu by of the effect	ution temp t of impurit	perature a ties on it	nd compos	sition of th	e phenol	
	Phase equilibria a) Construction of th cooling curves b) Determination of t	e phase diagr he critical solu ly of the effect on of mutual	ution temp t of impurit solubility 1	perature a ties on it temperatu	nd compos	sition of th ncentratior	e phenol	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stuc c) Study of the variati	e phase diagr he critical solu ly of the effect on of mutual	ution temp t of impurit solubility 1	perature a ties on it temperatu	nd compos	sition of th ncentratior	e phenol	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stuc c) Study of the variati phenol water system a	e phase diagr he critical solu ly of the effect on of mutual and determina	ution temp t of impurit solubility 1	perature a ties on it temperatu	nd compos	sition of th ncentratior	e phenol	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stuc c) Study of the variati phenol water system a Conductance (i) Determination of ce (ii) Determination of ce	e phase diagr he critical solu dy of the effect on of mutual and determina ell constant f equivalent	ution temp t of impurit solubility t tion of the	perature a ties on it temperatu critical so	nd compos re with co lubility ten	sition of th ncentration nperature.	e phenol	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stuc c) Study of the variati phenol water system a Conductance (i) Determination of ce (ii) Determination of ce dissociation constant of	e phase diagr he critical solu dy of the effect on of mutual and determina ell constant f equivalent of a weak acid	ution temp t of impurit solubility t tion of the conducta	erature a ties on it temperatu critical so ance, de	nd compos re with co lubility ten gree of	sition of th ncentration nperature. dissociatic	e phenol n for the on and	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stuc c) Study of the variati phenol water system a Conductance (i) Determination of ce (ii) Determination of ce	e phase diagr he critical solu dy of the effect on of mutual and determina ell constant f equivalent of a weak acid ving conductor	ution temp t of impurit solubility t tion of the conducta	erature a ties on it temperatu critical so ance, de	nd compos re with co lubility ten gree of	sition of th ncentration nperature. dissociatic	e phenol n for the on and	
	Phase equilibria a) Construction of th cooling curves b) Determination of t water system and stuc c) Study of the variati phenol water system a Conductance (i) Determination of ce (ii) Determination of dissociation constant of (iii) Perform the follow	e phase diagr he critical solu dy of the effect on of mutual and determina ell constant f equivalent of a weak acid ving conductor ng base	ution temp t of impurit solubility t tion of the conducta netric titra	erature a ties on it temperatu critical so ance, de ations: (a) s	nd compos re with co lubility ten gree of	sition of th ncentration nperature. dissociatic	e phenol n for the on and	

	(ii) Strong acid vs. strong base						
	(iii) Weak acid vs. strong base						
	(iv) Potassium dichromate vs. Mohr's salt						
II	ORGANIC CHEMISTRY	30					
	Systematic Qualitative Organic Analysis of Organic Compounds possessing						
	monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and						
	preparation of one derivative.						
	11						
	(i) Separation of amino acids by paper chromatography						
	(ii) Determination of the concentration of glycine solution by formylation method						
	(iii) Titration curve of glycine						
	(iv) Action of salivary amylase on starch						
	(v) Effect of temperature on the action of salivary amylase on starch						
	(vi) Differentiation between a reducing and a nonreducing sugar						
Suggestee	l Readings:						
1.	Vogel, A. I.; Tatchell, A. R.; Furnis, B. S.; Hannaford, A. J.; Smith, P. W. G. Textbook of Pra	ctical					
Organic C	hemistry, Prentice-Hall, 5 th ed, 1996.						
2.	Mann, F. G.; Saunders, B. C. Practical Organic Chemistry Orient-Longman, 1960.						
3.	Khosla, B. D.; Garg, V. C.; Gulati, A. Senior Practical Physical Chemistry, R. Chand & C	o.: New					
Delhi (202	.1).						
4.	Ahluwalia, V.K.; Aggarwal, R. Comprehensive Practical Organic Chemistry, Universit	ian Drann					

Course No:	Course Name:				Course C	ode:			
GE: Transition		tal & Coordi	nation Che	emistry,	SBS CH 020203 GE 4004				
	States of Matter &	Chemical Kin	etics			1			
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs.		
2022	Integrated B.Sc						per Week:	04	
Onwards	M.Sc. Chemistry	II	4	0	0	4	Total Hours:	60	
	ation Marks: 100	Examinatio	n Duration:	3 Hrs.					
CIE: 301	Marks	-			-		on metals, coor	dination	
TEE: 70 1	Marks	chemistry, k	inetic theo	ry of gases	and chemi	cal kinetics			
Course Objective	To provide studen coordination chem		-	-				nding in	
Outcomes: CO1: Understand cl CO2: Properties of CO3: Understandin CO4: Understandin CO5: Understand th		his course, student is expected to learn the following: hemistry of d and f block elements coordination compounds g VBT for bonding in coordination compounds g CFT for bonding in coordination compounds he real gases deviation from ideal behaviour f reactions and the factors that affect the rates of chemical reactions.							
need to ans	no. 1 is compulsory and swer any four. Each part nos. 2 to 5 are to be set	to be set fror carries three	and half ma	e syllabus. arks.			-		
	ts need to answer any ty						•		
Unit No.			Conten					ontact Hrs.	
1	TRANSITION ELEMENTS (3d SERIES) 15 General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu. 15 Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only). 15							15	
II	COORDINATION CHEM Valence Bond Theory ((coordination numbe with coordination num Drawbacks of VBT. IUP.	VBT): Inner a rs 4 and 6) bers 4 and 6.	. Structura	l and st				15	

	CRYSTAL FIELD THEORY Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for O_h and T_d complexes, Tetragonal distortion of octahedral geometry.	
	Jahn-Teller distortion, Square planar coordination.	
III	KINETIC THEORY OF GASES Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.	15
	Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO2.	
	Maxwell Boltzmann distribution laws of molecular velocities and molecular energies and their importance.	
	Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).	
IV	CHEMICAL KINETICS The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).	15
Sugge 1. 2. 3. 4. 5. 6.	sted Readings: Barrow, G.M. Physical Chemistry Tata McGraw-Hill, 2007. Castellan, G.W. Physical Chemistry 4 th Ed. Narosa, 2004. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998). Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York, 1985. Rodgers, G.E. Inorganic & Solid State Chemistry, Cengage Learning India Ltd., 2008. Atkins, P. Paula, J. Atkins' Physical Chemistry, 10 th Edition. Oxford University Press, 2014.	

Course No	GE Lab: Transitio	on Metal & Coordination es of Matter & Chemical			Course Code: SBS CH 020204 GE 0042				
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hr	s.	
2022	Integrated B.Sc						per Week:	04	
Onwards	M.Sc. Chemistry	П	0	0	4	2	Total Hrs:	60	
Total Evaluation Marks: 50		Examinatio	Examination Duration: 6 Hrs.						
TEE: 35 f	Marks Marks	chemistry, k	inetic theor	y of gases	and chemi	cal kinetics			
Course Objective	To provide studen coordination chem		•	-				onding in	
Course	After completing th				arn the foll	owing:			
Outcomes:	, ,			icals					
	CO2: Determine ha		er						
	CO3: Study reaction		ncion and	iccocity					
	CO4: Measuremen	t of surface te	ension and V	iscosity					
		CO	URSE SYI	LABUS					
NOTE:									
Unit No.	ns will be set, one from ea	ch of the UNIT.	The candida Content		ured to atte	mpt all the d	questions.	Contact	
onit No.			conten	.5				Hrs.	
I	INORGANIC CHEMIST		g H₂S or oth	er methoo	ls) of mixtu	res - not m	ore than	30	
 Semi-micro qualitative analysis (using H₂S or other methods) of mixtures - not more than two ionic species (one anion and one cation, excluding insoluble salts) out of the following: Cations : NH⁴⁺, Pb²⁺, Bⁱ³⁺, Cu²⁺, Cd²⁺, Fe³⁺, Al³⁺, Co²⁺, Ni²⁺, Mn²⁺, Zn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, K⁺ Anions : CO₃²⁻, S²⁻, SO₂⁻, S₂O₃²⁻, NO³⁻, CH₃COO⁻, Cl⁻, Br⁻, I⁻, NO₃, SO₄²⁻, PO₄³⁻, BO₃³⁻, 						²⁺ , K ⁺			
	C ₂ O ₄ ²⁻ , F ⁻ (Spot tests should be c	arried out wh	erever feasi	ible)					
	 Estimate the amount of nickel present in a given solution as bis(dimethylglyoximato) nickel(II) or aluminium as oximate in a given solution gravimetrically. Estimation of (i) Mg²⁺ or (ii) Zn²⁺ by complexometric titrations using EDTA. 								
II	PHYSICAL CHEMISTRY							30	
	 (I) Surface tension mea a) Determination of stalagmometer. b) Study of the variation (II) Viscosity measurem a) Determination of the an Ostwald's viscometed b) Study of the variation (III) Chemical Kinetics Study the kinetics of the 	the surface on of surface nent (use of o e relative and er. n of viscosity	tension of tension of a rganic solve absolute vis of an aquec	a liquid of detergen nts exclud scosity of a	or a dilute t solution v ed). a liquid or c	with concer lilute soluti	ntration. on using		

	 Initial rate method: Iodide-persulphate reaction Integrated rate method: Acid hydrolysis of methyl acetate with hydrochloric acid.
	3. Saponification of ethyl acetate.
Sugge	sted Readings:
1.	Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2.	Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3.	Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi

(2011).
Course No:	Course Name:				Course C	ode:				
	GE: Organometalli	cs, Bioinc	organic C	hemistry,		20301 GE 4	004			
	Polynuclear Hydroc	arbons and L	JV, IR Spect	roscopy						
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs	•		
2022	Integrated B.Sc						per Week:	04		
Onwards	M.Sc. Chemistry	- 111	4	0	0	4	Total Hours	: 60		
Total Evalua	ation Marks: 100	Examinatio	n Duration:	3 Hrs.						
CIE: 30 M	1arks	-				-	nents, bondin			
TEE: 70 M	1arks	in organom	etallic comp	ounds alor	ng with sor	me spectros	scopic parame	ters.		
Course	To provide	students with basic concept of bonding aspects in								
Objective	organometallic/bio	inorganic/po	lynuclear co	mpounds.						
Course	After completing th	nis course, stu	ident is exp	ected to le	arn the fol	lowing:				
Outcomes:	, , , , , , , , , , , , , , , , , , , ,									
	important properti		iliar compo	unds potas	sium dichi	romate, pot	tassium perma	anganate		
	and potassium ferr	•								
	CO2: Use IR data to	•		-		• •				
	CO3 : Get a general CO4: Understand t			•		• •		a and and		
	heterocyclic compounds through the study of methods of preparation, properties and chemical reactions with underlying mechanism									
	CO5: Gain insight into the basic fundamental principles of IR and UV-Vis spectroscopic techniques									
	CO6: Use basic theoretical principles underlying UV-visible and IR spectroscopic techniques									
	functional group id	•	•			•	.,			
	· _ · _ · _ · _ ·	(COURSE SYL	LABUS						
NOTE:										
	no. 1 is compulsory and			-	t will have	seven sub-	parts and stud	lents		
	wer any four. Each part									
	nos. 2 to 5 are to be set							parts		
	s need to answer any tw	vo sub-parts (part carrie	es seven ma		.		
Unit No.			Conten	LS .				Contact		
	CHEMISTRY OF 3d MET							Hrs. 15		
•	CHEIMISTRY OF 50 MIET	ALS AND OK	GANONILIA		FOUNDS			15		
	Chemistry of 3d metal	c								
	Oxidation states displa		Co Ni and	Co						
	A study of the followin				n and imp	ortant pro	nerties).			
		of Cr, K								
	nitroprusside, [Co(NH ₃]				4[. 0(0. 76]	,				
	Organometallic Compo	ounds								
	Definition and Classifi carbon bond (ionic, s Zeiss salt and ferror bonding and properties	s, p and m cene. EAN ru	ulticentre Ile as appli	bonds). S ed to cark	tructures oonyls. Pre	of methyl eparation, s	lithium, structure,			

	acceptor behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).	
II	BIO-INORGANIC CHEMISTRY A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na ⁺ , K ⁺ and Mg ²⁺ ions: Na/K pump; Role of Mg ²⁺ ions in energy production and chlorophyll. Role of Ca ²⁺ in blood clotting, stabilization of protein structures and structural role (bones).	15
III	POLYNUCLEAR AND HETERONUCLEAR AROMATIC COMPOUNDS AND ACTIVE METHYLENE COMPOUNDS Polynuclear/heteronuclear aromatic compounds Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene, Anthracene, Furan, Pyrrole, Thiophene, and Pyridine. Active methylene compounds: Preparation: Claisen ester condensation. Keto-enol tautomerism. Reactions: Synthetic uses of ethylacetoacetate (preparation of non-heteromolecules having upto 6 carbon).	15
IV	APPLICATION OF SPECTROSCOPY TO SIMPLE ORGANIC MOLECULESApplication of visible, ultraviolet and infrared spectroscopy in organic molecules. Electromagnetic radiation, electronic transitions, $\lambda_{max} \& \varepsilon_{max}$, chromophore, auxochrome, bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes and α,β – unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).	15

1. Huheey, J. E.; Keiter, E.; Keiter, R. *Inorganic Chemistry: Principles of Structure and Reactivity,* Pearson Publication.

- 2. Miessler, G. L.; Tarr, D. A. Inorganic Chemistry, Pearson Publication.
- 3. Lee, J. D. A New Concise Inorganic Chemistry, E.L.B.S.
- 4. Cotton, F. A.; Wilkinson, G. *Basic Inorganic Chemistry*, John Wiley & Sons.
- 5. Finar, I. L. Organic Chemistry (Vol. I & II), E.L.B.S.
- 6. Dyer, J. A. Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall.

7. Silverstein, R. M.; Bassler, G. C.; Morrill, T. C. *Spectroscopic Identification of Organic Compounds*, John Wiley & Sons.

- 8. Morrison, R. T.; Boyd, R. N. Organic Chemistry, Prentice Hall.
- 9. Sykes, P. A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
- 10. Bahl, A.; Bahl, B. S. Advanced Organic Chemistry, S. Chand.

Course No	: Course Name:				Course	Code:					
	GE Lab: Organomet Polynuclear Hydrod	-	•		SBS CH	020302 GE	4004				
Batch:	Programme:	Semester:	L	T	Р	Credit	Contact Hr	s.			
2022	Integrated B.Sc						per Week:	04			
Onwards	M.Sc. Chemistry		0	0	4	2	Total Hrs:	60			
Total Evalu	ation Marks: 50	Examinatio	n Duration:	6 Hrs.							
CIE: 15 M	Marks	Pre-requisite of course: Basic understanding of metal-carbon bonds, metal ions in biology, hydrocarbons and spectroscopy.									
	Marks										
Course Objective								onding in			
Course	After completing th	nis course, stu	dent is exp	ected to le	arn the fol	lowing:					
Outcomes: CO1: Understandin		•		n chemistı	ry						
	CO2: Importance of		0,								
	CO3: Understandin			าร							
		CO4: Synthesis of simple molecules CO5: And their characterizations by UV and IR spectroscopy									
	COS: And their cha				сору						
			URSE SY	LLABUS							
NOTE: Two questio	ns will be set, one from ea	ch of the UNIT.	The candida	tes are regi	uired to atte	empt all the o	questions.				
Unit No.			Conten	-		•		Contact			
1	INORGANIC CHEMISTR	Y						Hrs. 30			
								50			
	 Separation of mixtu (Combination of two io 	•		: Measure	e the Rf	value in ea	ich case.				
	Paper chromatographic	c separation o	of Fe ³⁺ , A1 ³⁺	and Cr ³⁺ o	r						
	Paper chromatographic	separation o	of Ni ²⁺ , Co ²⁺ ,	Mn ²⁺ and	Zn ²⁺						
	2. Preparation of any conductivity:	two of the	following	complexes	s and mea	asurement	of their				
	a. tetraamminecarb	onatocobalt (III) nitrate								
	b. tetraamminecopp	-	-								
	c. potassium trioxal										
	Compare the conducta	• •	•	h that of N	4/1000 col	ution of No					
	and LiCl ₃ .		ipickes wit	n that OF IV	η 1000 30H						
11	ORGANIC CHEMISTRY							30			
								50			
	monofunctional groups		enolic, aldel	nydic, keto	onic, amide	, nitro, ami	ossessing nes) and				
	preparation of one der	ivative. Chara	acterization	by UV and	d IR spectr	oscopy.					

- 1. A.I. Vogel: Qualitative Inorganic Analysis, Prentice Hall, 7th Edn.
- 2. A.I. Vogel: Quantitative Chemical Analysis, Prentice Hall, 6th Edn.
- 3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- 4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

Course No:	Course Name: GE: Quantum Chen Photochemistry	nistry, Spectro	oscopy &		Course Co SBS CH C	o de: 020303 GE	4004			
Batch: 2022	Programme: Integrated B.Sc	Semester:	L	Т	Р	Credit	Contact Hr per Week:		04	
Onwards	M.Sc. Chemistry	III	4	0	0	4	Total Hour	rs: 6	60	
Total Evalua	tion Marks: 100	Examinatio	n Duration:	3 Hrs.						
CIE: 30 N	larks	Pre-requisit	e of cou	r se: Basic	understa	nding of	quantum n	nechan	nics	
TEE: 70 M	larks	molecular s	pectroscopy	/ and phot	ochemical ı	eactions.				
Course		ts with basic	s with basic concept of quantum mechanics, bonding in molecules, electronic							
Objective	transition, quantum					5				
Course	After completing th	nis course, stu	ident is exp	ected to le	arn the foll	owing:				
Outcomes:	CO1 : Understand basic principles of quantum mechanics: operators, eigen values, averages,									
	probability distribu									
	CO2 : Understand c		-						£	
	CO3 : Understand interpretation of sp		isic concep	ts of mic	rowave, I	k and UV	-vis spectro	scopy	10	
	CO4: Understand t		tals of elect	ron spin r	esonance					
	CO5: Understandin			•						
		reactions and the factors that affect the rates of chemical reactions.								
		(COURSE SYL	LABUS						
ii) Question	wer any four. Each part nos. 2 to 5 are to be set s need to answer any ty	t from all four	units one f	rom each.				-parts		
Unit No.			Conten		<u>p - </u>			Conta Hrs.		
1	QUANTUM CHEMISTR	Y						15		
	Postulates of quantum		uantum me	chanical op	perators, Sc	hrödinger e	equation			
	and its application t	o free parti	cle and "p	article-in-	a-box" (rig	orous trea	atment),			
	quantization of energy		• •	•	-		•			
	wavefunctions, probab three dimensional boxe					tension to	two and			
	Qualitative treatment on up of Schrödinger equ energy of diatomic mol	ation and dis	scussion of	solution a			-			
	Angular momentum: momentum and z-com		n rules, qu	antization	of square	e of total	angular			
	Rigid rotator model transformation to sphe harmonics. Discussion	erical polar				-	-			

11	CHEMICAL BONDING Covalent bonding, valence bond and molecular orbital approaches, LCAO-MO treatment of H ²⁺ . Bonding and antibonding orbitals. Qualitative extension to H2. Comparison of LCAO-MO and VB treatments of H ₂ (only wavefunctions, detailed solution not required) and their limitations. Refinements of the two approaches (Configuration Interaction for MO, ionic terms in VB). Qualitative description of LCAO-MO treatment of homonuclear and heteronuclear diatomic molecules (HF, LiH). Localised and non-localised molecular orbitals treatment of triatomic (BeH ₂ , H ₂ O) molecules. Qualitative MO theory and its application to AH2 type molecules.	15
111	 MOLECULAR SPECTROSCOPY Interaction of electromagnetic radiation with molecules and various types of spectra; Born- Oppenheimer approximation. Rotation spectroscopy: Selection rules, intensities of spectral lines, determination of bond lengths of diatomic and linear triatomic molecules, isotopic substitution. Vibrational spectroscopy: Classical equation of vibration, computation of force constant, amplitude of diatomic molecular vibrations, anharmonicity, Morse potential, dissociation energies, fundamental frequencies, overtones, hot bands, degrees of freedom for polyatomic molecules, modes of vibration, concept of group frequencies. Vibration-rotation spectroscopy: diatomic vibrating rotator, P, Q, R branches. Raman spectroscopy: Qualitative treatment of Rotational Raman effect; Effect of nuclear spin, Vibrational Raman spectra, Stokes and anti-Stokes lines; their intensity difference, rule of mutual exclusion. Electronic spectroscopy: Franck-Condon principle, electronic transitions, singlet and triplet states, fluorescence and phosphorescence, dissociation and predissociation, calculation of electronic transitions of polyenes using free electron model. 	15
IV	PHOTOCHEMISTRY Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws, of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, photosensitised reactions, quenching. Role of photochemical reactions in biochemical processes, photostationary states, chemiluminescence.	15

1. Banwell, C. N. & McCash, E. M. *Fundamentals of Molecular Spectroscopy* 4th Ed. Tata McGraw-Hill: New Delhi, 2006.

2. Chandra, A. K. Introductory Quantum Chemistry Tata McGraw-Hill, 2001.

3. House, J. E. *Fundamentals of Quantum Chemistry* 2nd Ed. Elsevier: USA, 2004.

4. Lowe, J. P. & Peterson, K. *Quantum Chemistry*, Academic Press, 2005.

5. Kakkar, R. Atomic & Molecular Spectroscopy: Concepts & Applications, Cambridge University Press, 2015.

6. Rohatgi, K. K. Mukherjee, K. K. Fundamentals of Photochemistry, 3rd Edition. New Age International (P) Ltd., 2014.

Course No	: Course Name:												
	GE Lab: Quantur	n Chemistry,	Spectrosco	ору &	SBS CH (020304 GE 00)42						
	Photochemistry												
Batch:	Programme:	Semester:	L	Т	Р	Credit C	Contact Hrs						
2022	Integrated B.Sc					p	er Week:	04					
Onwards	M.Sc. Chemistry	111	0	0	4	2 T	otal Hrs:	60					
Total Evalu	ation Marks: 50	Examinatio	n Duration:	6 Hrs.									
CIE: 15	Marks												
		Pre-requisit	e of course	Knowled	ge of spect	roscopy and co	olourimetry	/					
	Marks					, , ,							
Course	To provide studen					bonding in m	nolecules, e	lectronic					
Objective	transition, quantui	n ejjiciency ur	ια ρποτοςπε	micu proc	Lesses.								
Course	After completing t												
Outcomes		• •	les of quar	ntum med	chanics: op	perators, eiger	n values, a	verages,					
	probability distribu												
	CO2: Understand c CO3: Understand		-		rowaya	P and UV/VI	S spectros	conv for					
			sic concep		, owave, I		sherring	-opy 101					
		interpretation of spectra CO4: Understand the fundamentals of electron spin resonance											
		CO5: Understanding fundamental of photophysical phenomena											
		-	reactions and the factors that affect the rates of chemical reactions.										
		CO	URSE SYI	LABUS									
NOTE:													
-	ons will be set, one from ea	ch of the UNIT.			uired to atte	empt all the que							
Unit No.			Content	S				Contact Hrs.					
1	UV/VISIBLE SPECTROS	COPY											
	UV/VISIBLE SPECTROSCOPY												
) Study the 200-500 nm absorbance spectra of KMnO ₄ and K ₂ Cr ₂ O ₇ (in 0.1 M H ₂ SO ₄) and determine the λ_{max} values. Calculate the energies of the two transitions in different												
C			•			-	-	30					
	determine the λ_{max} v units (J molecule ⁻¹ , kJ	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV	ite the ene /).	rgies of t	he two tra	insitions in dif	-						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen	alues. Calcula nol ⁻¹ , cm ⁻¹ , eV dence of the l	ite the ene (). UV-Vis spec	rgies of t trum (200	he two tra)-500 nm) d	of K ₂ Cr ₂ O ₇ .	ferent						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the ¹) nm UV spect	ite the ene (). UV-Vis spec ra of the giv	rgies of t trum (200 ven compo	he two tra 0-500 nm) o ounds (ace	ansitions in dif of $K_2Cr_2O_7$. tone, acetalde	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the ¹ nm UV spect cid) in water.	ite the ene (). UV-Vis spec ra of the giv	rgies of t trum (200 ven compo	he two tra 0-500 nm) o ounds (ace	ansitions in dif of $K_2Cr_2O_7$. tone, acetalde	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the ¹ nm UV spect cid) in water.	ite the ene (). UV-Vis spec ra of the giv	rgies of t trum (200 ven compo	he two tra 0-500 nm) o ounds (ace	ansitions in dif of $K_2Cr_2O_7$. tone, acetalde	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the ¹ nm UV spect cid) in water.	ite the ene (). UV-Vis spec ra of the giv	rgies of t trum (200 ven compo	he two tra 0-500 nm) o ounds (ace	ansitions in dif of $K_2Cr_2O_7$. tone, acetalde	ferent ehyde,						
11	determine the λ _{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the 0 nm UV spect cid) in water. npounds.	ite the ene (). UV-Vis spec ra of the giv Comment	rgies of t trum (200 ven compo on the e	he two tra 0-500 nm) o ounds (ace effect of s	onsitions in dif of K ₂ Cr ₂ O ₇ . tone, acetalde tructure on t	ferent ehyde,	30					
<u> </u>	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambé	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the 0 nm UV spect cid) in water. npounds.	ite the ene (). UV-Vis spec ra of the giv Comment	rgies of t trum (200 ven compo on the e and d	he two tra 0-500 nm) o ounds (ace effect of s	the	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambe concentration of CuSO	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the 0 nm UV spect cid) in water. npounds. ert-Beer's	lte the ene (). UV-Vis spec ra of the giv Comment law r ₂ O ₇ in a sc	rgies of t trum (200 ven compo on the e and d lution of t	he two tra 0-500 nm) o punds (ace effect of s effect of s etermine unknown c	the oncentration	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambe concentration of CuSC ii) Determine the conc	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the m UV spect cid) in water. pounds. ert-Beer's 04/KMnO4/K2C entrations of	lte the ene (). UV-Vis spec ra of the giv Comment law r ₂ O ₇ in a sc KMnO4 and	rgies of t trum (200 /en compo : on the e and d lution of u K ₂ Cr ₂ O ₇ ir	he two tra 0-500 nm) o ounds (ace effect of s etermine unknown c n a mixture	the oncentration	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambe concentration of CuSO ii) Determine the conc iii) Study the kinetics of	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the 0 nm UV spect cid) in water. npounds. ert-Beer's 04/KMnO4/K2C entrations of f iodination o	lte the ene (). UV-Vis spec ra of the giv Comment law r ₂ O ₇ in a sc KMnO ₄ and f propanon	rgies of t trum (200 ven compo on the e and d lution of u K ₂ Cr ₂ O ₇ ir e in acidic	he two tra 0-500 nm) o ounds (ace effect of s etermine unknown c n a mixture medium.	the oncentrations	ferent ehyde,						
- 11	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambe concentration of CuSC ii) Determine the conc iii) Study the kinetics of iv) Determine the amo	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the 0 nm UV spect cid) in water. pounds. ert-Beer's 04/KMnO4/K2C entrations of f iodination o unt of iron pr	Ite the ene (). UV-Vis spectors of the given comment Comment Iaw r_2O_7 in a sector KMnO4 and f propanone esent in a sectors	rgies of t trum (200 ven compo on the e and d lution of u K ₂ Cr ₂ O ₇ ir e in acidic ample usin	he two tra 0-500 nm) o ounds (ace effect of s effect of s etermine unknown c n a mixture medium. ng 1,10-ph	the oncentrations enathroline.	ferent ehyde,						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambe concentration of CuSO ii) Determine the conc iii) Study the kinetics of	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the onm UV spect cid) in water. pounds. ert-Beer's 04/KMnO4/K2C entrations of f iodination o unt of iron pr ciation consta	te the ene (). UV-Vis spec ra of the giv Comment law r_2O_7 in a so KMnO ₄ and f propanon esent in a si ant of an inc	rgies of t trum (200 /en compo : on the e and d lution of u K ₂ Cr ₂ O ₇ ir e in acidic ample usin dicator (ph	he two tra -500 nm) o bunds (ace effect of s etermine unknown c n a mixture medium. ng 1,10-ph henolphtha	the oncentrations. tone, acetalde tructure on t the oncentration c. enathroline. alein).	ferent hyde, he UV						
	determine the λ_{max} v units (J molecule ⁻¹ , kJ ii) Study the pH-depen iii) Record the 200-350 2-propanol, acetic ac spectra of organic con COLOURIMETRY i) Verify Lambe concentration of CuSC ii) Determine the conc iii) Study the kinetics o iv) Determine the amo v) Determine the disso	alues. Calcula mol ⁻¹ , cm ⁻¹ , eV dence of the onm UV spect cid) in water. pounds. ert-Beer's 04/KMnO4/K2C entrations of f iodination o unt of iron pr ciation consta	te the ene (). UV-Vis spec ra of the giv Comment law r_2O_7 in a so KMnO ₄ and f propanon esent in a si ant of an inc	rgies of t trum (200 /en compo : on the e and d lution of u K ₂ Cr ₂ O ₇ ir e in acidic ample usin dicator (ph	he two tra -500 nm) o bunds (ace effect of s etermine unknown c n a mixture medium. ng 1,10-ph henolphtha	the oncentrations. tone, acetalde tructure on t the oncentration c. enathroline. alein).	ferent hyde, he UV						

1. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

2. Khosla, B. D.; Garg, V. C. & Gulati, A., *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).

3. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. *Experiments in Physical Chemistry* 8th Ed.; McGraw-Hill: New York (2003).

4. Halpern, A. M. & McBane, G. C. *Experimental Physical Chemistry 3rd Ed.;* W.H. Freeman & Co.: New York (2003).

1	: Course Name: GE: Molecules of L	ife		Course Code: SBS CH 020401 GE 4004							
Batch: 2022	Programme: Integrated B.Sc	Semester:	L	Т	P	Credit	Contact Hr	s. 04			
Onwards	M.Sc. Chemistry	IV	4	0	0	4	Total Hour	s: 60			
Total Evalu	ation Marks: 100	Examination	Duration:	3 Hrs.		·					
	Marks	Pre-requisite	e of course	: Basic und	lerstanding	of biologic	al processes				
	Marks						1				
Course Objective	To provide student	s with basic co	ncept of bi	lological pr	ocesses and	a energy in	biosystem.				
Course Outcomes:	After completing ti CO1: Learn and o properties, reactiv CO2: Gain an insig CO3: Understand t CO4: Understand t CO5: Demonstrate energy production CO6: To understan	demonstrate h ity and biologic nt into mechan he basic princi biological proce an understand from biochem d concept of e	now the s cal uses ism of enz ples of dru esses like r ing of met ical proces	tructure of yme action g-receptor eplication, abolic path sses osystems	of biomoleon and inhibi interaction transcription	tion and SAR on and tran	slation				
				LADOJ							
need to ans ii) Questior	no. 1 is compulsory and swer any four. Each part n nos. 2 to 5 are to be se nts need to answer any tr	carries three a t from all four	and half ma units one f	arks. rom each. stion. Each	Every ques	tion will ha	ve three sub				
I	CARBOHYDRATES			CARBOHYDRATES							
	Classification of carbo	ohydrates, reducing and non-reducing sugars, General properties se, their open chain structure. Epimers, mutarotation and anomers. figuration of Glucose (Fischer proof). acose. Haworth projections. Cyclic structure of fructose. nonosachharides, structure of disacharrides (sucrose, maltose, narrides (starch and cellulose) excluding their structure elucidation.									
	Determination of conf Cyclic structure of gluc Linkage between mo	e, their open ch iguration of GI cose. Haworth pnosachharides	ain struct ucose (Fise projection s, structu	cure. Epime cher proof s. Cyclic st re of dis	ers, mutaro). ructure of acharrides	tation and fructose. (sucrose,	anomers. maltose,	15			
11	Determination of conf Cyclic structure of gluc Linkage between mo	e, their open ch iguration of Gl cose. Haworth pnosachharides arrides (starch	ain struct ucose (Fise projection s, structu and cellulo	cure. Epime cher proof s. Cyclic st re of dis	ers, mutaro). ructure of acharrides	tation and fructose. (sucrose,	anomers. maltose,	15			

III	ENZYMES AND CORRELATION WITH DRUG ACTION, AND NUCLEIC ACIDS	15			
	Enzymes and correlation with drug action Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, Specificity of enzyme action (including stereospecificity), Enzyme inhibitors and their importance, phenomenon of inhibition(Competitive and Non- competitive inhibition including allosteric inhibition). Drug action-receptor theory. Structure –activity relationships of drug molecules, binding role of –OH group,-NH2 group, double bond and aromatic ring.				
	Nucleic Acids Components of nucleic acids: Adenine, guanine, thymine and Cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (nomenclature), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.				
IV	LIPIDS AND CONCEPT OF ENERGY IN BIOSYSTEMS				
	Lipids Introduction to lipids, classification. Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).				
	Concept of Energy in Biosystems Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.				
1. 2. 3.	ed Readings: Morrison, R. T.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson I Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson I Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson I Nelson, D. L.; Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed., W. H. Freeman.	Education).			

Neison, D. L.; Cox, M. M. Leminger's Principles of Biochemistry 7th Ed., V
 Berg, J. M. Tymoczko, J.L. & Stryer, L. Biochemistry, W.H. Freeman, 2002.

Course No:	Course Name:				Course Co	ode:			
	GE Lab: Molecul	es of Life			SBS CH 02	0402 GE 0	042		
Batch:	Programme:	Semester:	L	т	Р	Credit	Contact Hr		
2022	Integrated B.Sc						per Week:	04	
Onwards	M.Sc. Chemistry	IV	0	0	4	2	Total Hrs:	60	
Total Evaluati	on Marks: 50	Examinatio	n Duration:	6 Hrs.					
CIE: 15 Ma	rks	-					aper chroma ction of D		
TEE: 35 Ma	rks	onion/caulif		,					
Course	To provide studer	nts with bas	s with basic concept of synthesis of medicinal compounds and paper						
Objective	chromatography. A			-		-	ne given samp	ole.	
Course	After completing th		•			-			
Outcomes:	CO1: To understan	• •		' in separat	ion of amin	o acids			
	CO2 : Determine sage CO3 : To understan								
	CO4: Synthesis of se			ds					
		CO	URSE SYI	LABUS					
NOTE:			The second state		····				
Unit No.	will be set, one from eac	ch of the UNIT.	Content		lired to atten	npt all the c	questions.	Contact	
Onic No.			conten	.5				Hrs.	
I IN	IORGANIC CHEMISTR	Y						30	
1.	Separation of amino	o acids by pap	per chromat	ography					
	To determine the co			olution by	formylation	n method.			
	Study of titration cu	• •							
	Action of salivary ar	•							
5.	Effect of temperatu	re on the act	ion of saliva	iry amylase	e on starch.				
II O	RGANIC CHEMISTRY							30	
1.	To determine the sa	ponification	value of an	oil/fat.					
	To determine the io	•		- ,					
3.	Differentiate betwe	en a reducing	g/nonreduci	ng sugar.					
4.	Extraction of DNA fr	rom onion/ca	uliflower						
	To synthesise aspir	• •		alicylic aci	d and con	npare it v	with		
th	e ingredient of an as	pirin tablet b	y TLC.						
Cuggostad Da	dinan								
Suggested Rea	-		V · Smith		Tatchell A	P Vogel	c Textbook of	f Practical	
	s, B. S.; Hannaford, A Chemistry, ELBS.	J., NUGEIS,	v., Jiiilii,	· · · · · · · · · · · · · · · · · · ·	atticit, A.	n. vogers	STEALDOOK OJ	riucucui	
_	-	P Comarch	anciua Drac	tical Oraca	ic Chamistr	v Universi	ities Proce		
Z. Aniuw	alia, V. K.; Aggarwal,	n. compren	ensive Pluci	licui Organ		y, Universi	11155 11855.		

	: Course Name: GE: Chemistry of I	Main Group E	lements, Tł	neories of	Course Code: f SBS CH 020403 GE 4004			
	Acids and Bases		· · · · · · · · · · · · · · · · · · ·					
Batch: 2022	Programme: Integrated B.Sc	Semester:	L	т	Р	Credit	Contact Hrs. per Week:	04
Onwards	M.Sc. Chemistry	IV	4	0	0	4	Total Hours:	60
Total Evalu	ation Marks: 100	Examination	n Duration:	3 Hrs.				
CIE: 30	Marks							
TEE: 70	Marks	Pre-requisit	e of course	: Basic pro	perties of a	acid-base ar	nd <i>s/p</i> -block el	ements.
Course	To provide student	s with basic co	ncent of n	priodic pro	nerties and	honding a	snects in mole	rules
Objective					perties and	a bonding a.	spects in mole	cures.
Course	After completing t	his course, stu	dent is exp	ected to le	arn the fol	lowing:		
Outcomes								
	CO2: Gain an insig		•			,		
	CO3: To understan	•	• •	•	operties of	s/p-block e	elements	
	CO4: To understan CO5: Understandir		-	poranes				
	CO6: To understandin	0	• •					
		a concept of p	scadonane					
		C	OURSE SYL	LABUS				
need to an ii) Question	no. 1 is compulsory and swer any four. Each part					COVON CUB-		ontc
	n nos. 2 to 5 are to be se Its need to answer any ty	t from all four	and half ma units one f	arks. rom each.	Every ques	tion will ha	ve three sub-p	
Unit No.	n nos. 2 to 5 are to be se its need to answer any to	t from all four	and half ma units one f	arks. rom each. stion. Each	Every ques	tion will ha	ve three sub-p arks.	oarts Contact
Unit No.		t from all four wo sub-parts c	and half ma units one f of each que Conten	arks. rom each. stion. Each ts	Every ques part carrie	tion will ha	ve three sub-p arks.	arts

II	s- AND p-BLOCK ELEMENTS	15
	Periodicity in <i>s</i> - and <i>p</i> -block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electronegativity (Pauling scale).	
	General characteristics of <i>s</i> -block metals like density, melting and boiling points, flame colour and reducing nature.	
	Oxidation states of <i>s</i> - and <i>p</i> -block elements, inert-pair effect, diagonal relationships and anomalous behaviour of first member of each group. Allotropy in C, P and S.	
	Complex forming tendency of <i>s</i> block elements and a preliminary idea of crown ethers and cryptates, structures of basic beryllium acetate, salicylaldehyde/ acetylacetonato complexes of Group 1 metals.	
	Solutions of alkali metals in liquid ammonia and their properties. Common features, such as ease of formation, solubility and stability of oxides, peroxides, superoxides, supprates and carbonates of <i>s</i> -block metals.	
III	Structure, bonding and properties	15
	Diborane and concept of multicentre bonding, hydrides of Groups 13 (EH3), 14, 15, 16 and 17.	
	Oxides of N and P, Oxoacids of P, S and Cl. Halides and oxohalides of P and S (PCl ₃ , PCl ₅ , SOCl ₂ and SO ₂ Cl ₂), Interhalogen compounds. A brief idea of pseudohalides	
IV	NOBLE GASES AND INORGANIC POLYMERS	15
	Noble gases Rationalization of inertness of noble gases, clathrates, preparation and properties of XeF_2 , XeF_4 and XeF_6 , bonding in these compounds using VBT and shapes of noble gas compounds using VSEPR Theory.	
	Inorganic Polymers Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates. Synthesis, structural features and applications of silicones. Borazines and cyclophosphazenes – preparation, properties and reactions. Bonding in $(NPCl_2)_3$.	
	sted Readings:	
1. 2.	Lee, J. D. Concise Inorganic Chemistry ELBS, 1991. Cotton, F. A.; Wilkinson, G.; Gaus, P. L. Basic Inorganic Chemistry, 3rd ed. Wiley.	
3.		John Wiley
4.		
5. 6.	Rodger, G. E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002. Miessler, G. L.; Tarr, D. A. Inorganic Chemistry 4th Ed. Pearson, 2010.	
o. 7.		

Course No	: Course Name:									
	GE Lab: CHEMI	STRY OF MAIN	GROUP EL	EMENTS,	SBS CH (020404 GE	0042			
	THEORIES OF ACID	S AND BASES								
Batch:	Programme:	Semester:	L	Т	Р	Credit	Contact Hrs	5.		
2022	Integrated B.Sc						per Week:	04		
Onwards	M.Sc. Chemistry	IV	0	0	4	2	Total Hrs:	60		
Total Evalu	ation Marks: 50	Examination	n Duration:	6 Hrs.						
CIE: 15 M	Marks	Pre-requisite of course: Basic understanding of quantitative analysis and								
TEE: 35 N	Marks	synthesis of some inorganic complexes.								
Course	To provide studer	ts with basic	concept o	of iodomet	ric estima	tion. gravii	metric estima	ation an		
Objective	determination of c			-		, 8				
Course	After completing this course, student is expected to learn the following:									
Outcomes:	CO1: To understan									
	CO2 : To understan	•			nlos					
		CO3: Determination of dissolved oxygen in water samples CO4: Synthesis of some inorganic complexes								
		CO	URSE SY	LLABUS						
NOTE:			The sevel de		inclusion atta					
Unit No.	ns will be set, one from ea	ich of the UNIT.	Conten		ured to atte	empt all the o	-	Contact		
			conten					Hrs.		
I	INORGANIC CHEMIST	RY						30		
	1.lodometric estimatio	•			pper sulp	hate				
	2.lodimetric estimatio 3.Estimation of amou	•			hing now	dor and he	ucohold			
	bleaches	unt of availat			ning pow		usenoiu			
	4. Estimation of iodine	e in iodized sa	lts.							
	5. lodimetric estimation			it juices.						
II	ORGANIC CHEMISTRY							30		
	1. Estimation of dissolv	ved oxygen in v	water sami	oles						
	2. Gravimetric estimat	10	•							
	3. Gravimetric estimat	•		•	ex					
	4. Preparation of the			•		traammine	copper(II)			
	sulphate monohydrate	-	rioxalatofe	rrate(III) (any two, i	ncluding or	ne double			
	salt and one complex).									
Suggested I	-									
1 0					-11 2041					
	hla, G. Vogel's Qualitati ndham, J. Vogel's Quan	-	-			2.				

5. TEACHING-LEARNING PROCESS

- Lectures
- Discussions
- Simulations
- Role Playing
- Participative Learning
- Interactive Sessions
- Seminars
- Research-based Learning/Dissertation or Project Work
- Technology-embedded Learning
- Hands on training
- Self study analysis
- Report writing

6. IMPLEMENTATION OF BLENDED LEARNING

Blended Learning is a pedagogical approach that combines face to-face classroom methods with computer-mediated activities in the process of teaching and learning. It implies nice blend of face-to-face and online activities to make the learning processes more interesting and engaging. It focuses on integration of traditional classroom activities and innovative ICT-enabled strategies. It emphasizes student-centric learning environment where the teacher is the facilitator for productive and measurable learning outcomes. It optimizes and compliments the face to face learning, giving ample freedom and flexibility to the students and teachers to access and explore the wide range of openaccess sources such as video lectures, podcasts, recordings and articles through digital platforms. It gives freedom and autonomy to the teachers in selection of appropriate digital platforms, resources and time-slots to complement and supplement face to face learning. The Blended Learning doesn't undermine the role of the teacher, rather it gives him/her an opportunity to explore the unexplored in accordance with the requirements of the curriculum.

Key features of Blended Learning

- Student-Centric Pedagogical Approach focusing on flexibility in timing, quality content, needs and interests of students and freedom to study through the mode of his/her choice;
- Freedom to Select variety of mediums and techniques;
- Increased student engagement in learning;
- Enhanced teacher and student interaction;
- Improved student learning outcomes;
- More flexible teaching and learning environment;
- More responsive for self and continuous learning;
- Better opportunities for experiential learning;
- Increased learning skills;
- Greater access to information, improved satisfaction and learning outcomes.

Note: It was resolved that Blended Learning with 40% component of online teaching and 60% face to face classes for each programme, may be adopted

7. ASSESSMENT AND EVALUATION

Overall assessment will be made as per relevant ordinances of CUH.

- Continuous Comprehensive Evaluation at regular after achievement of each Course-level learning outcome
- Formative Assessment on the basis of activities of a learner throughout the programme instead of one-time assessment
- Oral Examinations to test presentation and communication skills
- Open Book Examination for better understanding and application of the knowledge acquired if required
- Group Examinations on Problem solving exercises
- Seminar Presentations
- Review of Literature
- Collaborative Assignments

8. REFERENCES

- Instructional Template for Facilitating Implementation of Choice Based Credit System (CBCS) (<u>https://www.ugc.ac.in/pdfnews/4426331 Instructional-</u> <u>Template.pdf</u>)
- Scheme and Syllabi of B. Sc. Honours with chemistry (https://www.ugc.ac.in/pdfnews/6573215_B.Sc.HONOURS-CHEMISTRY.pdf)
- Scheme and Syllabi of B. Sc. with chemistry (<u>https://www.ugc.ac.in/pdfnews/0614691_LOCF-chemistry.pdf</u>)
- National Education Policy-2020. <u>https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0</u> .pdf
- The draft subject specific LOCF templates available on UGC website. <u>https://www.ugc.ac.in/ugc notices.aspx?id=MjY500</u>==
- Draft Blended Mode of Teaching and Learning: Concept Note available on UGC website. <u>https://www.ugc.ac.in/pdfnews/6100340 Concept-Note-Blended-Mode-of-Teaching-and-Learning.pdf</u>
- Guidelines for Multiple Entry and Exit in Academic Programmes offered in Higher Education Institutions (<u>https://www.ugc.ac.in/e-book/GL%20Multipe%20Entry%20Exit/mobile/index.html</u>)

9. APPENDICES

• Curricular Reforms — Extracts from National Education Policy-2020