

# KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029

Course Name **B.SC., CHEMISTRY**

Curriculum and Scheme of Examination under CBCS

(Applicable to the students admitted during the Academic Year 2021-2022)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycle	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
<b>I</b>	I	21TML101	Language I@	6	25	75	100	3	3
	II	21ENG101	English -I	6	25	75	100	3	3
	III	21UCH101	Core Paper- I Inorganic, Organic & Physical Chemistry - I	6	25	75	100	3	5
			Core Practical- I Inorganic qualitative analysis & Preparations	3	-	-	-	-	-
	III	21 UMA1A1/ 21UZO1A1	Allied A paper – I Mathematics/ Zoology – I	7/ 5	25/ 20	75/ 55	100/ 75	3	5/4
			Allied Zoology Practical	2	-	-	-	-	-
	IV	21EVS101	Environmental Studies **	2	-	50	50	3	2
			<b>Total</b>	<b>30</b>	-	-	450/ 425	-	18/ 17
<b>II</b>	I	21TML202	Language II@	6	25	75	100	3	3
	II	21ENG202	English II	6	25	75	100	3	3
	III	21UCH202	Core Paper- II Inorganic, Organic & Physical Chemistry - II	6	25	75	100	3	5
	III	21UCH2CL	Core Practical- I Inorganic qualitative analysis & Preparations	3	40	60	100	3	2
	III	21UMA2A2/ 21UZO2A2	Allied A paper – II Mathematics/ Zoology – II	7/ 5	25/ 20	75/ 55	100/ 75	3	5/4
	III	21UZO2AL	Allied Zoology Practical	2	20	30	50	3	2
	IV	21VED201	Value Education-Moral & Ethics* *	2	-	50	50	3	2
			<b>Total</b>	<b>30</b>	-	-	550/ 575	-	21/ 22
<b>III</b>	I	21TML303	Language III @	6	25	75	100	3	3
	II	21ENG303	English III	6	25	75	100	3	3
	III	21UCH303	Core Paper- III Inorganic, Organic & Physical Chemistry - III	4	25	75	100	3	4
	III		Core Practical- II Inorganic volumetric and organic qualitative analysis	3	-	-	-	-	-
	III	21UPH3A1	Allied B Paper – I Physics- I	4	20	55	75	3	4

	III		Allied Physics Practical- I	3	-	-	-	-	-
	IV	21UGA3S1	Skill Based Subject- I General Awareness (on line)	2	25	75	100	3	3
		21TBT301/18T AT301/ 21UHR3N1	Basic Tamil*/ Advanced Tamil**/ Non Major elective -I **	2	-	75	75	3	2
	<b>Total</b>				<b>30</b>	-	-	550	-
IV	I	21TML404	Language IV @	6	25	75	100	3	3
	II	21ENG404	English IV	6	25	75	100	3	3
	III	21UCH404	Core paper- IV Inorganic, Organic & Physical Chemistry - IV	4	25	75	100	3	4
		21UCH4CM	Core Practical- II Inorganic volumetric and organic qualitative analysis	3	40	60	100	6	3
	III	21UPH4A2	Allied B Paper – II Physics- II	5	20	55	75	3	4
	III	21UPH4AL	Allied Physics Practical -I	2	20	30	50	3	2
	IV	21UCH4S2	Skill Based Subject -II Water pollution and management	2	25	75	100	3	3
	IV	21TBT402/18T AT402/ 21UWR4N2	Basic Tamil*/ Advanced Tamil**/ Non Major elective – II**	2	-	75	75	3	2
		21UCH5IT	Internship training****	-	-	-	-	-	-
	<b>Total</b>				<b>30</b>	-	-	700	-
V	III	21UCH505	Core Paper –V Spectroscopy	3	25	75	100	3	3
	III	21UCH506	Core Paper –VI Inorganic Chemistry	4	25	75	100	3	3
	III	21UCH507	Core Paper –VII Organic reaction mechanism	4	25	75	100	3	3
	III	21UCH508	Core Paper –VIII Physical Chemistry - I	4	25	75	100	3	4
	III	21UCH5E1	Major Elective -I	3	25	75	100	3	5
	III	21UCH6CN	Core Practical -III Gravimetric Analysis	3	-	-	-	-	-
	III	21UCH6CO	Core Practical–IV Physical Chemistry Experiments	4	-	-	-	-	-
	III	21UCH6CP	Core Practical –V Application Oriented practical	3	-	-	-	-	-
	IV	21UCH5X1	EDC - Chemistry in day today life	2	25	75	100	3	3
			SWAYAM -MOOC	-	-	-	-	-	2
<b>Total</b>				<b>30</b>	-	-	600	-	<b>23</b>

VI	III	21UCH609	Core Paper-IX Solid State And Coordination Chemistry	4	25	75	100	3	4
	III	21UCH610	Core Paper-X Chemistry Of Natural Products	5	25	75	100	3	4
	III	21UCH611	Core Paper-XI Physical Chemistry - II	4	25	75	100	3	4
	III	21UCH6E1	Major Elective – II	3	25	75	100	3	5
	III	21UCH 6Z1	Project***	-	20	80	100	-	5
	III	21UCH6CN	Core Practical- III Gravimetric Analysis	3	40	60	100	3	3
	III	21UCH6CO	Core Practical-IV Physical Chemistry Experiments	3	40	60	100	3	3
	III	21UCH6CP	Core Practical –V Application Oriented Subject practicals	4	40	60	100	3	4
	IV	21UCH6S3	Skill Based Subject- III Food chemistry	2	25	75	100	3	3
<b>Total</b>				<b>30</b>	<b>-</b>	<b>-</b>	<b>900</b>	<b>-</b>	<b>35</b>
V	21NCC/NSS/YRC/ PYE/ECC/RRC/ WEC101#	Extension Activities*	-	50	-	50	-	1	
<b>Grand Total</b>				<b>-</b>	<b>-</b>	<b>-</b>	<b>3800</b>	<b>-</b>	<b>140</b>

**Note :**

CBCS – Choice Based Credit system  
CIA – Continuous Internal Assessment  
ESE – End of Semester Examinations

@ Hindi/Malayalam/ French/ Sanskrit – 21HIN/MLM/FRN/SAN101 - 404

\* - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

\*\* - No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

\*\*\* Project Report – 60 marks; Viva voce – 20 marks; Internal-20 marks

\*\*\*\* The students shall undergo an Internship training / field work for a minimum period of 2 weeks at the end of the fourth semester during summer vacation and submit the report in the fifth semester. The report will be evaluated for 100 marks along with the internal viva voce by the respective Faculty. According to their marks, the grades will be awarded as given below.

Marks %	Grade
85 – 100	O
70 – 84	D
60 – 69	A
50 – 59	B
40 – 49	C
< 40	U (Reappear)

### **Major Elective Papers**

**(2 papers are to be chosen from the following 6 papers)**

1. Polymer technology
2. Nano and green Chemistry
3. Pharmaceutical Chemistry
4. Agricultural Chemistry
5. Dairy Chemistry
6. Leather Chemistry

### **Non-Major Elective Papers**

1. Human Rights
2. Women's Rights
3. Consumer Affairs

**Sub. Code & Title of the Extra Departmental Course (EDC) :**

**21UCH5X1 - Chemistry in day today life**

### **# List of Extension Activities:**

1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

**Note:** In core/ allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core/allied subjects remain the same as stated below.

### Tally Table:

S.No.	Part	Subject	Marks	Credits
1.	I	Language – Tamil/Hindi/Malayalam/ French/ Sanskrit	400	12
2.	II	English	400	12
3.	III	Core – Theory/Practical	1600	58
		Allied	400	20
		Electives/Project	300	15
4.	IV	Basic Tamil / Advanced Tamil (OR) Non-major electives	150	4
		Skill Based subject	300	9
		EDC	100	3
		Environmental Studies	50	2
		Value Education	50	2
5.	V	Extension Activities	50	1
6.		SWAYAM- MOOC		2
		<b>Total</b>	<b>3800</b>	<b>140</b>

- 25 % CIA is applicable to all subjects except JOC and SWAYAM
- JOC is considered as extra credit course.
- The students should complete a **SWAYAM-** and the course completed certificate should be submitted to the HOD.
- A **Field Trip** preferably relevant to the course should be undertaken every year.

### **Components of Continuous Internal Assessment**

Components		Marks	Total
<b>Theory</b>			
CIA I	75	(75+75 = 150/10)	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
<b>Practical</b>			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	
<b>Project</b>			
Review		15	20
Regularity		5	

## BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

**K1**-Remembering;**K2**-Understanding;**K3**-Applying;**K4**-Analyzing;**K5**-Evaluating

### 1. Theory Examination - Part I, II & III

#### (i) CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 - K2 Q1 to Q10	A (Answer all)	10 x 1 = 10	MCQ	75
K2 - K5 Q11 to Q15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 - K5 Q16 to Q20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

#### (ii) CIA I & II and ESE: 55 Marks

Knowledge Level	Section	Marks	Description	Total
K1 - K2 Q1 to Q10	A (Answer all)	10 x 1 = 10	MCQ	55
K2 - K5 Q11 to Q15	B (Either or pattern)	5 x 3 = 15	Short Answers	
K2 - K5 Q16 to Q20	C (Either or pattern)	5 x 6 = 30	Descriptive / Detailed	

### 2. Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4		Record Work	
K5			

### 3. Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report	60	80
K4		Viva voce	
K5			

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PAPER – I</b> <b>INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY – I</b>			
Batch 2021 – 2022	Hours / Week 6	Total Hours 90	Credits 5

### Course Objectives

1. To know the concept of qualitative inorganic analysis.
2. To acquire knowledge about nomenclature of Inorganic, organic compounds and chemistry of alkanes and cycloalkanes.
3. To know about the structure of atom and Gaseous state.

### Course Outcomes (CO)

K1 – K5	CO1	Explain the basic analytical knowledge and group separation of elements.
	CO2	Understand and apply the nomenclature of inorganic and organic Compounds.
	CO3	Explain the isomerism of alkanes and cycloalkanes.
	CO4	Acquire the knowledge about the structure of atoms.
	CO5	Evaluate and understand the knowledge about characteristics of gases.

### UNIT – I

#### Qualitative analysis

Introduction - Dry reactions – heating, flame tests; Wet reactions – test tubes, centrifuge tubes, stirring rods, droppers, reagent bottles and reagents, the centrifuge, washing the precipitates, wash bottles, transferring of precipitates, heating of solutions, evaporation, dissolving of precipitates, precipitation with hydrogen sulphide, cleaning of apparatus. Interfering anions and its elimination, classification of cations into analytical groups (group separation only), scheme of classification of anions. (18 Hours)

### UNIT-II

#### Nomenclature of inorganic and organic compounds

Writing symbols of elements and formulae of inorganic species- inorganic nomenclature- names of compounds in general-names of ions – names of radicals –names of isopolyanions-names of hetero polyanions –names of acids – names of salts and salt like compounds –names of addition compounds –names of neutral hydrides –names of boron hydrides. Nomenclature of cations, anions, radicals, binary acids, oxy acids, peroxy acids salts, binary compounds, hydrates, double salts.

Nomenclature of organic compounds – Introduction, systems of naming organic compounds – Rules of IUPAC system of nomenclature for cyclic compounds , complex organic compounds – substituted alkanes, alkenes and alkynes, compounds having functional groups, polyfunctional compounds.

(18 Hours)

### UNIT-III

#### Chemistry of alkanes and Cycloalkanes

Inductive effect, electromeric effect, mesomeric effect and hyperconjugative effect.

Homolytic and heterolytic fission, Reaction Intermediates-carbocations, carbanions, carbon free radicals and carbenes.

Classification of reagents: Electrophiles and nucleophiles.

Types of organic reactions- Substitution, addition, elimination and rearrangement reactions (Basic ideas only).

Structure – Nomenclature - Isomerism in alkanes – Natural source of alkanes – Methods of preparation – physical properties - chemical properties – Conformation study of ethane and n-butane.

Nomenclature – methods of preparation – physical and chemical properties. Stability of cycloalkanes .  
Bayer strain theory. (18 Hours)

### UNIT-IV

#### Structure of atom – Classical Mechanics and Wave mechanical approach

Introduction of classical mechanics approach - Quantum Theory and Bohr Atom.

Wave mechanical concept of atom – de Broglie's equation . Heisenberg's Uncertainty principle. Schrodinger's Wave equation. Charge cloud concept and orbitals. Quantum Numbers-Principal, Azimuthal, Magnetic and Spin Quantum Numbers and their significance. Pauli's Exclusion principle. Energy distribution and orbitals. Distribution of electrons in orbitals. Representation of ground state electronic configuration of elements – **\*Aufbau principle and its limitations, n+l rule and Hund's rule. Pauling's exclusion principle for multi electron system.** (18 Hours)

### UNIT-V

#### Gaseous state

Characteristics of gases- parameters of a gas. Gas laws-Boyle's law, Charles Law, Gay lussac's law and Avogadro's law. The ideal gas equation- kinetics of molecular theory of gases. Derivation of kinetic gas equation. Distribution of molecular velocities- calculation of molecular velocities. Collision properties. vander-waals equation – Liquefaction of gases – Law of corresponding states- Methods of liquefaction of gases. (18 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment



## TEXT BOOKS

1. B. R. Puri, L. R. Sharma, K. K. Kalia, (2014) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi.
2. Arun Bahl , B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand & Co., New Delhi, Revised multicolor edition.
3. Arun Bahl and B.S.Bahl, G.D.Tuli, (2012) **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi, Revised multicolor edition.

## REFERENCE BOOKS

1. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
2. J. D. Lee, (2006) **Concise Inorganic Chemistry**, Black Well Science, UK.
3. M. K. Jain, S. C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi,.
4. S. Glasstone, D. Lewis, (2004) **Elements of Physical Chemistry**, Macmillan Ltd, London.
5. G. Svehla, (2012) **Vogel's Text book of Macro and Semimicro Qualitative Analysis**, Longman Inc., Newyork.
6. R. D. Madan, (2004) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi.
7. M.K. Jain. S.C. Sharma, (2004) **Modern Organic Chemistry**, Vishal publishing Co., New Delhi .

21UCH101

### MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	M	H
CO2	S	S	M	M	M
CO3	S	S	M	M	M
CO4	S	S	H	M	M
CO5	S	S	H	M	M

S–Strong

H–High

M–Medium

L –Low

# UCH 1

21EVS101

Title: For B.A., BBA, B.Com, BCA and B.Sc., Degree Students				
PART IV – ENVIRONMENTAL STUDIES				
Batch	Semester	Hours / Week	Total Hours	Credits
2021-2022	I	2	30	2

## COURSE OBJECTIVES

- The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
- To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
- To shape students into good “Ecocitizens” thereby catering to global environmental needs.
- This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
- The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

## COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↑ ↓ K5	CO 1	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

## UCH 2

### **UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENT (6 HOURS)**

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

### **UNIT II ECOSYSTEMS (6 HOURS)**

Concept of an ecosystem – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

### **UNIT III BIODIVERSITY AND ITS CONSERVATION (6 HOURS)**

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – *In situ* Conservation of Biodiversity – *Ex situ* Conservation of Biodiversity

### **UNIT IV ENVIRONMENTAL POLLUTION (6 HOURS)**

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

### **UNIT V SOCIAL ISSUES AND THE ENVIRONMENT (6 HOURS)**

Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl – Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

## UCH 3

### Text Book

1.P.Arul, A Text Book of Environmental Studies, Environmental Agency, No 27, Nattar street, Velacherry main road, Velacheery, Chennai – 42, First Edition, Nov.2004.

### References

1.Purohit Shammi Agarwal, A text Book of Environmental Sciences, Publisher Mrs.Saraswati Prohit, Student Education , Behind Naswan Cinema Chopansi Road, Jodhpur.

2.Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering , Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, Delhi -110 006.

3.J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering, Prentice Hall of India Private Ltd., New Delhi – 110 001

### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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### Question Paper Pattern

(External only)

**Duration: 3 Hours**

**Total Marks : 50**

**Answer all Questions (5 x 10 = 50 Marks)**

Essay type, either or type questions from each unit.

## UCH 4

Subject code : 21UCH202

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PAPER – II</b> <b>INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 6	Total Hours 90	Credits 5

### Course Objectives

1. Know about metallurgy, importance of periodic table and atomic properties.
2. To learn about Benzene and Aromaticity.
3. To study the fundamentals of thermodynamics and thermochemistry.

### Course Outcomes (CO)

K1 – K5	CO1	Obtain problem solving skills in order to modify industrial processes in extraction metallurgy.
	CO2	Gain knowledge about periodic properties
	CO3	Understand the basic aspects Benzene and Aromaticity.
	CO4	Learn about concepts of thermodynamics.
	CO5	Acquire the knowledge in thermochemistry.

### UNIT-I : Metallurgy

**\*Introduction-Minerals, ores - occurrence of metals-classification of ores**-various steps involved in the metallurgical processes- concentration of ores, working of concentrated ore-calcination – roasting - smelting - Thermodynamic Principles-reduction by carbon-alumino thermic process-reduction by heating air-electrolytic reduction - purification of metals-electro refining - zone refining - van Arkel process - Amalgamation process - Mond's process, Cement processing and mining operations.

(18 Hours)

### UNIT-II: Periodic table and atomic properties

Mendeleev Periodic Table, Modern Periodic table-Long form periodic table, Description of groups-Alkali metals-Alkali earth metals-Boron Family-Carbon Family-Nitrogen family/Pnictogen-Oxygen family/Chalcogens-Halogen family-Inert gases/Noble gases – IUPAC nomenclature for the super heavy elements, Merits and Demerits of long form of periodic table.

Periodicity, Causes of periodicity, Calculation of effective nuclear charge, Periodic Properties, Atomic Size-Covalent radius--Ionic Radius-Metallic radius-Vander Waal's radius, Factors affecting atomic size, Ionization energy – factors affecting ionization energy-applications of ionization energy, Electron affinity-Factors affecting electron affinity, Electronegativity-Factors Affecting electronegativity-applications of electronegativity.

(18 Hours)

## UCH 5

### UNIT-III

#### Benzene and Aromaticity

##### Nomenclature

Naming of monosubstituted Benzene, disubstituted benzene and polysubstituted benzene. Benzenoid and non benzenoid aromatic electrophilic substitution reaction. Arenium ion mechanism.

Reactions – Nitration, sulphonation, halogenation, Friedel Crafts alkylation and acylation, orientation and reactivity of monosubstituted benzene.

**Aromaticity** The concept of Aromaticity, Aromatic, anti aromatic, and non aromatic compounds, Huckel's rule.

Toluene, cumene and styrene – Preparation, Physical and Chemical properties. (18 Hours)

### UNIT-IV

#### Thermodynamics - I

Basic concepts - scope and limitations - Thermodynamic terms - intensive and extensive properties- state, equilibrium - processes-nature of heat and work – pressure – volume work - isothermal reversible and irreversible expansion works of an ideal gas - maximum work - Zeroth law of thermodynamics - Internal Energy and First law of thermodynamics - Enthalpy of a system-Relation between  $\Delta E$  and  $\Delta H$ -Relation between  $C_p$  and  $C_v$  – Joule Thomson effect -comparison between adiabatic and isothermal expansions - Adiabatic expansion of an ideal gas -work done in adiabatic reversible expansion. (18 Hours)

### UNIT-V

#### Thermochemistry

Introduction - exothermic and endothermic reactions - Thermo chemical equations - Kirchoff's equation - types of heat of reaction - heat of formation - standard heat of formation - standard heat of reaction - heat of combustion-heat of solution - heat of neutralization-heat of fusion - heat of vaporization - heat of sublimation and heat of transition – definition - simple problems. Hess's law of constant heat summation – applications - bond energy and strength of bond - experimental determination of heat of combustion - bomb calorimeter.

(18 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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## UCH 6

### TEXT BOOKS

1. Puri B.R, Sharma L.R, Kalia K.C., (2014) **Principles of Inorganic Chemistry**, MILESTONE publishers and Distributors, New Delhi.
2. B.S. Bahl, and Arun Bahl, (2012) **Advanced Organic Chemistry**, S.Chand andCo, New Delhi, Revised multicolor edition.
3. B.S. Bahl and G. D. Tuli, and Arun Bahl, (2012) **Essentials of Physical Chemistry**, S. Chand publishing, Revised multicolor edition.

### REFERENCE BOOKS

1. R. D. Madan, (2011) **Modern Inorganic Chemistry**, S.Chand and Co., Third Revised Edition.
2. R. Gopalan, (2009) **Inorganic Chemistry For Undergraduate**, Universities Press (India) Private Limited, Hyderabad.
3. Puri B. R. Sharma L. R., M. S. Pathania, (2013) **Principles of Physical Chemistry**, Vishal Publishing Co., New Delhi.
4. Sathya praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
5. M.K. Jain, S.C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi

21UCH202

### MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	H
CO2	S	S	M	M	M
CO3	S	S	H	H	M
CO4	S	S	H	H	M
CO5	S	S	H	H	M

S – Strong

H – High

M – Medium

L – Low

## UCH 7

**21VED201**

<b>Programme Code: 01</b>	All UG First years		
<b>MORAL AND ETHICS</b>			
<b>Batch</b> 2021-2022	<b>Hours / Week</b> 2	<b>Total Hours</b> 30	<b>Credits</b>

### Course Objectives

- To impart Value Education in every walk of life.
- To help the students to reach excellence and reap success.
- To impart the right attitude by practicing self introspection.
- To portray the life and messages of Great Leaders.
- To insist the need for universal brotherhood, patience and tolerance.
- To help the students to keep them fit.
- To educate the importance of Yoga and Meditation.

### Course Outcomes (CO)

After completing the course the students:

K1 to K5	CO1	will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	will be able to Analyse the Practical outcome of practicing Moral values in real life situation
	CO5	could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

#### **UNIT I:**

**4 Hours**

**Moral and Ethics:** Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

#### **UNIT II:**

**6 Hours**

**Life and Teachings of Swami Vivekananda:** Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

#### **UNIT III:**

**4 Hours**

**Warriors of our Nation:** Subhas Chandra Bose – Sardhar Vallabhbai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiyadi Valliammai – Velu Nachiyar – Vanchinathan

#### **UNIT IV:**

**8 Hours**

**Physical Fitness and Mental Harmony:** Simplified Physical Exercise – Hand Exercises – Leg Exercises – Neuro Muscular Breathing Exercises – Eye Exercises – Kabalabathi – Maharasana A & B – Massage - Acupressure – Relaxation – Kayakalpa Yogam - LifeForce – Aim & Objectives – Principle – Methods. Introspection – Analysis of Thoughts – Moralization of Desires – Neutralization of Anger – Eradication of Worries



## UCH 8

### UNIT V:

**8 Hours**

**Yoga and Meditation – The Asset of India:** Yogasanam – Rules & Regulations – Surya Namaskar – Asanas –Sitting – Stanging – Prone - Supine - Pranayama – Naadi Sudhi – Ujjayi – Seethali – Sithkari - Benefits. Meditation – Thanduvasudhi - Agna – Shanthi – Thuriyam – Benefits.

#### **Text Books:**

Value Based Education – Moral and Ethics – Published by Kongunadu Arts and Science College (Autonomous), First Edition (2020).

#### **Reference Books:**

1. Swami Vivekananda – A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24<sup>th</sup> Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition(2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication(2000).
5. Yoga Practices - 1 – The World Community Service Centre – Vethathiri Publications, Sixth Edition (2017),Erode.
6. Yoga Practices - 2 – The World Community Service Centre – Vethathiri Publications – Eighth Edition (2017),Erode.

### **Question paper pattern (External only)**

Duration: 3 hrs

Total Marks: 50

Answer all Questions (5 x 10 = 50 Marks)  
Essay type, either or type questions from each unit.

## UCH 9

Subject code : 21UCH2CL

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PRACTICAL – I</b> <b>INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 90	Credits 2

### Course Objectives

1. To demonstrate the basic laboratory technique of semi micro qualitative analysis.
2. To understand about the interfering anions, its elimination and group separation.
3. To prepare inorganic complexes.

### Course Outcomes (CO)

K2 – K5	CO1	Build the knowledge in principles of semi micro qualitative analysis.
	CO2	Know about the interfering and non interfering anions.
	CO3	Experience to remove interfering anion and group separation of various cations.
	CO4	Learn the preparation of inorganic complexes.
	CO5	To get innovative ideas regarding Inorganic compounds

### I Semi - Micro Qualitative Analysis

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semi-micro methods using the conventional scheme with Hydrogen Sulphide may be adopted.

### II. Preparation of Inorganic Complexes.

1. Tetraamminecopper(II) sulphate
2. Potassiumtrioxalatochromate(III)
3. Iron(III) hexacyanoferrate(II)
4. Hexamminecobalt(II) chloride
5. Hexathiourealead(II) nitrate
6. Trisathioureacopper(I) sulphate

### III. Melting point and FT-IR spectrum of Inorganic complexes.(demonstration only)

### TEXT BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu . A.R, (1997), **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons,

### BOOKS FOR REFERENCE

1. G. Svehla, (1987) , **Vogel's Qualitative Inorganic Analysis**, Orient Longman Ltd, Hyderabad.

## UCH 10

**Time: 3 Hours**

**Max. Marks : 60**

### **Distribution of Total Marks: 60**

Record	10 marks
Analysis	40 marks
Preparation	10 marks

### **Distribution of Analysis Marks: 40**

Four ions with correct Procedure	40 marks
Three ions with correct Procedure	30 marks
Two ions with correct Procedure	25 marks
One ions with correct Procedure	12 marks

- ❖ Spotting of an ion -5 marks
- ❖ Precipitation- 5marks
- ❖ Correct detection of cations without eliminating the interfering ion should be treated as spotting
- ❖ At least one confirmatory test for each ion is expected. If no confirmatory test is reported deduct 3 marks
- ❖ The candidate may be asked to leave a small portion of the given mixture so that the examiners may confirm the presence of an ion if any discrepancies arise.
- ❖ **Anions to be given:** Sulphate, Chloride, Bromide, Fluoride, Borate, Nitrate, Carbonate, Oxalate, and Phosphate.
- ❖ **Cations to be given:** Lead, Bismuth, Copper, Manganese, Aluminium, Ferrous, Ferric, Cadmium, Cobalt, Nickel, Zinc, Barium, Calcium, Strontium, Magnesium and Ammonium.

**21UCH2CL**

### **MAPPING**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	M
<b>CO2</b>	S	S	H	M	M
<b>CO3</b>	S	S	H	M	M
<b>CO4</b>	S	S	S	M	M
<b>CO5</b>	S	S	S	H	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 11

Subject code : 21UCH303

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
<b>Title of the paper : CORE CHEMISTRY PAPER – III INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - III</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To know the basic concepts in quantitative analysis.
2. To observe the chemistry of dicarboxylic acids and reactions involving carbonyl compounds.
3. To enumerate second law of thermodynamics, state functions S, A, G and chemical equilibrium.

### Course Outcomes (CO)

K1 – K5	CO1	Gain knowledge in preparation, standardization of solution and principles of volumetric analysis.
	CO2	Study the preparation, properties and reactions of di carboxylic acids, unsaturated acids and hydroxy acids.
	CO3	To Study on the preparation and properties of aldehydes and ketones.
	CO4	Analyze and apply laws of thermodynamics.
	CO5	Inculcates the importance of partial molal properties and disorderliness of the universes.

### UNIT-I

#### Quantitative Analysis

1. The mole concept – atomic, molecular and molar masses. Equivalent mass – Equivalent mass of an acid, equivalent mass of a base, equivalent mass of oxidizing and reducing agents.
2. concentration terms – Normality, molarity, mole fraction, molality, percentage solution – weight composition, volume composition.
3. Principles of volumetric analysis – standard solution (primary and secondary standards) titration – types (acid, base, oxidation, reduction), equivalent point, end point, indicators – action of phenolphthalein and methyl orange, caution in volumetric titrimetry – precautions to avoid errors in titrimetric analysis, corrections for unavoidable errors. (12 Hours)

### UNIT-II

#### Dicarboxylic acids

Preparation, physical, chemical properties and uses of Oxalic, Malonic, Succinic, Glutaric, Adipic, Maleic and Fumaric acid. Geometrical isomerism of Maleic acid and Fumaric acid. synthetic applications of Malonic ester and Acetoacetic ester . Tautomerism of Acetoacetic ester. (12 Hours)

### UNIT-III

#### Aldehydes and ketones

General methods of preparations and properties of aldehydes and ketones. Mechanism of Nucleophilic addition of Grignard reagents, aldol condensation, Perkin, Knoevenagel, Claisen, Reformatsky reaction. Reactions with  $\text{LiAlH}_4$  and  $\text{NaBH}_4$ , Wolf Kishner, Meerwein - Ponndorf-Verley reductions and Cannizzaro reactions, Claisen and Dieckmann reactions.

(12 Hours)

### UNIT-IV Thermodynamics-II

Limitations of First law – need for second law. Various statements of second law. Spontaneous or irreversible processes. Criteria of spontaneity - Cyclic process- Entropy – definition - numerical definition. The Carnot's cycle- thermodynamic efficiency. Derivation of entropy from Carnot's cycle. Physical significance of entropy- Entropy change in isothermal expansion of an ideal gas, entropy change in reversible and irreversible processes, entropy change accompanying change of phase. Entropy as the function of P, V and T. Some other state functions-Work and Free energy functions - Gibbs's free energy (G) and Helmholtz free energy (A)- variation of free energy with temperature and pressure. Isothermal change in free energy - Gibbs-Helmholtz equations. The Clapeyron Equation-Clausius – Clapeyron equation-its applications. Significance of  $\Delta A$  and  $\Delta G$ . van't Hoff isotherm –van't Hoff isochore.

(12 Hours)

### UNIT-V Thermodynamics-III

Partial molal properties: Concept of chemical potential- Physical significance-The Gibbs – Duhem equation-variation of chemical potential with T and P- Time's Arrow .

Need for third law of thermodynamics – Nernst heat theorem- Third law of thermodynamics. Determination of absolute entropy of solids, liquids and gases. Standard absolute entropies ( $S^\circ$ ). Entropy change in chemical reactions. Unattainability of absolute zero. Derivation of Boltzmann entropy equation. Residual entropy. Problems involving residual entropy. Stirling's approximation.

(12Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Power point presentation/Seminar/Quiz/Discussion/Assignment
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### TEXT BOOKS

1. R. D. Madan, (2013) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi.
2. B. R. Puri, L. R. Sharma, K. K. Kalia, (2017) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi.
3. Arun Bahl, B. S. Bahl, (2010) **Advanced Organic Chemistry**, S. Chand & Co., New Delhi.
4. Arun Bahl and B. S. Bahl, G. D. Tuli, (2009) **Essentials of Physical Chemistry**, S. Chand & Co., New Delhi.

**REFERENCE BOOKS**

1. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madan, (2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
2. J. D. Lee, (2006) **Concise Inorganic Chemistry**, Black Well Science, UK.
3. M. K. Jain, S. C. Sharma, (2011) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi.
4. B. Mehta, Manju Mehta, (2005) **Organic Chemistry**, Prentice Hall of India Pvt Ltd., New Delhi,.
5. S. Glasstone, D. Lewis, (2012) **Elements of Physical Chemistry**, Macmillan Ltd, London.
6. B. R. Puri, L. R. Sharma, M. S. Pathania, (2009) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.

21UCH303

**MAPPING**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	M	H
<b>CO2</b>	S	S	S	H	H
<b>CO3</b>	S	S	S	H	H
<b>CO4</b>	S	S	H	H	M
<b>CO5</b>	S	S	H	H	M

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code: 01</b>			
<b>SBS I – GENERAL AWARENESS</b>			
<b>Batch</b>	<b>Hours / Week</b>	<b>Total Hours</b>	<b>Credits</b>
2021-2022	2	30	3

**Course Objectives**

1. To acquire knowledge in relation to various competitive examinations.
2. To encourage the students to newspaper reading and journals.
3. To familiarise the students with online examinations which are being adopted in competitive examinations.

**Course Outcomes (CO)**

K1 to K5	CO1	Knowledge about literature, Reasoning, Science and Technology and Youth Red Cross.
	CO2	Remembering important data on general knowledge
	CO3	Make use of the data for competitive examinations
	CO4	Analyse social phenomena
	CO5	Comprehend a glimpse and overview of civil service exams.

**Unit I (6 Hours)**

**1. Tamil and other Literatures**

Tamil, English, Christian and Muslim Literatures – Ancient Literature – Bakthi Literature – Epics – Medieval Literature – Modern Literature (Novel, Dramas, Short Stories, Modern Poetry).

**2. Economics and Commerce**

Basic Economics – Auditing – Management – Capital Market – Foreign Trade – Companies – Banking.

**3. Social studies**

Indian History – Inventions – Indian Poetry – Constitution - Judiciary – Languages – Literacy – Indian Geography – Lithosphere – Climate – Soil – Agriculture – Population.

**UNIT II (6 hours)**

**4. Numerical Aptitude**

Objective Arithmetic : Number systems – probability – HCF and LCM of numbers – decimal fractions – simplification – squareroots and cuberoots – average – percentage – profit and loss – ratio and proportion – time and work – simple interest – area, volume and surface area.

**5. Verbal Aptitude**

Spot the odd one out – correct form of verb – preposition – find out the rightly spelt word – choose the correct meaning of idioms – synonyms and antonyms.

**6. Abstract Reasoning**

Logic Reasoning : Logic – statement – arguments – statement assumptions – Statement course of action – theme detection – deriving conclusion from passages.

Non – verbal Reasoning : Series – analogy – classification – analytical reasoning – mirror images – water images – paper folding – paper cutting – rule detection – grouping of identical figures.

**UNIT III (6 hours)**

**7. General Science and Technology**

**SCIENCE** - Basic principles and concepts in Physics, Chemistry, Botany and Zoology.

**TECHNOLOGY** - Metallurgy, instrumentation, discoveries and inventions of techniques.

**8. Computer Science**

Historical evolution of computers – Computer applications – Data processing concepts – Computer codes and arithmetic – Hardware components – Data Structures.



## UCH 16

### 9. Education

Development process of the learner – Principles of development (physical, social, emotional and intellectual) – Learning process – Teaching and teacher behaviour – Interaction analysis

– Microteaching – Teacher as a leader – Motivation – Personality dimension – concept of mental health – Counselling.

### UNIT IV (6 hours)

#### 10. Library and Information Science

Library and Information Science – Basics, Computer, Library Network and others like Research, Reprography etc.

#### 11. Sports and Games

Athletics – Track Events – Field Events – Games – Indoor Games – Outdoor Games – General knowledge – Sport and Olympics – First Aid.

#### 12. Current Affairs

State, Central and International affairs: Budgets – Politics – Sports – Education – Commerce and Industry – Inventions – Science and Technology – Currency – Agriculture – Movies – Guinness records – Awards – IT Industry – Space Research – Defence etc.

### UNIT V (6 hours)

#### 13. National Cadet Corps (NCC)

Introduction to the Armed Forces (Army, Navy, Air Force) – Drill – Weapon Training – Map Reading – Civil Defence.

#### 14. National Service Scheme (NSS)

History of NSS – History of Motto, Symbol, Badge – Aims and Objectives – Duties and Total Hours – Organisational and Administrative setup – History of voluntary organization – Regular activities – Special camp activities – Special programmes – awards – Important days.

#### 15. Youth Red Cross (YRC)

History of International Red Cross – History of Indian Red Cross – History of Youth Red Cross – Main objectives of YRC – Emblem – Fundamental principles of Red Cross – Organizational Setup – Activities of Youth Red Cross – Role of different functionaries – Training programmes for YRC Program Officers – Training programme for YRC Volunteers – YRC Song – Working Hours – General orientation – Special orientation – Program skill learning.

**Text Book**

1. **General Awareness Question Bank.** Kongunadu Arts and Science College, Coimbatore, First Edition 2014.

**Reference Books**

1. **General Knowledge Manual 2007**, Tata McGraw Hill Publication Company Limited, New Delhi, 2007.
2. Edgar Thorpe and Showick Thorpe, **The Pearson General Knowledge Manual 2013**, Dorling Kindersley India Pvt. Ltd, 2013.
3. Dr. Sanjay R Agashe, Introduction to **Physical Education Fitness and Sports**, Koncept Book, Uttarkhand, 2007.

**Question Paper Pattern**

**Max. Marks 100**

**End of Semester Examination (ESE)- On-Line Examination**

**75 Marks**

1. 150 questions are to be given. Each question carries  $\frac{1}{2}$  mark.
2. In each unit, 30 questions are to be given, covering all the 5 units.

**Continuous Internal Assessment (CIA) (through On-Line)**

**25 Marks**

a) Two Exams. 15 Marks

b) Assignment\*\* 5 Marks

c) Attendance 5 Marks

\*\* Each student has to submit an assignment in the Current Affairs area.

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PAPER – IV</b> <b>INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - IV</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To learn group IA elements.
2. To know about various types of alcohols, phenols and their reactions
3. To know about phase rule and phase equilibria

### Course Outcomes (CO)

K1 – K5	CO1	Gain the knowledge about the properties of alkali metals.
	CO2	To understand the basic aspects of alcohols and their derivatives
	CO3	To learn the aromatic electrophilic substitution reactions and commercial uses of phenols
	CO4	Analyze and apply phase rule to various systems and know about the industrial importance of phase rule
	CO5	To face the contemporary challenges on knowledge and which in turn - intellectual property right and writing and publishing – Globalisation of knowledge.

### UNIT-I

#### Group IA elements - Alkali metals

**\*General properties-electronic configuration, density, molar volume, atomic volume, atomic and ionic radii, heat of atomization,** melting and boiling point- ionization energy- Comparison of ionization energy of alkali metals- electropositive character. Similarities in chemical properties – formation of halides, nitrates, oxides, hydroxides, hydrides. Comparison of Lithium with other members of the family. Anomalous behavior of lithium-diagonal relationship of Li and Mg - Lithium- Extraction, properties and uses. Sodium extraction, properties, commercial and analytical uses  
(12 Hours)

### UNIT-II

**Alcohols :** Classification and Nomenclature, **Monhydric Alcohols :** Methods of Formation by Reduction of Aldehydes, Ketones, Carboxylic Acids and Esters, Hydrogen Bonding, Acidic Nature, Reactions of Alcohols. **Dihydric Alcohols :** Methods of Formation, Chemical Reactions of Vicinal Glycols, Oxidative Cleavage [Pb(OAc)<sub>4</sub> and HIO<sub>4</sub>] **Trihydric Alcohols :** Methods of Formation, Chemicals Reactions of Glycerol. Commercial importance of methanol in energy field.

**UNIT - III**

**Phenols**

Monohydric Phenols - preparation and properties, acidity of phenols, reaction of monohydric phenols - Esterification, Nitration, Sulphonation, Halogenation, coupling with diazonium salts, Kolbe-Schmitt, Reimer-Tiemann, Schotten-Baumann, Hoesch-Houben reaction and Gattermann reactions with mechanism, Lederer Manasse reaction, Phenol formaldehyde resin, Phenolphthalein preparation,

(12 Hours)

**UNIT-IV**

**Phase rule and Phase equilibria**

Phase rule-statement- Definition of terms phase, component, and degrees of freedom. Conditions for equilibrium between phases, Derivation of Gibb's Phase rule. Phase diagrams of Water, Carbon dioxide and Sulphur systems. Polymorphism- transition temperature-cooling curves-Two components system: Simple Eutectic systems - Silver-Lead and Formation of compounds with congruent and incongruent melting point (Ferric chloride – water system and Sodium sulfate - water system).

(12 Hours)

**UNIT-V**

**Intellectual Property Rights-The art of writing and publishing-Effective dissertation writing**

Introduction to Intellectual Property- Protection of human innovations by IPR such as Patents-Trademarks- Copyright-Geographical Indications. Territoriality of IPR - Role of WTO and WIPO. The Art of Writing and publishing a research paper-Basic concepts of writing paper- Intentions for paper writing-Structure of scientific papers-Writing for publication-Publishing scientific papers-Concluding remarks. Introduction Dissertation Writing-Title Page-Abstract-Acknowledgement-Contents Page-Introduction-Literature Review-Research Methodology-Findings-Results-Data Analysis-Discussion- Conclusions-References. (12 Hours)

*\*self study portion*

**Teaching Methods**

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. R. D. Madhan, (2012)**Modern Inorganic Chemistry**, S. Chand and Co.
2. Arun Bahl and B.S.Bahl, (2010) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
- 3..B. R. Puri, L.R. Sharma, and S. Pathania, (2019) **Principles of Physical Chemistry**, Shoban Lal Nagin Chand & Co, New Delhi.

**REFERENCE BOOKS**

1. Lee J.D., (2007) **Concise Inorganic Chemistry**, Black Well Science-Wiley – India, New Delhi.
2. B.Mehta, Manju Mehta, (2005) **Organic Chemistry**, Prentice Hall of India Private Limited, New Delhi.
3. Arun Bahl, B.S. Bahl, G.D.Tuli., (2009) **Essentials of Physical Chemistry** S. Chand and company, New Delhi.
4. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2012) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi

21UCH404

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	M	M	M
<b>CO2</b>	S	S	M	M	M
<b>CO3</b>	S	S	M	M	M
<b>CO4</b>	S	S	H	H	M
<b>CO5</b>	S	S	H	H	M

S – Strong

H – High

M – Medium

L – Low

Subject code : 21UCH4S2

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>SKILL BASED SUBJECT-II</b> <b>WATER POLLUTION AND MANAGEMENT</b>			
Batch 2021 – 2022	Hours / Week 2	Total Hours 30	Credits 3

### Course Objectives

1. To know about the sources and characteristics of water.
2. To learn about the analysis of the pollutants in water.
3. To learn the methods of purification and management of water.

### Course Outcomes (CO)

K1 – K5	CO1	Understand the importance of water.
	CO2	Studying the different types of water pollution.
	CO3	Analyze and measurement of toxic chemical substances.
	CO4	Gain the knowledge of purification.
	CO5	To get and utilize scientific knowledge about water management and recycling process.

### UNIT-I

#### Sources of water and its importance

Introduction- Sources of water – Chemistry of water – Water quality parameter- Domestic purpose - Types of water- hard and soft water- uses of water – disadvantages of using hard water for domestic purpose- disadvantages of using hard water for various industries - water for industry. Quality of natural waters - Chemistry of water - Water in human body - Water as a solvent - main quality characteristics of water - effects of water on rocks and minerals - organic matter in water - humic material in water - colloidal material in water. (6 Hours)

### Unit-II

#### Water pollution

**\*Definition - water pollutants - types of water pollution - ground water pollution, surface water pollution, lake water pollution, river water pollution and sea water pollution - physical pollution of water - chemical pollution of water - biological pollution of water – physiological pollution of water. (6Hours)**

### Unit- III

#### Analysis of a water pollutants

Physical and chemical examination of water- Sample - preservation and pre concentration method- carbon adsorption method, freeze concentration method, solvent extraction method. Chemical substances affecting portability - suspended solids - dissolved solids - alkalinity - measurement of toxic chemical substances - general analytical methods of determination of Iron using spectro photometric method, atomic absorption method. (AAS) dissolved oxygen - Biochemical Oxygen Demand - Chemical Oxygen Demand. (6 Hours)

### Unit- IV

#### Purification of water

Removal of coarse, dispersed and colloidal impurities from water - Coagulation of water - Contact and electrochemical coagulation - Flocculants - Purification or treatment of water for municipal supply ( Screening - Aeration - Sedimentation with coagulation- Filtration- Sterilisation and disinfection – Storage and distribution) - Chemical methods of sterilisation - Physical methods of sterilization. Desalination of brackish water - Reverse osmosis. Zeolite process - Ion exchange method - Demineralization of water. (6 Hours)

### Unit-V

#### Water management

Introduction - Water management - Use and conservation of water resources - Water quality management - Rain water harvesting - Water from rocks - Water management in agriculture - Rain fed system - Irrigated systems - Sea water for agriculture - Water management in industries. (6 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/PowerPoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOK

1. B.K Sharma, (2017) **Water pollution**, Goel publishing House, Meerut.
2. A. K. Dee ,(2017) **Environmental chemistry**, New age international.

#### REFFRENCES

1. Jain and Jain, (2001) **Engineering Chemistry**, Dhanpat Rai Publishing Co.,
2. N. Manivasakam (Water Analyst),(2001) **Chemical and Microbiological Analysis of Mineral Water and Packaged Drinking Water**, Principal Public Health Laboratory, Coimbatore.

## MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	M	H	M	S
<b>CO2</b>	M	S	S	S	S
<b>CO3</b>	H	S	M	S	S
<b>CO4</b>	M	S	S	M	S
<b>CO5</b>	H	S	S	H	H

S – Strong

H – High

M – Medium

L – Low



<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORECHEMISTRY PRACTICAL – II</b> <b>INORGANIC VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 90	Credits 3

### Course Objectives

1. To demonstrate the concept of quantitative volumetric analysis.
2. To understand the various types of titrimetric analysis.
3. To identify the functional groups of unknown organic compounds.

### Course Outcomes (CO)

K2 – K5	CO1	Gain the knowledge in principles of volumetric analysis.
	CO2	Estimating the amount of substances present in solutions.
	CO3	Learn to approach a problem systematically and to interpret the results logically.
	CO4	Detect various functional groups present in an organic compound.
	CO5	To acquire hands on knowledge about quantitative and organic analysis

### I. Titrimetric Quantitative Analysis

#### a. Acidimetry and Alkalimetry:

1. Estimation of HCl by NaOH using a standard Oxalic acid solution  
2. Estimation of  $\text{Na}_2\text{CO}_3$  by HCl using a standard  $\text{Na}_2\text{CO}_3$  Solution.

#### b. Permanganometry:

1. Estimation of Oxalic acid by  $\text{KMnO}_4$  using a standard Oxalic acid solution  
2. Estimation of Iron(II) Sulphate by  $\text{KMnO}_4$  using a standard Mohr's Salt solution  
3. Estimation of Calcium(II) by  $\text{KMnO}_4$  using standard oxalic acid solution

#### c. Dichrometry:

1. Estimation of Iron (II) by potassium dichromate using standard Mohr's salt solution

#### d. Iodometry:

1. Estimation of  $\text{KMnO}_4$  by Thio using a standard Potassium dichromate Solution  
2. Estimation of Copper (II) Sulphate by  $\text{K}_2\text{Cr}_2\text{O}_7$  solution.

### II. Organic analysis

#### Analysis of organic compounds

1. Preliminary tests
2. Detection of elements present
3. Aromatic or Aliphatic
4. Saturated or Unsaturated
5. Nature of the functional group
6. Confirmatory tests and Preparation of derivatives for the functional groups.
7. Melting point and FT-IR spectrum of organic compounds (**demonstration only**)

## UCH 25

**The following functional group compounds may be given:**

Aldehydes, Ketones, Amines, Amides, Diamide, Carbohydrates, Phenols, Acids, Esters and Nitro compounds.

### BOOKS FOR REFERENCE

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, NewDelhi, Sultan Chand and Sons.
2. Mendham. J, Denney. R.C, Bames. J.D, and Thomas, M. (2006) **Vogel's Text book of Quantitative Chemical Analysis**, Pearson Education.
3. Gopalan. R, Subramaniam. P.S, and Rengarajan. K, (2010) **Elements of Analytical Chemistry**, Sultan Chand and Sons.

**Time: 6 Hours**

**Max. Marks : 60**

### Distribution of Total Marks- 60

Record	10 marks
Practical	50 marks

### Distribution of Practical Marks-50

Volumetric	25
Organic Analysis	25

### Distribution of Volumetric Analysis Marks-25

Procedure (To be written within five minutes)	5
Experiment	20
Error up to <2 %	20
2 – 3 %	15
3 - 4 %	10
>4 %	5

### Distribution of Organic Analysis – 25 Marks

Preliminary Tests	5
Aliphatic or Aromatic	3
Saturated or Unsaturated	3
Special elements	6
Functional group	5
Derivative	3

## UCH 26

- **Substance to be given for organic analysis:** Cinnamic acid, Benzoic acid, Succinic acid, Phthaleic acid, Aniline, Benzamide, Urea, Benzaldehyde, Acetophenone, Phenol, Cresols, Glucose, Toludine, Nitrobenzene. Ethylbenzoate.

21UCH4CM

### MAPPING

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	S	H
<b>CO2</b>	S	S	H	H	M
<b>CO3</b>	S	S	H	H	H
<b>CO4</b>	S	S	H	S	H
<b>CO5</b>	S	S	H	S	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PAPER – V SPECTROSCOPY AND CHROMATOGRAPHIC TECHNIQUES</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 3

### Course Objectives

1. To know about the region of electromagnetic spectrum, fundamentals of ultra – violet visible spectroscopy and Infrared spectroscopy.
2. To study Nuclear Magnetic Resonance (NMR) spectroscopy and Mass spectrometry and to interpret and solve problems using various spectra.
3. To have insight about chromatographic techniques.

### Course Outcomes (CO)

K1 – K5	CO1	Understand the basic principles, instrumentation of UV-Visible spectroscopy and to utilize their basic aspects to identify various organic compounds.
	CO2	Gain the knowledge in principles, instrumentation and functions of IR and Raman spectroscopy.
	CO3	Study the basic principles and instrumentation of NMR spectroscopy and apply to identify the organic compounds.
	CO4	Know about basic principles and instrumentation of mass spectroscopy technique and the application of various spectral techniques to elucidate the structure of organic molecules.
	CO5	Exploring the various chromatography techniques and their applications in separation of organic mixtures.

### UNIT-I

#### Ultra – violet and visible spectroscopy

**\*Electromagnetic spectrum and absorption of radiations**, Principle of ultraviolet spectroscopy, the absorption laws- Lambert's law and Beer's law. Selection rules, instrumentation – Block Diagram, theory of electronic spectroscopy, types of electronic transitions, the chromophoric concept, auxochromes, absorption and intensity shifts – bathochromic, hypsochromic hyperchromic and hypochromic shifts. Types of absorption bands, solvent effects, Frank – Condon principle. Woodward fisher rules for calculating absorption maximum in dienes. (9 Hours)

### UNIT-II

#### Infrared spectroscopy

Principle of Infrared spectroscopy, molecular vibrations, vibrational frequency, number of fundamental vibrations, overtones and combination bands, selection rules, factors influencing vibrational frequency – coupled vibrations and Fermi resonance, electronic effects, hydrogen bonding and bond angles. Scanning of infrared spectrum (instrumentation), finger print region. (9 Hours)

**UNIT – III****Nuclear Magnetic Resonance (NMR) spectroscopy**

Principle and theory of NMR spectra, conditions of resonance, relaxation process – spin –spin relaxation, spin – lattice relaxation and quadrupole relaxation. Instrumentation, solvent used in NMR, Chemical shift (shielding and deshielding effects). Number of signals, position of signals, factors influencing chemical shift – inductive effect, vander-Waal's deshielding, Anisotropy (diamagnetic shielding in benzene), Peak area and proton coupling, spin – spin splitting, splitting of the signals in pure ethanol and chloroethane. (9

Hours)

**UNIT – IV****Mass spectrometry and application of spectroscopic methods**

Basic principles, theory of mass spectrometry, meta stable ions or peaks, nitrogen rule, general fragmentation modes of hydrocarbons, Retro – Diels Alder reaction, hydrogen transfer rearrangements and McLafferty rearrangement.

IR, NMR and Mass techniques in the identification of simple organic molecules. (Ethanol and dimethyl ether, acetaldehyde and acetone, ethylene and acetylene). (9 Hours)

**UNIT – V****Chromatography**

Introduction, definition, types, thin layer chromatography – experimental techniques - coating materials - preparation of thin layer in plates – activation of adsorbents – purification of silica gel – sample application – development tank – solvent systems – plate development – detection of components, evaluation of chromatography. Column chromatography – principle experimental techniques – apparatus – adsorbents – preparation of adsorption columns – solvents used in successive elution – gradient elution.

(9 hours)

***\*self study portion*****Teaching Methods**

Smart class room/Power point presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. Y.R, Sharma, (2007) **Elementary Organic Spectroscopy Principles and Chemical Applications**, S.Chand & Company Ltd, New Delhi.
2. Gurdeep R. Chatwal, (2018) **Instrumental Methods of Chemical Analysis**, Himalaya publishing house, Delhi.
3. V.K. Srivastava, K.K. Srivastava, K.K. Kishore, **Introduction to Chromatography – Theory & Practice**, S. Chand & Co. (P) Ltd., New Delhi, 3rd Edn., (2010).

**REFERENCE BOOKS**

1. P.S. Sindhu, Elements of (2010) **Molecular Spectroscopy**, New Age International Publishers, New Delhi.
2. H.S. Randhana, (2007) **Modern Molecular Spectroscopy**, Macmillan India Ltd, New Delhi.
3. H. Kaur, **Instrumental Methods of Chemical Analysis**, Pragati Prakashan, Meerut, 2010
4. Jag Mohan, (2018) **Organic Spectroscopy – Principles and Applications**, Narosa publishing house
5. A.K. Srivastava, P.C. Jain, **Chemical Analysis: An Instrumental Approach for B.Sc. Hons. and M.Sc. Classes**, S. Chand and Company Ltd., Ram Nagar, New Delhi, 2010.

21UCH505

**MAPPING**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	H	M
<b>CO2</b>	S	S	M	M	M
<b>CO3</b>	S	S	H	M	H
<b>CO4</b>	S	S	S	H	H
<b>CO5</b>	S	S	S	H	H

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper: <b>CORE CHEMISTRY PAPER – VI INORGANIC CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 3

### Course Objectives

1. To understand the key features of coordination compounds, including: the variety of structures, ligands, various theories of coordination complexes, stability of complexes.
2. To identify what radioisotopes and acquaint knowledge about nuclear reactions.
3. To describe about Inorganic acids, bases, Inorganic Solvents and Inorganic Polymers.

### Course Outcomes (CO)

K1 – K5	CO1	Understand the theories of co-ordination compounds.
	CO2	Knowledge about basics nuclear Chemistry
	CO3	Analyze the importance of radioactive isotopes and nuclear reactions.
	CO4	Describe about the different concepts of Inorganic acids, bases, Inorganic Solvents and Inorganic Polymers.
	CO5	To gain knowledge about inorganic solvents and inorganic polymers

### UNIT – I

#### Co-ordination Compounds

Co-ordination Compounds – Types of ligand, Industrial applications of Chelation, Nomenclature, Werner's coordination theory- Electronic interpretation of coordinate bond by Sidgwick. EAN rule, Isomerism: Examples of geometrical isomerism in square planar and octahedral coordination compounds. Magnetic properties of square planar and octahedral coordination compounds and their interpretation by Pauling's Valence Bond Theory.

(12 Hours)

### UNIT - II

#### Nuclear Chemistry - I

Introduction – Nuclear stability and n/p ratio. Magic numbers. Packing fraction. Mass defect and binding energies. Definition for isotopes, isobars and isotones. Detection of isotopes - mass spectrographs-Thomson's, Dempster's and Aston's mass spectrographs- Importance of discovery of isotopes. Radioactivity –emission of alpha, beta and gamma rays. Radioactive disintegration -first order kinetics - half-life period. Radioactive disintegration series. Basic difference between nuclear reaction and conventional chemical reaction (12 Hours)

**UNIT - III**

**Nuclear Chemistry - II**

Nuclear reactions – fission, fusion, spallation, capture and particle-particle reactions - nuclear fission-nuclear reactors- basic components of nuclear reactor, Atom bomb- nuclear fusion - Stellar energy- Hydrogen bomb. Artificial transmutation of elements. Artificial radioactivity. Uses of radioactive isotopes – medicine – agriculture –  $C^{14}$  dating – dating of Universe. \***Atomic power projects in India**- Disposal of nuclear wastes, Cyclotron. (12 Hours)

**UNIT - IV**

**Acids and Bases**

Different concepts of acids and bases- Arrhenius, Lowry- Bronsted, Lewis, Cady- Esley (solvent system), Lux-Flood and Usanovichs concepts. Conjugate acids and bases- comparison of strengths of Lowry-Bronsted acids - Comparison of strengths of Lewis acids and bases. Levelling effect and levelling solvents. Hard and soft acids and bases (HSABs)- Acid and bases strengths of HSABs- Applications of HSABs concept, Basis of hardness and softness - pi-bonding contributions- electro negativity factor. Limitations of HSAB concept- (12 Hours)

**UNIT – V**

**Solvents and Inorganic Polymers**

Solubilities of compounds- effect of temperature on solubility- chemical structure and solubility. Classification of solvents - properties of ionizing solvents. Types of reactions in solvents. Specific non-aqueous solvents - protic solvents (ammonia) - aprotic solvents ( $SO_2$ ). Molten salts as solvents, advantages of inorganic solvents over organic solvents. Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and Borazines

(12 Hours)

*\*self study portion*

**Teaching Methods**

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. R. D. Madhan, G. D. Tuli, and S. M. Malik,(2009) **Selected Topics in Inorganic Chemistry**, S. Chand & Co., New Delhi,
2. B. R. Puri, L. R. Sharma, K. K. Kalia, (2019) **Principles of Inorganic Chemistry**, Milestone Publishers and Distributors, New Delhi
3. U. N. Dash, (2010) **Nuclear Chemistry**, S. Chand & Co., New Delhi

**REFERENCE BOOKS**

1. Karen C.Timberlake,(2008) **Basic Chemistry**, Los Angeles Valley College, Pearson-Benjamin Cummings, San Francisco, First Edition.
2. G. S. Manku,(2006)**Theoretical Principles of Inorganic Chemistry**, Mc - Graw Hill Edition.



## UCH 32

3. M. G. Arora, M. Singh, (2014) **Nuclear Chemistry**, Anmol publications Pvt. Ltd., New Delhi.
4. Sathya Praksash, G.D. Tuli, S. K. Basu, R.D. Madhan,(2012) **Advanced Inorganic Chemistry**, Vol. 1, S. Chand & Co., New Delhi.
5. H. J. Arnikaar,(2018) **Essentials of Nuclear Chemistry**, New Age International.
6. R. D. Madan, (2019) **Modern Inorganic Chemistry**, S. Chand & Co., New Delhi

21UCH506

### MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	H
<b>CO2</b>	S	M	S	M	S
<b>CO3</b>	S	M	S	M	S
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	S	S	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper: <b>CORE CHEMISTRY PAPER – VII</b> <b>ORGANIC REACTION MECHANISM</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 3

### Course Objectives

1. To study asymmetry and optical activity of organic molecules and basics in carbohydrate.
2. To understand the mechanisms of important organic rearrangements reactions and Preparations and reactions of Amines and Diazo compounds
3. To study preparation and properties of heterocyclic compounds

### Course Outcomes (CO)

K1 – K5	CO1	Understanding the fundamental aspects of stereochemistry.
	CO2	Learn about preparation, properties and structural elucidation of carbohydrates.
	CO3	Study on the various naming reactions and their detailed mechanistic pathway.
	CO4	Acquire the knowledge about the preparations and reactions of Amines and Diazo compounds.
	CO5	To inculcate knowledge about five and six membered heterocyclic compounds

### UNIT-I

#### Stereochemistry

**\*Optical Isomerism**, cause of optical activity, plane polarized light, specific rotation, Plane of symmetry, chiral (asymmetric) carbon atom, chirality, Optical isomerism of lactic acid, Fischer projections and optical isomerism of tartaric acid. Properties of Enantiomers and diastereo isomers. Resolution of Racemic mixture – mechanical separation – kinetic separation – selective adsorption – chemical method – biochemical method. Racemization, chiral (Asymmetric) synthesis, Walden inversion. Specifying absolute configuration – D, L and R, S system for asymmetric molecule. Optical activity of Biphenyl, Allenes, Spiranes and over crowded molecules. Geometrical isomerism. (12

Hours)

### UNIT-II

**Carbohydrates** - Introduction, classification

**Monosaccharides** - occurrence, preparation, structural elucidation, properties and uses of Glucose and Fructose. Cyclic form of glucose and fructose. Mutarotation, interconversion of glucose to fructose and vice versa.

**Disaccharides** – Structure, preparation, properties and uses of sucrose and maltose.

## UCH 34

**Polysaccharides** – starch and cellulose - Manufacture, structure and properties. Derivatives of cellulose. (12 Hours)

### UNIT-III

#### **Molecular Rearrangements with mechanism**

Reaction, mechanism, and applications of molecular rearrangement reactions - Pinacol-Pinacolone, Beckmann, Hoffmann, Curtius, Benzilic acid, Claisen Rearrangements, Cope rearrangement and Fries rearrangement. (12 Hours)

### UNIT-IV

#### **Amines and Diazo compounds**

Preparation and reactions of amines, separation of a mixture of primary, secondary and tertiary amines – comparison of their basicity. Hinsberg test for distinguishing primary secondary and tertiary amines, Ring substitution, Diazotization and coupling reaction of aromatic amines.

Preparation, structure and synthetic applications of Diazomethane. (12 Hours)

### UNIT-V

#### **Heterocyclic compounds**

Introduction- preparation – physical and chemical properties of Furan, Pyrrole, Thiophene, Pyridine, Quinoline and Isoquinoline. (12 Hours)

*\*self study portion*

#### **Teaching Methods**

Smart Class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### **TEXT BOOKS**

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
2. Gurdeep. R. Chatwal, (2017) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi.
3. M.K. Jain, S.C. Sharma, (2013) **Modern Organic Chemistry**, Vishal Publishing Co., New Delhi.

#### **REFERENCE BOOKS**

1. M.G Arora, (2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi.
2. Jagdamba Singh and Yadav, (2009) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers.
3. I.L.Finar,( 2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

UCH 35

MAPPING

21UCH507

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	S	M	M
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	M	M
<b>CO4</b>	S	M	S	M	M
<b>CO5</b>	S	H	S	H	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PAPER - VIII</b> <b>PHYSICAL CHEMISTRY - I</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To understand the fundamentals of electrochemistry.
2. To know the types and importance of electrodes and electro chemical cells.
3. To study about corrosion, batteries and Electroanalysis.

### Course Outcomes (CO)

K1 – K5	CO1	Understanding the concept of conductance and its applications.
	CO2	Acquire basic knowledge about electrode potential, electrochemical cell and potentiometric titrations.
	CO3	Understanding the fundamental principles of electrodes and their types.
	CO4	To gain knowledge about corrosion, protective coatings electroplating and its significance.
	CO5	Know about basic principles and instrumentation of Electrochemical Power Systems, Polarography and its applications.

## UNIT-I

### Fundamentals of Electrochemistry

Introduction-Classification of conductors – Electrolytic conductance-conductivity cell measurement of conductance of solutions – Variation of equivalent conductance with dilutions. Migrations of ions - Transport number – determination by moving boundary method and Hittorf's method – Kohlrausch's law – statement - application. Arrhenius theory of electrolytic dissociation - Ostwald's dilution law and limitations - theory of strong electrolytes: Debye-Huckel – Onsagar theory (elementary treatment only) - Debye – Falkenhagen effect and Wien effect. Applications of conductance measurements: (i) Determination of dissociation constant of a weak organic acid (i) Conductometric titrations – acid-base titration, precipitation titration. (iii) Determination of solubility product of sparingly soluble salt (iv).Determination of ionic product of water. (12 Hours)

## UNIT - II

### Electro Chemical Cells

Galvanic cell- classification of cell – representation of cell – cell terminology. Reversible and irreversible cells - Electrode potentials – types of electrodes and their potentials. Nernst equations - Computation and measurement of cell emf and Weston - Cadmium cell - Single electrode potentials. Determination and significance of electrode potentials - Electrochemical series and its applications- Thermodynamic quantities of cell reactions ( $\Delta G$ ,  $\Delta H$  and  $\Delta S$ ) (12 Hours)

**UNIT - III****Electrodes and their types**

pH scale – Buffer solution, Buffer action – Henderson's equation – determination of pH of Buffer solution. Concentration cells with and without transport - Liquid junction potential. Application of EMF measurements – determination of pH using hydrogen, glass and quinhydrone electrode. Potentiometric titrations – acid - base, redox and precipitation. Redox Potentials - redox indicators - diphenyl amine. (12 Hours)

**UNIT – IV****CORROSION AND ADSORPTION**

**\*Introduction, Dry or Chemical corrosion, Wet or Electrochemical Corrosion,** Mechanism of Wet or Electrochemical Corrosion, Galvanic (or Bimetallic) Corrosion, Concentration Cell Corrosion, Passivity, Types of Corrosion, Galvanic Series, Factors Influencing Corrosion, Corrosion Control Methods. Cathodic Protection Protective Coatings, Metallic Coating, Electroplating, Influencing factors, Pretreatment, Electroplating Methods – Cu, Ni, Electroless Plating – Cu, Ni.

Sorption – Absorption, Adsorption-Types of adsorption, adsorption of gases by solids. Adsorption isotherms –Freundlich, Langmuir. Adsorption of solutes from solutions. Application of adsorption. (12 Hours)

**UNIT - V****Electrochemical Power Systems and Analysis**

**\*Introduction – Batteries – Types-** Lead storage cells and Lithium ion cell. Fuel cells - Definition and importance, Hydrogen-Oxygen fuel cell, Hydrocarbon - Oxygen cell. Zinc air battery - Over voltage – Application of over voltage. Polarography – Instrumentation - Advantages of DME-Limiting current, factors affecting limiting current - Ilkovic equation (derivation not necessary) - Half wave potential –Application of polarography. Amperometric Titrations. Bioelectrochemistry – Bioelectrochemical cell - Electrochemical mechanism of Nervous System. (12 Hours)

**\*self study portion****Teaching Methods**

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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**TEXT BOOKS**

1. P. L. Soni. O. P. Dharmarha and U. N. Dash, (2013) **Textbook of physical chemistry**, S. Chand & Co., New Delhi, . .
2. B.S. Bahl and G. D. Tuli, and Arun Bahl, (2012) **Essentials of Physical Chemistry**, S. Chand publishing, Revised multicolor edition.
3. P. C. Jain and Monika Jain, (2013) **Engineering Chemistry**, Dhanpat Rai Publishing Co., New Delhi.

## REFERENCE BOOKS

1. B. R. Puri, L. R. Sharma, M. S. Pathania, (2013) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi
2. Karen C. Timberlake, (2005) **Basic Chemistry**, Los Angeles Valley College, Pearson Benjamin Cummings New York.
3. Samuel Glasstone,(2002) **Introduction to Electrochemistry**, EWP Pvt. Ltd.,.
4. Syed Aftab Iqbal, (2011)**Text Book of Electrochemistry**, Discovery Publishing house Pvt. Ltd., New Delhi.

21UCH508

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	H	M	H
<b>CO3</b>	S	S	H	M	H
<b>CO4</b>	S	S	M	M	H
<b>CO5</b>	S	H	M	S	S

S – Strong

H – High

M – Medium

L – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>EXTRA DEPARTMENTAL COURSE (EDC) - CHEMISTRY IN DAY TODAY LIFE</b>			
Batch 2021 – 2022	Hours / Week 2	Total Hours 30	Credits 3

### Course Objectives

1. To gain knowledge about water treatment in industrial plant and its usage.
2. To get the knowledge about industrial fermentation process, oil, wax and soap preparation.
3. To have a holistic idea about food adulteration, food hygiene and paints manufacture.

### Course Outcomes (CO)

K1 – K5	CO1	Basic understanding of water technology and acquire knowledge in the treatment of water for multi-purpose.
	CO2	Study on fermentation and its application on the manufacturing process of alcohol and alcoholic beverages.
	CO3	To understand the chemistry involved in the manufacturing process of oil, fats, wax and soap.
	CO4	To design a demonstration, that provides an opportunity to identify adulteration in food standards.
	CO5	Broadening the knowledge about paints and pigments and their commercial importances.

### Unit – I

**Water Treatment:** Introduction – Sources and Uses of Water – Water for Industrial Purposes – Quality of Normal water – water in human body – Hardness of water – Types - Softening of Water – Soda Lime Process, Zeolite, and Ion-exchange Processes (principles only). Demineralization of water – Treatment of Water for Municipal purposes – Desalination of Brackish Water – Electro dialysis – Reverse Osmosis Method (principles only).

### Unit – II

**Fermentation:** Introduction – Conditions for Fermentation – Characteristics of Enzymes – Fermentation Processes – Alcohol Beverages – Wine, Beer- Manufacture of Spirits – Whisky – Wine. Vinegar – Manufacture. Manufacture of Power Alcohol – Alcohol from Molasses, Starch, Hydrocarbon gases – Uses.

### Unit – III

**Oils, Fats, Waxes and Soap:** Waxes – Classification – Solubility – Saponification value – Manufacture of Candles – Hydrocarbon of Candles – Hydrogenation – of Oils – Soaps – Manufacture – detergents – Cleansing Action of Soaps.



## UCH 40

### Unit – IV

**Food Adulteration and Hygiene:** Definition of Adulteration Food – Common Adulterants in Different Foods – Toxic Effects of Some Metals and Chemicals – Contamination of Foods with Harmful Microorganisms – **\*Detection of Adulteration in Some Common Food items** – **\*Food Additives and Preservatives** – Food standards.

### Unit – V

**Paints:** Classification – Requirements of a Good Paint and Importance of pigment volume concentration (PVC) – Paints Failure. Emulsion Paints , Enamels , Lacquers and Varnishes – constituents and Manufacture.

*\*self study portion*

### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

### TEXT BOOKS

1. B.K. Sharma, Environmental Chemistry, Krishna Prakasam Medai (P) Ltd., Meerut, 6th Revised Edn., (2011).
2. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 16<sup>th</sup> edition (2019)
3. M. Swaminathan, Food & Nutrition, Bappco, 2nd ed. (2011).

### REFERENCES BOOKS

1. B. Sri Lakshmi, Food Science, New Age, 5th ed. (2013).
2. Jayashree, Applied Chemistry, S. Chand, 3rd ed. (2013).

21UCH5ED3

### MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	S	S	S
CO2	H	S	S	S	S
CO3	M	H	S	S	S
CO4	H	H	S	S	S
CO5	H	H	S	S	S

S – Strong

H – High

M – Medium

L – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper: <b>CORE CHEMISTRY PAPER – IX SOLID STATE AND COORDINATION CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To know about fundamentals of crystallography and solid state Chemistry
2. To study about reactions of complexes.
3. To insight knowledge about Bio – Inorganic Chemistry

### Course Outcomes (CO)

K1 – K5	CO1	Knowing the difference between amorphous and crystalline solids and their arrangement in crystal lattice.
	CO2	Learn about defects in crystals, various theories of metallic bonding and alloys.
	CO3	Decide the various crystal structures using X-ray diffraction techniques and study about liquid crystals.
	CO4	Study about various ligand substitution reactions.
	CO5	To acquire knowledge about bioinorganic chemistry.

### UNIT-I

#### Solid state – I

\* *Classification of solids (true solids, pseudo solids, crystalline and amorphous solids)*, elements of crystal symmetry, Definition of lattice point, crystal lattice and unit cell. Seven crystal system and 14 Bravais lattices, close packing of identical solid spheres (CCP, FCC, HCP and BCC), Designation of planes in crystals – Miller indices, radius ratio rule and shape of ionic crystal. Number of particles per unit cell and density of crystals. (12 Hours)

### UNIT II

#### Crystallography

Study of the following with respect to cubic system: (100), (110) and (111) planes. Inter planar distances –  $d_{100}$ ,  $d_{110}$ ,  $d_{111}$  - Ratio of inter planar distances ( $d_{100} : d_{110} : d_{111}$ ) X-ray diffraction studies of crystals – Bragg's equation – Bragg method and powder method – crystal structure of NaCl and ZnS. Growth of a crystals from the Melt and the solution. (12 Hours)

### UNIT III

#### Solid state – II

1. Defects in crystal – Stoichiometric and non Stoichiometric defects.
2. Metallic bonding- theories- electron gas theory, Valence bond theory, Molecular orbital theory (Band theory) – True metal or conductor, insulators, semi conductors- types of semi conductors- intrinsic and extrinsic, n and p- type.
3. Alloys-Substitutional and interstitial solid solutions, intermetallic compounds- Tamman's rule, Hume-Rothery rule. Alloys in automobile industry and construction sectors. (12 Hours)

### UNIT - IV

#### Reactions mechanism of coordination compounds-

Ligand substitution reactions in octahedral complexes, labile and inert complexes – types and mechanism of substitution reactions –  $SN_1$  and  $SN_2$  type mechanisms – acid hydrolysis reaction – simple acid hydrolysis type and catalyzed aquation type, base hydrolysis reaction –  $SN_2$  and  $SN_1CB$  mechanism – anation reactions.

Ligand substitution reactions in square planar complexes – trans effect – trans directing series – theories of trans effect – applications of trans effect. (12 Hours)

### UNIT – V

#### Bioinorganic chemistry

Porphyrin systems- Structure of myoglobin and hemoglobin. Role of Hemoglobin in biological systems – cooperativity effect – explanation of cooperativity effect in hemoglobin-metallo enzymes – Carbonic anhydrase, inhibition and poisoning of enzymes – role of alkali and alkaline earth metals in biological systems – sodium pump – calcium pump – biological functions and toxicity of some elements – biological fixation of nitrogen. (12 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

#### TEXT BOOKS

1. Sathya Prakash, G.D. Tuli, S. K. Basu, R.D. Madhan, (2015) **Advanced Inorganic Chemistry**, Volume 1, S. Chand & Company, New Delhi.
2. Wahid Malik, G.D Tuli, R. D. Madhan, (2015) **Selected Topics in Inorganic Chemistry**, S. Chand & Company, New Delhi.
3. B.R.Puri, L.R.Sharma and K.C.Kalia, (2009) **Principles of Inorganic Chemistry** Milestone Publishers, New Delhi.

#### REFERENCE BOOKS

1. M.G. Arora, (1997) **Solid State Chemistry**, Anmol Publishing House, New Delhi.
2. R.D.Madhan, (2011) **Modern Inorganic Chemistry**, S.Chand & Company, New Delhi.

## UCH 43

3. Gurdeep raj, ( 2011) **Advanced Inorganic Chemistry**, Vol.1 , Goel Publishing House, Meerut.
4. Gurdeep raj, (2010) **Advanced Physical Chemistry** , Vol.1 , Goel Publishing House, Meerut.
5. .Asim K.Dass, (2007) **Bioinoranic Chemistry**, Books and Allied (p) Ltd, Kolkata.

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### MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	M	H
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	S	S	M	M
<b>CO4</b>	S	M	S	S	S
<b>CO5</b>	S	H	S	M	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 44

Subject code : 21UCH610

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
<b>Title of the paper : CORE CHEMISTRY PAPER – X CHEMISTRY OF NATURAL PRODUCTS</b>			
Batch 2021 – 2022	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To study about Terpenoids and Alkaloids.
2. To understand about Vitamins and Hormones.
3. To study the preparations and reactions of amines, Diazocompounds and Chemotherapy.

### Course Outcomes (CO)

K1 – K5	CO1	Study on the classification, structural elucidation and synthesis of few important terpenoids.
	CO2	Learn about structural determination and synthesis of alkaloids.
	CO3	Acquire basic knowledge about vitamins and hormones.
	CO4	To study about Amino acids, peptides and Proteins.
	CO5	To gain knowledge about chemotherapy.

### UNIT –I

#### Terpenoids

Terpenoids: Introduction, classification, isolation and commercial value of essential oils. Isoprene rule, structural elucidation and synthesis of Geraniol, terpineol, dipentene and alpha-pinene.

(15 Hours)

### UNIT-II

#### Alkaloids

Introduction, classification, phytochemical isolation of naturally occurring products, general characteristics and general methods of determining structures and Hoffmann's exhaustive methylation. Structural elucidation and synthesis of Nicotine, Coniine, Piperine and Papaverine.

(15 Hours)

### UNIT III

#### Vitamins and Hormones

*\*Introduction, classification, sources of Vitamins and their deficiency diseases.* Structural elucidation and synthesis of Thiamine and Riboflavin.

**Hormones** -Introduction, structural elucidation and synthesis of adrenaline and thyroxin.

(15 Hours)

### UNIT-IV

#### Amino acids , peptides and Proteins.

1. **Amino acids** – Nomenclature, dipolar nature of amino acids, isoelectric point, methods of preparation – amination of halo acids – Strecker synthesis – Gabrielphthalimide synthesis – Koop synthesis. Physical and chemical properties of amino acids.

## UCH 45

2. **Nomenclature of peptides** – peptide linkages, determination of structure of peptides – synthesis of peptides.

3. **Proteins** - classification based on composition and function. Structure of proteins – primary – secondary and tertiary structure. General properties of proteins. Denature of proteins. Colour test for proteins.

(15 Hours)

### UNIT – V

#### Chemotherapy

Designation of drugs based on physiological action – functional and formaco dynamic drugs – chemotherapeutic drugs. Definition and two examples each of antibacterial drugs- sulpha drugs and mode of action of sulpha drugs, Antimalarial drugs, Amebicidal drugs, Antiseptics, Anaesthetics, Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents - Antibiotics - Penicillin, streptomycin, and tetracyclins.

(15 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2015) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi.
2. M. K. Jain and S. C. Sharma, (2011) **Modern Organic Chemistry**, New Delhi.

#### REFERENCE BOOKS

1. Jagdamba Singh and Yadav, (2015) **Organic Chemistry**, Vol. I and II, Pragathi Prakasam Publishers.
2. I. L. Finar, (2010) **Organic Chemistry**, Vol. I and Vol.II, Addison-Wesley Longman.
3. Gurdeep Chatwal, (2013) **Organic Chemistry of Natural Products**, Himalaya Publishing House, New Delhi.
4. Morrison R.T. and Boyd R.N, (2008) **Organic Chemistry** New York, Allyn & Bacon Ltd.

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#### MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	H
CO2	S	H	H	M	H
CO3	S	H	M	H	S
CO4	S	S	S	S	S
CO5	S	S	H	S	H

S – Strong

H – High

M – Medium

L – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORE CHEMISTRY PAPER – XI</b> <b>PHYSICAL CHEMISTRY - II</b>			
Batch 2021 – 2022	Hours / Week 5	Total Hours 75	Credits 4

### Course Objectives

1. To understand the basics and theoretical aspects of Chemical kinetics.
2. To learn about kinetics of thermal and photochemical reactions.
3. To gain knowledge about importance of catalysis, colloids and Liquid state.

### Course Outcomes (CO)

K1 – K5	CO1	Understand the basic principles, various experimental techniques and theories of chemical kinetics.
	CO2	To understand the importance of various theories explaining chemical kinetic.
	CO3	Gain the knowledge about principles of photochemical and photosensitized Process.
	CO4	Study the basic principles and types of catalysis and colloids.
	CO5	Explore the fundamentals of Liquid State.

#### UNIT- I

##### Chemical Kinetics-I

Empirical laws and experimental aspects. Rate law, stoichiometry, order and molecularity of reactions. Setting up and solving simple differential equations for first order, second order, third order and zero order reaction. Expressions for half – life periods of first order, second order, zero order and third order reactions. Determination of order of reactions. Experimental techniques involved in the following kinetics of reaction. Volumetry, Manometry, Dilatometry, Polarimetry and Colorimetry. Typical examples for each of the techniques.

(12 Hours)

#### UNIT- II

##### Chemical Kinetics-II

Theoretical aspects: Effect of temperature on the rate constant. The activation energy. Significance of free energy of activation. The collision theory of reaction rates and its limitations. The theory of absolute reaction rates (ARRT). Comparison of the collision theory with the absolute reaction rate theory. Lindemann theory of uni-molecular reactions.

(12 Hours)

#### UNIT- III

##### Kinetics of Photochemical Reactions

Dark reactions - Complex thermal reactions – Thermal chain reaction - the H<sub>2</sub> - Br<sub>2</sub> reaction. Absorption of light and photochemical processes – Laws of photochemistry - The Stark–

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Einstein law of photochemical equivalence. Kinetics of photochemical chain reaction - the  $H_2$  /  $Br_2$  reaction.

Quantum yield of photochemical reactions. Comparison of the thermal and photochemical kinetics of the  $H_2$  /  $Br_2$  reaction. Photosensitized reactions – photophysical process, Fluorescence, Phosphorescence and Chemiluminescence.

(12 Hours)

### UNIT- IV

#### Catalysis and Colloids

**\*Catalysis – Types of catalysis – Characteristics of catalytic reactions** Theories of catalysis – Intermediate Compound Formation Theory, Adsorption Theory – Acid-base catalysis – Enzyme catalysis – Mechanism of enzyme catalysis – Electrocalatysis.

**\*Colloids - Definitions – Classification of colloids** – sols – preparation, and properties Stability of colloids, gold number, associated colloids – Cleansing action of soaps and detergents. Emulsion – types of emulsions, preparation and properties. Gels – types of gels, preparation and properties. Applications of colloids.

(12 Hours)

### UNIT- V

#### Liquid State and Liquid Crystals

Intermolecular Forces in Liquids, Dipole-dipole Attractions, London Forces, Hydrogen Bonding Vapour Pressure, Effect of Temperature on Vapour Pressure, Determination of Vapour Pressure The Static Method, The Dynamic Method, Effect of Vapour Pressure on Boiling Points-Surface Tension, Units of Surface Tension, Determination of Surface Tension, Capillary Rise Method, Drop Formation Method, Ring- detachment Method, Bubble Pressure Method – Viscosity, Units of Viscosity, Measurement of Viscosity, Ostwald Method- Effect of Temperature on Viscosity of a Liquid, Refractive Index, Molar Refraction, Determination of Refractive Index

Optical Activity, Specific Rotation, Measurement of Optical Activity. Introduction - Liquid crystals, Vapour pressure-temperature diagrams, Thermography, LCDs and the seven segment cell.

(12 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOKS

1. Arun Bahl and B. S. Bahl, G. D. Tuli, ( 2015) **Essentials of Physical Chemistry**, S. Chand & Co., Revised multicolor edition.
2. B. R. Puri, L. R. Sharma, and M. S. Pathania, (2015) **Principles of Physical Chemistry**, S. Chand & Co., New Delhi.
3. P. L. Soni, O. P. Dharmarha and U. N. Dash, (2013) **Textbook of Physical Chemistry**, S. Chand & Co., New Delhi.



**REFERENCE BOOKS**

1. Keith J. Laidler and John H. Meiser,( 2014) **Physical Chemistry**, CBS Publishers & Distributors, New Delhi.
2. Gurudeep Raj, (2009) **Advanced Physical Chemistry**, Goel Publishing House, Meerut.
3. K. K. Rohatgi Mukherjee, (2014) **Fundamentals of Photochemistry**, New age International Publishers.

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**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	M
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	M	H	M
<b>CO4</b>	S	S	H	M	S
<b>CO5</b>	S	S	H	S	H

**S** – Strong**H** – High**M** – Medium**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>SKILL BASED SUBJECT – III FOOD CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 2	Total Hours 30	Credits 3

### Course Objectives

1. To have an idea about food adulteration and food preservation techniques.
2. To understand the chemistry of vinegar, fruit juices, vegetable acids and beverages.
3. To analyse and characterize chemical aspects of milk.

### Course Outcomes (CO)

K1 – K5	CO1	To Know about the nutrition values in food, food adulteration, standards of food, contamination and food poisoning.
	CO2	Understand about the different preservatives in packaged food.
	CO3	Acquiring knowledge about amino acids in vegetables, vinegar, fruit juice, pH value and mineral acids in vinegar.
	CO4	To gain knowledge about commercially important beverage.
	CO5	Understand the detailed information about milk, commercially important dairy products and value added foods.

### UNIT- I

#### NUTRITION VALUES OF FOOD MATERIALS AND FOOD ADULTRATION

**Nutritional values of carbohydrates, vitamins, proteins and fats\*Definition – Food standards – Food Standards in India – Standards for ensuring quality of Products – Common adulterants in different foods – Contamination of foods with toxic chemicals, pesticides and insecticides. Contamination of food with harmful micro-organisms – Bacterial infections – Fungal contaminations of foods.**

(6Hours)

### UNIT-II

#### IMPACT OF FOOD PRESERVATIVES

Introduction –Types of preservation methods - Chemical Preservatives - Cold Storage - Foods preserved in Tinned Iron and Glass Containers - Inspection of Tinned foods - Arsenic in foods - The Gutzeit test for Arsenic – Examination of glucose for the presence of Arsenic, Antimony in beverages.

(6 Hours)

### UNIT-III

#### AMINO ACIDS IN VEGETABLES, VINEGAR AND FRUIT JUICES

Biological importance of Amino acids – Leucine – Isoleucine – Lysine – Tryptophan. Preparation and properties of Vinegar. Examination of Vinegar – Determination of Total Solids and examination of residue, Total acidity, Mineral acids in Vinegar, Hydrogen ion Concentration, pH Value, Methods of determining pH, detection of mineral acids in Vinegar

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by pH Value, Alcohol in Vinegar. Fruit Juices and Vegetable Acids: Examination of Lime Juice, Lemon Squash, etc.,

(6 Hours)

### UNIT –IV

#### COMMERCIALLY IMPORTANT BEVERAGES

Introduction – Types of beverages - Tea - Nature and Properties of Tea - Adulteration of Tea - Tea Infusions. Coffee - Nature and Properties of Coffee - Adulteration of Coffee with Chicory. Cocoa and Chocolate - Nature and properties of Cocoa and Chocolate - Adulteration of Cocoa. Alcoholic Beverages - Introduction - Determination of Alcohol - Proof Spirit - Denaturing of Alcohol.

(6 Hours)

### UNIT -V

#### DAIRY PRODUCTS

General characteristics of Cows' milk –The determination of the specific gravity – use of lactometer – Determination of total solids – Determination of ash – Determination of fat [Gerber,gottlieb – rose, Werner – Schmid and Adams methods] – Calculation of extent of adultration - Determination of total protein – Determination of lactose – Determination of acidity – Added colouring matter in milk – Preservatives in milk [Boric acid,formaldehyde,etc.] – Boiled and pasturised milk – Homogenised milk – Cream – Reconstituted cream – Synthetic cream – Condensed milk – Dried milk.

(6 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOKS

1. C. Kenneth Tinkler and Helen Masters,( 2005) **Applied Chemistry**, Vol. II, London.
2. M. Swaminathan, (2003) **Advanced Text Book on Food and Nutrition**, Vol. II, .
3. B. Sri Lakshmi, (2002) **Nutrition science**, New Age International Pvt. Ltd., New Delhi.

#### REFERENCE BOOKS

1. M. Swaminathan, (2004) **Handbook of Food and Nutrition**, The Bangalore Printing and Publishing Co. Ltd.,
2. B. Sri Lakshmi, (2004) **Food Science**, New Age International Pvt. Ltd., New Delhi.
3. S. D. Venkataiah,( 2004) **Nutrition Education**, Anmol Publication Pvt. Ltd.,

**UCH 51**

**21UCH6S3**

**MAPPING**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>
<b>CO1</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO5</b>	<b>H</b>	<b>H</b>	<b>H</b>	<b>S</b>	<b>S</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORECHEMISTRY PRACTICAL – III</b> <b>INORGANIC QUANTITATIVE ANALYSIS</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 90	Credits 3

### Course Objectives

1. To understand the concept of gravimetric analysis.
2. To get acquainted with the experimental procedure of gravimetric analysis.
3. To determine the quantity of analyte in solution.

### Course Outcomes (CO)

K2 – K5	CO1	Understand the basic principles of Gravimetric analysis.
	CO2	Understand about the various precipitating agents.
	CO3	Determination of analyte masses through the gravimetric analysis.
	CO4	Improve the accuracy of analysis.
	CO5	To gain knowledge about Metal analysis in cosmetic products using AAS

### I. Gravimetric Analysis

1. Estimation of Sulphate as Bariumsulphate.
  2. Estimation of Barium as Barium Chromate.
  3. Estimation of Lead as Lead Chromate.
  4. Estimation of Calcium as Calcium Oxalate.
  5. Estimation of Nickel as Nickel Dimethylglyoxime.
- II. Metal analysis in cosmetic products using AAS. (demonstration only)

### REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Mendham. J, Denney, R.C. Bames. J.D and Thomas. (2006) M, **Vogel's Text book of Quantitative Analysis**, Pearson Education.
3. Gopalan.R, Subramaniam P.S and Rengarajan. (2004) K, **Elements of Analytical Chemistry**, Sultan Chand and Sons.

## UCH 53

**Time: 3 Hours**

**Max. Marks : 60**

### **Distribution of Total Marks- 60**

Record	<b>10</b>
Gravimetric	<b>50</b>

### **Distribution of Gravimetric Marks-50**

Procedure (To be written within five minutes)	5
Experiment	45
Error up to 2%	45
3%	35
4%	25
5%	15
>5%	5

- ❖ Proportionate deduction of marks must be made for errors between the limits given above.
- ❖ Examiners should calculate the result of each candidate with the data obtained by the candidate.
- ❖ For each independent arithmetic error deduct 2 marks.
- ❖ For incomplete or wrong calculation deduct 20% of marks eligible for the result as calculated by the examiners.
- ❖ For incomplete or wrong calculation deduct 30% of marks eligible for the result as calculated by the examiners.
- ❖ If there is a difference between the two results, the examiners should consider the one favorable to the candidate.
- ❖ If a candidate is not able to complete the experiment due to accident, award 5 marks.

**UCH 54**

**21UCH6CN**

**MAPPING**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	H	M	H
<b>CO2</b>	S	S	M	H	H
<b>CO3</b>	S	S	H	M	H
<b>CO4</b>	S	S	M	H	H
<b>CO5</b>	S	S	H	H	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORECHEMISTRY PRACTICAL – IV</b> <b>PHYSICAL CHEMISTRY EXPERIMENTS</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 90	Credits 3

### Course Objectives

1. Transformation of theoretical knowledge gain to practical aspects.
2. To have experience in handling electrical and non-electrical equipments.
3. To determine the strength of various solutions through spectrometric and electrochemical techniques.

### Course Outcomes (CO)

K2 – K5	CO1	The results of physical chemistry experiments are incorporated in both theoretical and practical aspects.
	CO2	Gain familiarity with a variety of physico-chemical measurement techniques.
	CO3	Interpret data from an experiment, including the construction of appropriate graphs and the evaluation of errors.
	CO4	To know about Determination of Cell Constant, Specific conductivity and Equivalent conductivity of strong electrolyte.
	CO5	To determine strength of acids and bases by Conductometric Titration.

### Physical Chemistry Experiments

1. Determination of Partition coefficient of Iodine between Carbon tetra chloride and water.
2. Determination of rate constant of acid-
3. Determination of  $K_f$  / Molecular weight by Rast Macro method (Naphthalene, Diphenyl and m-dinitrobenzene as solvents).
4. Determination of Critical solution temperature of Phenol- Water system.
5. Determination of concentration of an electrolyte (NaCl/ KCl/ Succinic acid)
6. Determination of Transition temperature of the hydrated salt (Sodium acetate, Sodium thio Sulphate and  $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ )
7. Phase diagram-Simple Eutectic system
8. Determination of Cell Constant, Specific conductivity and Equivalent conductivity of strong electrolyte
9. Determination of dissociation constant of a weak acid (Acetic acid)
10. Conductometric Titration (Strong acid Vs Strong base)
11. Potentiometric Titration (Acid-Base Titration HCl Vs NaOH  $\text{CH}_3\text{COOH}$  Vs  $\text{Na}_2\text{CO}_3$  )
12. Potentiometric Titration (Redox Titration FAS Vs  $\text{KMnO}_4$ )
13. Estimation of Manganese by colorimetric method.



## UCH 56

### REFERENCE BOOKS

1. Venkateswaran.V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Gopalan. R, Subramaniam. P.S., and Rengarajan, K.,( 2004) **Elements of Analytical Chemistry**, Sultan Chand and Sons.

**Time: 3 Hours**

**Max. Marks : 60**

### Distribution of Physical Practical Marks-60

Record	10
Experiment	50

### Distribution of Marks for each Experiment

#### 1. Equilibrium Constant

For carrying out the experiment	- 13
Remaining Marks given below	- 37
Calculation of [KI]	- 8
Calculation of [I <sub>2</sub> ]	- 8
Calculation of [KI <sub>3</sub> ]	- 8
Value of equilibrium Constant error up to 10%	- 13
10-12%	- 8
12-14%	- 5
>14%	- No Marks

#### 2. Strength of KI Solution may be given in the range from 0.02N to 0.06N

Calculation of [KI]	- 8
Calculation of [I <sub>2</sub> ]	- 8
Calculation of [KI <sub>3</sub> ]	- 8
Calculation Strength of given [KI] Solution	- 5

For wrong calculation of above value, 50% of marks to be deducted for those steps only.

#### 3.HCl or H<sub>2</sub>SO<sub>4</sub>, 0.5N to be given. If the order of difference between theoretical and candidates value is

Below a factor of 10 Between 10-20 Above 20-37  
- reduce 3 marks for each factor -5 marks

#### 4. Critical Solution Temperature of Phenol-Water system is 67.0 °c

Phenol-Water system	
Plot of % Phenol Vs Temp.	-37
Error up to ±3°c	-15

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Error up to  $\pm 3^\circ\text{C}$  to  $15^\circ\text{C}$  - reduce 3 marks for each percent  
Above  $\pm 15^\circ\text{C}$  -5

**5. Candidate may be instructed to use solutions of strength 1% and below. Unknown solution must be below 0.8%**

Plot of %NaCl Vs Temp - 20  
Determination of % NaCl Solution - 17  
Error up to 1% - 17  
Error up to 1-2% - 14  
Error up to 2-3% - 10  
Error above 3% - 05

**6. 0.1N Acetic acid and 0.1N KCl 100ml each to be given**

Calculation of cell constant - 17  
Correct Eq. Conductance of Acetic acid - 17  
Error up to 10% - 20  
Error up to 10% to 20% - reduce 1 mark for each %.

**7. 0.1N Acetic acid 100ml and 0.1N KCl 100ml to be given**

Calculation of cell constant - 13  
Correct Eq. Conductance of Acetic acid - 13  
Calculation of dissociation constant - 10  
Reduce marks for errors as in **experiment-6 above**

**8. 0.02N HCl may be given**

Error up to 5% - 37  
Error up to 5-10% - reduce 3 marks for each %  
Error up to 10-15% - reduce 3 marks for each %  
Error above 5% - 05

**9. Rast method**

Solvent Kf	Solute
1. Naphthalene ( $6.9^\circ\text{C}$ )	1. Biphenyl
2. Diphenyl ( $8-8.4^\circ\text{C}$ )	2. Naphthalene
3. Diphenyl amine ( $8.4 - 8.8^\circ\text{C}$ )	3. Dichlorobenzene

For each step error has to be worked out

Melting point of solvent - 07  
Error upto  $\pm 10\%$  - 30  
Error upto  $\pm 20\%$  - 15  
Above 20% - 05

**10. Phase diagram.....37**

Melting point of A - 06  
Melting point of B - 06  
Construction of phase diagram - 09

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Eutectic temperature	- 08
Eutectic composition	- 08
Error up to 1%	- 08
Error up to 2%	- 06
Error up to 3%	- 04
Error > 3 %	- 0

### 11. Colorimetric Experiments

Error upto 1%	- 37
Error upto 2%	- 30
Error upto 3%	- 20
Error > 3%	- 05

## 21UCH6CO

### MAPPING

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	M	S
<b>CO2</b>	S	S	H	H	S
<b>CO3</b>	S	S	H	H	S
<b>CO4</b>	S	S	S	M	S
<b>CO5</b>	S	S	H	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>CORECHEMISTRY PRACTICAL – V</b> <b>APPLICATION ORIENTED PRACTICAL</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 120	Credits 4

### Course Objectives

1. To demonstrate the basic laboratory techniques and application oriented physical constants.
2. To prepare organic dyes, organic compounds and home care products.
3. To estimate the hardness of water, DO, available chlorine in bleaching powder and saponification value of an oil.

### Course Outcomes (CO)

K2 – K5	CO1	Gain the knowledge of physical constants and preparation of dyes.
	CO2	Know about the preparation of organic compounds.
	CO3	Learn about the preparation method of home care products.
	CO4	Learn about estimation of hardness of water, dissolved oxygen, saponification of oil and isolation of citric acid.
	CO5	To understand practical experience on the preparation of soap, detergent powder, phenoil and soap oil.

#### I. Determination of Physical Constants.

1. Determination of Melting point
2. Determination of Boiling point.

#### II. Preparation of Organic dyes

Preparation of dyes like Methyl Orange, Methyl Red, Azo Amino benzene.

#### III. Preparation of Organic Compounds

Preparation involving Acetylation, Hydrolysis, Oxidation, Halogenation, Nitration and Benzoylation

#### IV. Preparation of Home care products

1. Preparation of white phenyl
2. Preparation of soap oil
3. Preparation of detergent powder
4. Preparation of transparent soap
5. Preparation of moisturizing cream

#### IV. Estimations

1. Estimation of Hardness of water using EDTA
2. Estimation of dissolved oxygen in water
3. Estimation of alkalinity in water

## UCH 60

4. Estimation of calcium in limestone by EDTA method
5. Estimation of Total Fatty Matter (TFM) of a soap
6. Estimation of acid value of an oil
7. Estimation of available chlorine in bleaching powder

### V. Day to day activity related experiments.

1. Natural Product extraction using Rotary vapor evaporator.
2. Water quality analysis using hydrometer.
3. Milk analysis using lactometer.
4. Green synthesis reactions in microwave oven.

### REFERENCE BOOKS

1. Venkateswaran. V, Veeraswamy. R, Kulandaivelu. A.R., (1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. Mendham. J., Denney. R.C., Bames. J.D. and Thomas, (2000) M. **Vogel's Text Book of Quantitative Analysis**, Pearson Education.
3. Sharma, K.K. and Sharma, D.S. (2005) **Introduction to Practical Chemistry**, Vikas Publishing House, New Delhi.
4. Praveen Kukreja, (2006). **Chemistry Advanced Practical Manual**, Vrinda Publishing (p) Ltd, New Delhi.

**Time: 3 Hours**

**Max. Marks : 60**

#### Distribution of Total Marks- (60)

Record	10
Physical Constant	10
Estimation	25
Preparation	15

#### Distribution of Physical Constant Marks- (10)

$\pm 2^\circ$	10
$\pm 3^\circ$	8
$\pm 4^\circ$	6
$\pm > 4^\circ$	5

#### Distribution of Estimation Marks- (25)

## UCH 61

Error up to 2%	25
3%	20
4%	15
5%	10
>5%	5

### Distribution of Preparation Marks- (15)

Quantity	10
Recrystallisation / Quality	5

**UCH 62**

**21UCH6CP**

**MAPPING**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	S	S	S	S
<b>CO2</b>	S	S	S	S	H
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	H
<b>CO5</b>	S	S	S	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 63

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>MAJOR ELECTIVE - I</b> <b>POLYMER TECHNOLOGY</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know about basics of polymers, polymerization and plastic materials
2. To learn about polymer processing and synthesis of some commercially important polymers and to know about various polymer processes techniques.
3. To know different type of plastics, advancements, disposal, applications

### Course Outcomes (CO)

K1 – K5	CO1	Know about the types of polymers, chemical and physical properties, its industrial applications and uses.
	CO2	Understand the various polymerization techniques, processing and different types of individual polymer products.
	CO3	Acquiring knowledge of commercially important polymer products and its applications.
	CO4	To know about the recent advances in polymer products and their applications.
	CO5	To know about Recent Advances in Polymers.

### UNIT-I

**Introduction to polymers: Genesis of polymers: \*Basic concept – monomers and polymers – definition.** Classification of polymers – natural and synthetic polymers – organic and inorganic Polymers – Thermoplastic and thermosetting plastics – plastic materials, elastomers, few applications.

**Chemistry of Polymerization:** Types – Chain polymerization – Free radical polymerization, Ionic polymerization, coordination polymerization. Step Polymerization – polycondensation, poly addition, ring opening. Miscellaneous polymerization reactions – electrochemical. Group transfer polymerization.

(9 Hours)



## UCH 64

### UNIT-II

#### **Polymer properties and Reactions**

**Molecular weight and Size:** Average molecular weight - number average - weight average molecular weights – concepts. Sedimentation and viscosity Average molecular weights - Molecular weight and degree of polymerization.

**Glass Transition Temperature (T<sub>g</sub>):** Definition, application of T<sub>g</sub> in processing, Transition and Associated properties, Factors influencing the glass transition temperature. Photo oxidative degradation of polymers.

(9 Hours)

### UNIT-III Polymerization Processing Techniques

**Polymer Processing Technology:** Introduction to polymer processing-basic concept and applications-Injection Moulding - compression moulding, extrusion process, Blow moulding, Blown film, Rotational Moulding, FRP.

(9 Hours)

### UNIT-IV Chemistry of Commercial Polymers

**Chemistry of polymers:** Types-engineering and commodity plastics, General methods and preparation Properties of PE, PP, PS, PMMA, polyacetal, PC, polyamides, PVC, PF, UF, epoxy, Teflon.

(9 Hours)

### UNIT-V Recent Advances in Polymers

Polymer and environmental effect-introduction-disposal of polymer waste-recycling system-importance of biopolymers –basis of conducting polymers, introduction to blends and alloys. Application of plastics in various fields-plastic industries in India.

(9 Hours)

*\*self study portion*

### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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### TEXT BOOK

1. V. R. Gowariker, N.V. Viswanathan and Jayadev Sreedhar, (2012) **Polymer Science**, Revised Edition, New Age International Publishers, New Delhi.

### REFERENCE BOOKS

1. F.W. Billmeyer – (1990) **Text Book of Polymer Science**, John Wiley & Sons.
2. J.R. Fried, (2014) **Polymer Science & Technology**, Prentice Hall of India Private Ltd.
3. G.S. Misra, (1997) **Introductory Polymer Chemistry**, New Age International Private Ltd, New Delhi.
4. Sharma. B.K., GOEL Publishing House, Meerut, (2004) **Polymer Chemistry**.
5. Arora. M.G., Singh. M, and Yadav. M.S., (2003) **Polymer Chemistry**, Anmol Publications Private Ltd., New Delhi.

## UCH 65

### MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>
<b>CO5</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 66

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
<b>Title of the paper : MAJOR ELECTIVE - II NANO AND GREEN CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 3

### Course Objectives

1. To gain knowledge about in - depth look at the basics of Nano Chemistry and to know the methods to prepare Nano materials.
2. To get the knowledge about Green Chemistry and its limitations.
3. To have a holistic idea about Green solvents in laboratory as well as in Industry and also to study the Reactions and applications of Green Chemistry.

### Course Outcomes (CO)

K1 – K5	CO1	To understand the basics of Nano Chemistry.
	CO2	To know the methods to prepare Nano materials.
	CO3	To have an idea about Nano chemistry in medicine.
	CO4	To gain knowledge about Green solvents in laboratory and also in Industry.
	CO5	To study the Reactions and applications of Green Chemistry.

### UNIT - I:

**Introduction to Nanoscience:** Definition of Nanomaterials – classification: Zero Dimensional, One Dimensional, Two Dimensional and Three Dimensional Nanomaterials with an example – Synthesis of Nanomaterials Top Down approach: Photolithography, Conventional Photolithography, Electron Beam lithography and Bottom up Approach: Physical vapor deposition, Plasma Arcing, Laser Ablation, Sol Gel method- Carbon Nanotubes: fullerene, Bukyball 60, Carbon Nanowires – Types, properties and uses.

(9 Hours)

### UNIT- II:

**Preparation of Nanomaterials.** Co-precipitation- sol- gel - photochemical reduction – hydrothermal and solvothermal synthesis.

**Nano Characterization:** Instrumentation – Characterization techniques – SEM, AFM, Powder XRD, Basic Principles, Topography, Morphology, Composition crystalline Structure; Advantages and Disadvantages.

(9 Hours)

### Unit III:

**Biologically Inspired Nanotechnology:** Basic biological concepts and principles that may lead to the development of technologies for nanoengineering systems.

**Nano in Medicine:** Drug delivery – Cancer diagnosis & Therapy – In vivo therapy - drug delivery system – Nano biotechnology devices.

(9 Hours)

## UCH 67

### Unit IV:

**Green Chemistry:** Introduction-definition-**\*Need for green chemistry-** Goals - Limitations – Progress of Green Chemistry - principles of green chemistry- Concept of Atom economy- Concept of Selectivity.

**Green Reactions:** Green reactions-Solvent free synthesis of Aldol condensation (Acid catalyst, Crossed aldol), Claisen rearrangement, Clemmensen reduction, Diels-Alder reaction.

(9 Hours)

### Unit-V:

**Green Solvents:** Green solvents – super critical carbon dioxide, ionic liquids - Water as greener solvent- reactions in ionic-liquid, solvent free reaction. Solvent less reaction – Microwave reactions – sonications.

(9 Hours)

*\*self study portion*

### Teaching methods

Smart class room/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

### TEXT BOOKS

1. S. Shanmugam, **Nanotechnology**, M.J.P. Publishers, Chennai, 2011.
2. V. Kumar, **An Introduction to Green Chemistry**, Vishal Publishing Co., 2015.
3. V.K. Ahluwalia, **Green Chemistry**, Ane Books India, New Delhi, 2010.

### REFERENCE BOOK

1. G. Cao, **Nanostructures & Nano Materials**, synthesis, properties and applications Imperial College Press, U.K, 2004.

**UCH 68**

**MAPPING**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO2</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>	<b>S</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>S</b>
<b>CO4</b>	<b>S</b>	<b>H</b>	<b>S</b>	<b>H</b>	<b>S</b>
<b>CO5</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>H</b>	<b>S</b>

**S – Strong**

**H – High**

**M – Medium**

**L – Low**

## UCH 69

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>MAJOR ELECTIVE - III PHARMACEUTICAL CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know about the common diseases and cure-terms of pharmacology and drug action.
2. To get introduced to chemotherapy – antibiotics.
3. To know the drugs meant for diabetes.

### Course Outcomes (CO)

K1 – K5	CO1	Gain the knowledge about the common diseases and cure-terms of pharmacology.
	CO2	Gain knowledge about various drugs.
	CO3	Understand about chemotherapy – antibiotics.
	CO4	Learn about drugs meant for diabetes.
	CO5	Basic ideas about various health promoting drugs.

## UNIT I

### Introduction

Common diseases -infective disease – insect – borne, air borne and water borne - hereditary diseases - Terminology- drug, pharmacology, pharmacognesy, pharmacodynamics, anti metabolites -absorption of drugs-routes of administration of drugs, factors affecting absorption drugs-routes of administration of drugs,–Assay of drugs-chemical, biological, immunological assays, LD50 and ED50 therepeutic index, drug dosage.

(9 Hours)

## UNIT II

### Drugs

\*Various sources of drugs, pharmacologically active constituents in plants, Indian medicinal plants-tulsi, neem, keezhanelli,- their importance-Classification of drugs- biological chemical-mechanism of drug action- Action at cellular and extra cellular sites. Drug receptors and biological responses- Metabolism of drugs through oxidation, reduction, hydrolysis and conjugate processes, factors affecting metabolism.

(9

Hours)

## UNIT III

### Chemotherapy

Designation of drugs based on physiological action; Definition and two examples each of Anaesthetics-General, IV and local- Analgesics – Narcotic and synthetic- Antipyretics and anti-inflammatory agents –Antibiotics –Penicillin, streptomycin, chloramphenicol, tetracyclins- Antivirals, AIDS- symptoms, prevention, treatment- Cancer and neoplastic agents.

(9 Hours)

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### UNIT IV

#### Common Body Ailments

Diabetes-Causes, hyper and hypoglycemic drugs- Blood pressure- Systolic & Diastolic  
Hypertensive drugs- Cardiovascular drugs- anti arrhythmic, anti anginals, vasodilators- CNS  
depressants and stimulants- Psychedelic drugs, hypnotics, sedatives (barbiturates, LSD)- Lipid  
profile –HDL, LDL cholesterol, lipid lowering drugs.  
(9 Hours)

### UNIT V

#### Health Promoting Drugs

Nutraceuticals- Vitamins A, B, C, D, E and K micronutrients Na, K, Ca, Cu, Zn, I-  
Medicinally important inorganic compounds of Al, P, As, Hg, Fe – L examples each their  
role and applications- Organic Pharmaceutical acids, Agents for Kidney function  
(Aminohippuric acid), Agents for liver function (Sulfo bromophthalein), Agents for pituitary  
function (metyrapone)- Organic Pharmaceutical bases-anti oxidants, treatment of ulcer and  
skin diseases. (9 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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#### TEXT BOOK

1. Jayashree Ghosh, (2010) A Text Book of **Pharmaceutical Chemistry**, S.Chand and Company Ltd., New Delhi.

#### REFERENCE BOOKS

1. Lakshmi S., (1995) **Pharmaceutical Chemistry**, S. Chand & Sons, New Delhi.
2. Ashutosh Kar, (2005) **Medicinal Chemistry**, Wiley Eastern Ltd., New Delhi.
3. David William & Thomas Lemke, (2018) **Principles of Medicinal Chemistry**, Foyers, BI publishers.
4. Romas Nogrady, (2008) **Medicinal Chemistry**, Oxford University press 3<sup>rd</sup> edition.

# UCH 71

## MAPPING

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	H	S	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	H	S	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low



## UCH 72

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>MAJOR ELECTIVE - IV</b> <b>AGRICULTURAL CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know about basics of soil chemistry and the physical properties of soil.
2. To get introduced to chemistry aspects of soil and various nutrients present in soil- waste for one, food for another.
3. To know the chemistry of pesticides, fungicides and herbicides.

### Course Outcomes (CO)

K1 – K5	CO1	To gain the knowledge about the origin soil.
	CO2	To understand about physical and chemical properties of soil.
	CO3	To get introduced to chemistry aspects of soil and various nutrients present in soil- waste for one, food for another.
	CO4	To learn about plant nutrients.
	CO5	To know basic ideas about pesticides, fungicides and herbicides

### UNIT I

#### Origin of soil

**\*Definition of soil-origin-igneous-metamorphic and sedimentary rocks-rock systems-weathering of rocks and minerals** - main components of soil-organic, inorganic, liquid and gaseous phase-Minerals of importance with respect to soil, industries and agriculture –Soil formation physical, chemical and biological factors responsible for soil formation-soil forming processes- Core soil groups of Tamilnadu-Soil survey standard soil survey-methods of soil surveys –remote sensing and soil mapping-soil resource management-use of satellite data for source inventory.

(9

Hours)

### UNIT II

#### Physical Properties of Soil

Physical properties of soil-soil texture and textural classification-pore space-bulk density, particle density –soil structure and soil colour-surface area-soil colloids-plasticity, shrinkage-flocculation and deflocculation-soil air, soil temperature, their importance in plant growth-soil reaction –ion exchange reaction-cation exchange-anion exchange –buffering capacity –hydrogen ion concentration-determination of pH Values-factors affecting soil pH-soil pH and nutrient availability- Soil degradation –causes.

(9 Hours)

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### UNIT III

#### Chemical Aspects of Soil

Origin of problem soils, their properties acid, alkali and saline soils-diagnosis-remediation of acid and salt effected soils –Methods of reaction and after care-Quality of irrigation water – causes for poor quality waters for irrigation, their effects in soil and crops. Soil testing-Concept,objective and basis-soil sampling, tools, collection processing, dispatch of soil and water samples. Soil organic matter-its decomposition and effect on soil fertility-source of organic matter in soil –maintenance and distribution –soil organism –their role-nitrification-denitrification, nitrogen fixation in soils-biological nitrogen fixation in soils –microbial interrelationship in soil-microbes in pest and disease management-Bio-conversion of agricultural wastes.

(9 Hours)

### UNIT IV

#### Plant Nutrients

Plant nutrients-macro and micro nutrients-their role in plant growth –sources-forms of nutrient absorbed by plants –factors affecting nutrient absorption-deficiency symptoms in plants-corrective measures-chemicals used for correcting nutritional deficiencies-nutrient requirements of crops, their availability, fixation and release of nutrients. Fertilizers – classification of NPK fertilizers –sources-natural and synthetic –straight –complex –liquid fertilizers, their properties, use and relative efficiency-secondary and micro nutrient fertilizers-mixed fertilizers –principles of fertilizers use –the efficient use of various fertilizers-integrated nutrient management biofertilizers –rhizobium, azospirillum, azotobacter-Blue green algae and azolla production and quality control of bio-fertilizers.

(9 Hours)

### UNIT V

#### Pesticides, Fungicides And Herbicides

**Pesticides:** Definition –classification –organic and inorganic pesticides-mechanism of action – Characteristics-Safe handling of pesticides –impact of pesticides on soil, plants and environment –Acts and Laws concerning the pesticides-. **Fungicides** Definition – classification – mechanism of action-Sulphur, copper-mercury compounds, dithanes, dithiocarbamates. **Herbicides:** Definition –Classification-mechanism of action-Arsenic and boron compounds-nitro compounds, chloro compounds, Triazines, propionic acid derivatives, urea compounds. Acaricides-Rodenticides-Attractants-Repellants-Fumigant foliants.

(9 Hours)

*\*self study portion*

#### Teaching Methods

Smart class room/Powerpoint presentation/Seminar/Quiz/Discussion/Assignment
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## UCH 74

### TEXT BOOKS

1. Biswas ,T.D and Mukeherjee, S.K.( 2001) **Textbook of Soil Science**,Tata McGraw – Hill publishing co.
2. Daji, T.A. (1990) **Textbook of Soil Sciences**, Asia Publishing House, Madras.
3. Tisdale. S. L., Nelson. W. L. and Beaton. J. D.( 2017) **Soil Fertility and Fertilizers**, 8<sup>th</sup> edition  
Macmillan Publishing Company, New York.

### REFERENCE BOOKS

- 1.Hesse, (1983) **A Textbook of Soil Chemical Analysis** P.R. John Murray.
- 2.Buchel, K.H. John Wiley & Sons , (1983) **Chemistry of Pesticides**, New York.
- 3.Sree Ramula, (1979) **Chemistry of Insecticides and Fungicides Chemistry of Insecticides and Fungicides**, U.S. Oxford and IBH Publishing Co., New Delhi.

### MAPPING

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	H	S	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	S	H	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 75

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>MAJOR ELECTIVE - V DAIRY CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To know the chemistry of milk and milk products
2. To know the basics of milk proteins, milk lipids, milk carbohydrates, and milk vitamins.
3. To acquire knowledge of dairy products, analyze the constituents of milk products.

### Course Outcomes (CO)

K1 – K5	CO1	Learning the chemistry of milk and milk products
	CO2	Knowing the basics of milk proteins, milk lipids, milk carbohydrates, and milk vitamins.
	CO3	Understanding the production and composition of milk products.
	CO4	By applying the acquired knowledge of dairy products, analyze the constituents of milk products.
	CO5	To know commercial values of milk.

### UNIT - I

Milk: Definition-General composition of milk-physical properties of milk- colour, odour, acidity-natural and developed, specific gravity-Recknagel effect viscosity and conductivity, factors affecting the gross competition of milk, physico-Chemical change taking place in milk due to processing parameters-boiling pasteurization- sterilization and homogenization.

Adulterants, preservatives and neutralizers-example and their detection. Estimation of fat, specific gravity, acidity and total solids in milk.

### UNIT - II

Milk lipids-terminology and definitions classification – saponifiable (triglycerides) and unsaponifiable matters (sterols and cholesterol) phospholipids structure and properties (Lecithin and Cephalin) Milk fat constants-refractive index-saponification number, Iodine number, R.M.number, R.M number and polenske number.

Milk proteins-Chemistry of proteins in general structure-N-terminal and Cterminal, hydrogen bond, disulphide bond and salt linkages, outlines of primary, secondary and tertiary structure of proteins. Physical properties of milk proteins- Electrical properties and hydration, solubility. Reaction of milk proteins with formaldehyde and ninhydrin. Non-protein nitrogen constituents of milk, effect of heat on milk protein, milk enzyme and functions.

Milk carbohydrate-Lactose-Its structure, solubility, hydrolysis, Oxidation and reduction, Estimation of lactose in milk.

Milk vitamins-water and soluble vitamins, effect of heat and light on vitamins. Ash and mineral matters in milk.

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### UNIT - III

Creams - Definition-composition-chemistry of creaming process-gravitational and centrifugal methods of separation of cream-Factors influencing cream separation (Mention the factors only)-Cream neutralization. Estimation of fat in cream.

Butter - Definition-% composition-manufacture-Estimation of fat, acidity, salt and moisture content-Desi butter.

Ghee - Major constituents-common adulterants added to ghee and their detection rancidity-definition-types (hydrolytic, oxidative and ketonic) prevention- antioxidants and synergists (natural and synthetic)-Measurements.

### UNIT - IV

Fermented milk products - Fermentation of milk-definition, conditions, cultured milk-definition of culture-examples, conditions, types-cultured cream-cultured butter milk-Bulgarius milk-acidophilus milk-yogurt. Bacteriophage-definition and its function.

Indigenous products - Definition percentage composition-preparation- physicochemical changes take place during khoa-making-khoa sweet- Gulab jamun, chana sweet-Rossogolla-ingredients and preparation.

Ice cream - Definition-percentage composition-types-ingredients needed manufacture of ice-cream stabilizers-emulsifiers and their role.

### UNIT - V

Milk powder - Definition-need for making powder-drying process-spray drying, drum drying, jet drying and foam drying-principles involved in each.

Manufacture of whole milk powder by spray drying process-keeping quality of milk powder.

Dairy Detergents - Definition-characteristics-classification-washing procedure (modern method) sterilization-chloramin-T and hypochlorite solution.

### Teaching methods

Smart class room/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

### REFERENCE BOOKS

1. **Outlines of Dairy Technology**-Sukumar De (2001)
2. **Principles of Dairy Chemistry**-Robert Jenness & S.Patorn.(1960)
3. **Indian Dairy products**-K.S. Rangappa and K.T. Achaya.Reprinted (2007)
4. **Modern Dairy Products**-L.M. Lampert.
5. **Principles of Dairy processing**-Warner.

**UCH 77**

**MAPPING**

<b>CO \ PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	H	H	S	S	S
<b>CO2</b>	S	S	S	S	S
<b>CO3</b>	S	S	S	S	S
<b>CO4</b>	S	S	S	S	S
<b>CO5</b>	S	S	S	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

## UCH 78

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
Title of the paper : <b>MAJOR ELECTIVE - VI LEATHER CHEMISTRY</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 45	Credits 5

### Course Objectives

1. To obtain the knowledge on the structure and composition of the hides, skin and Leather.
2. To know the basic principles involved in the pre-training methods of leather manufacture.
3. To understand the problems caused by tannery effluents and to develop the method to dispose the tannery waste in safe manner.

### Course Outcomes (CO)

K1 – K5	CO1	Learning the basic principles involved in the pre-training methods of leather manufacture.
	CO2	Understanding the different types of tanning and the physico-chemical principles.
	CO3	Widening a skill on the preparation and chemistry of chrome tanning liquids and their factors involving in it.
	CO4	Gaining the broad idea on the chemical methods of curing and preserving the hides in different medium.
	CO5	To know about animal by-products.

### UNIT – I

Introduction-chief process used in leather manufacture. Hides, Skins, Leather – An elementary knowledge of the structure and composition of hides and skins. Proteins and their characteristics, Anatomy and histology of protein constituents of leather (an elementary concept). Basic principles involved in pre-training such as soaking, liming, delimiting, bating, pickling and depickling.

### UNIT – II

Types of tanning – vegetable and mineral tanning, different types of vegetable tanning– materials classification and chemistry of vegetable tanning. Factors and Physico-chemical principles involved in vegetable tanning, Fixation of vegetable tanning. Synthetic tanning – their classifications, general methods of manufacture and use.

### UNIT – III

The preparation and chemistry of chrome tanning liquids, Olation, Oxolation and hydrolysis of chrome liquids. Effect of adding tanning agents – Role of Ph in the reaction of chromium complexes with hide proteins. Factors governing chrome tanning- chemistry of neutralization

## UCH 79

process. A brief survey of chemistry of other tanning materials like Al, Zr and Te salts and their relative merit in contrast with chrome tanning. Chemistry of combination of tannages involving vegetable tanning aldehyde chrome and other tanning agents.

### UNIT – IV

Chemical methods of curing and preservation of hides and skins in acid and alkaline solutions. Principles of Analytical methods employed in curing, liming, deliming, bating, pickling. Analysis of vegetable tanning materials and extract. Process of dyeing leather – use of mordant, dyeing auxiliaries such as leveling, Wetting and dispersing agents – dye fixations.

### UNIT – V

Animal by-products – their collection, handling and preservation methods (such as hair, blood, bones, glands, keratinous materials and their utilization). Tannery effluents and treatment: Types of water pollution – physical, chemical, physiological and biological. Different types of tannery effluents and waste- beam-house waste – liquors – tanning and finishing yard waste liquors, solid waste – origin and disposal.

#### Teaching methods

Smart class room/ Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

#### TEXTBOOKS

1. B.K.Sharma, (2019), **Industrial chemistry**, Goel publishing House, Meerut.
2. Jayashree Ghosh, **Reprint 2008, Fundamental Concepts of Applied Chemistry**, S.Chand & Company Ltd
3. P.C.Jain, M.Jain, (2008), **Engineering Chemistry**, Dhanpat Raj Publishing Company Pvt Ltd, 15<sup>th</sup> Edn

#### MAPPING

PSO CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	H	S

S – Strong

H – High

M – Medium

L – Low



## UCH 80

21UHR3N1

<b>Programme Code : 04</b>	<b>B.Sc Chemistry</b>		
<b>PART IV -NON MAJOR ELECTIVE –I HUMAN RIGHTS</b>			
<b>Batch</b> 2021-2024	<b>Hours / Week</b> 2	<b>Total Hours</b> 30	<b>Credits</b> 2

### Objectives

1. To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy
5. To appreciate the relationship between rights and duties
6. To foster respect for tolerance and compassion for all living creature.

### Course Outcomes (CO)

K1 – K5	CO1	To understand the hidden truth of Human Rights by studying various theories.
	CO2	To acquire overall knowledge regarding Human Rights given by United Nation Commission. (UNO)
	CO3	To gain knowledge about various organs responsible for Human Rights such as National Human Rights Commission and state Human Right commission (UNHCR)
	CO4	To get habits of how to treat aged person, others and positive social responsibilities
	CO5	To treat and confirm, child, refugees and minorities with positive social justice.

### UNIT – I

Definition, Meaning, Concept ,Theories and Kinds of Human Rights- Evaluation and Protection of Human Rights in India- Development of Human Rights under the United Nations.

### UNIT – II

United Nations Charter and Human Rights - U.N.Commission on Human Rights- Universal Declaration of Human Rights - International Covenant on

- Civil & Political Rights
- Economic, Social and Cultural Rights

## UCH 81

### UNIT – III

Human Rights and Fundamental Rights (Constitution) - Enactments regarding Human Rights Laws in India - National Human Rights Commission and State Human Rights Commission.

### UNIT – IV

Aged persons and their Human Rights - Human Rights of Persons with Disabilities - Tribal Human Rights in India - Three Generation Human Rights -Social Awareness and Responsibilities of Individuals.

**21UHR3N1**

### UNIT – V

Rights of Women, Child, Refugees and Minorities –Social media and Human Rights - NGO's in protection of Human Rights - Right to Election

#### Books for Study:

1. Human Rights (2019) Published by Kongunadu Arts and Science College,  
Coimbatore –29.

#### Book for Reference:

1. Human Rights, (2018)Jaganathan,MA.,MBA.,MMM.,ML.,ML.,  
Humanitarian Law and J.P.Arjun Proprietor,Usha Jaganathan  
Refugee Law law series, 1<sup>st</sup> floor, Narmatha Nanthi  
Street, Magathma Gandhi Nagar, Madurai – 625014.

### Question Paper Pattern (External only)

Duration: 3 hrs

Max: 75 marks

#### Section A(5x5=25)

Short notes

Either – Or/ Type - Question from each unit

#### Section B(5X10=50)

Essay type

Either – Or/ Type - Question from each unit

<b>Programme Code: 04</b>		<b>B.Sc. Chemistry</b>		
Course Code: 21UWR4N2		<b>Part IV -Non- Major Elective – II Women’s Rights</b>		
Batch <b>2021-2022</b>	Semester <b>IV</b>	Hours / Week <b>2</b>	Total Hours <b>30</b>	Credits <b>2</b>

### Objectives

1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women’s rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women’s rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

### Course Outcomes (CO)

#### After Completion of the Course the student will be able to

K1 to K5	CO1	Appraise the importance of Women’s Studies and incorporate Women’s Studies with other fields.
	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication.
	CO3	Interpret the laws pertaining to violence against Women and legal consequences.
	CO4	Contribute to the study of the important elements in the Indian Constitution, Indian Laws for Protection of Women.
	CO5	Spell out and implement Government Developmental schemes for women and create awareness on modernization and impact of technology on Women.

### Unit I

(6 Hours)

#### Women’s Studies:

Basic concepts of Women’s studies in Higher education, Women’s studies perspectives- Socialization- Patriarchy- Women’s studies as an academic discipline- Growth and development of Women’s studies as a discipline internationally and in India.

**Unit II**

**(6 Hours)**

**Socio-Economic Development of Women:**

Family welfare measures, role of Women in economic development, representation of Women in media, status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

**Unit III**

**(6 Hours)**

**Women's Rights – Access to Justice:**

Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economic abuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

**Unit IV**

**(6 Hours)**

**Women Protective acts:**

Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

**Unit V**

**(6 Hours)**

**Women and Child welfare:**

Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

**Teaching Methods:**

Smart Class Room / Powerpoint Presentation / Seminar / Quiz / Discussion / Flipped Class

**Text Book:**

1. **Women's Rights** (2021), Published by Kongunadu Arts & Science College, Coimbatore – 641 029.

**Reference Books:**

1. **“Rights of Indian Women”** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
2. **“Women's security and Indian law”** by Harsharam Singh. Publisher: Aabha Publishers and Distributors, 2015.
3. **“Women's Property Rights in India”** by Kalpaz publications, 2016.

**21UWR4N2**

**Question Paper Pattern**

Duration :3 hrs

Max: 75 marks

**Section A (5 X 5=25 Marks)**

Short notes

Either – Or/ Type - Question from each unit.

**Section B (5 X 10=50 Marks)**

Essay type

Either – Or/ Type - Question from each unit.

## UCH 84

<b>Programme Code: 04</b>	<b>B.Sc. Chemistry</b>		
<b>Non- Major Elective – Consumer Affairs</b>			
<b>Batch</b>	<b>Hours/Week</b>	<b>Total Hours</b>	<b>Credits</b>
2021-2022	2	30	2

### Course Objectives

- 1.To familiarize the students with their rights and responsibilities as a consumer.
- 2.To understand the procedure of redress of consumer complaints.
- 3.To know more about decisions on Leading Cases by Consumer Protection Act.
- 4.To get more knowledge about Organizational set-up under the Consumer Protection Act
- 5.To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

### Course Outcomes (CO)

K1 to K5	CO1	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Applying the role of different agencies in establishing product and service standards.
	CO4	Analyse to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

### UNIT I

**6 Hours**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

**UNIT II**

**6 Hours**

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.

Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

**UNIT III**

**6 Hours**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

**UNIT IV**

**6 Hours**

Role of Industry Regulators in Consumer Protection

- i. Banking: RBI and Banking Ombudsman
- ii. Insurance: IRDA and Insurance Ombudsman
- iii. Telecommunication: TRAI
- iv. Food Products: FSSAI
- v. Electricity Supply: Electricity Regulatory Commission
- vi. Real Estate Regulatory Authority

**UNIT V****6 Hours**

Contemporary Issues in Consumer Affairs - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

Note: Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would be added appropriately after the new law is notified.

**Teaching Methods:**

Smart Class rooms /Power Point Presentations / Seminars/Quiz /Discussion /Flipped Classrooms

**SUGGESTED READINGS:**

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books :- [www.consumereducation.in](http://www.consumereducation.in)
8. Empowering Consumers e-book, [www.consumeraffairs.nic.in](http://www.consumeraffairs.nic.in)
9. ebook, [www.bis.org](http://www.bis.org)
10. The Consumer Protection Act, 2086 and its later versions.

**UCH 87**

**Question paper pattern (External Only)**

Duration: 3 hrs

Max: 75 Marks

**Section A (5 x 5=25)**

Short notes

Either – or / type – question from each unit.

**Section B (5 x 10=50)**

Essay type

Either – or / type – question from each unit.



<b>Programme code : 04</b>		<b>B.Sc Chemistry</b>		
		<b>Title: Project</b>		
Batch 2020-2021		Hours / Week 2	Total Hours 30	Credits 5

**MARKS DISTRIBUTION**

	Marks
Project Report	60
Viva-Voce	20
Internal	20
Total	100

**Job Oriented Course (JOC) - TEXTILE CHEMISTRY**

**Course Objectives**

1. To know about manufacture and properties of natural fibres (vegetable fibres, animal fibres) and synthetic fibres.
2. To learn preparatory process before dyeing.
3. To know the principles of bleaching and dyeing.

**Course Outcomes (CO)**

K1 – K5	CO1	Gain the knowledge about both synthetic and natural fibres.
	CO2	TO know about Regenerated And Synthetic Fibres.
	CO3	Understand about scouring and desizing.
	CO4	Learn about bleaching.
	CO5	Basic ideas about dyeing

**UNIT I**

***Vegetable Fibres And Animal Fibres***

Definition –classification of textile fibres- essential and desirable properties of textile fibres-Cotton fibre – Physical and Chemical properties, Jute –Purification; physical and chemical properties of jute, silk and wool. (9 Hours)

**UNIT II**

***Regenerated And Synthetic Fibres***

Rayon –different types of rayon and their sources-manufacture of viscose rayon- physical and chemical properties- acetate rayon –manufacture –properties, enprammonium rayon –manufacture and properties. Manufacture – properties and uses of polyamides- polyester-polypropylene and polyacrylonitrile. (9 Hours)

**UNIT III**

***Preparatory Process Prior To Dyeing***

Scouring: Objective of scouring –process of caustic scouring on open kier machine with sine diagram, scouring with NaOH and Na<sub>2</sub>CO<sub>3</sub> -Precautions to be taken before scouring. Desizing using malt extract-merits and demerits of acid and enzyme desizing Singeing –Impurities present in grey cotton and cotton fabric –objects of singeing –process of singeing on gas singeing machine –precautions to be taken during gas singeing. (9 Hours)

**UNIT IV**

***Principles of Bleaching***

Principles of wetting and mechanism of detergency –synthetic detergents –surface active agents-bleaching processes –bleaching agents-H<sub>2</sub>O<sub>2</sub>, NaOCl, bleaching powder and bio-bleaching and their properties-bleaching of cotton, rayon, wool and synthetic fibres. (9 Hours)

**UNIT V**

**Principles of Dyeing**

Colour and chemical constitution –Chromophore and auxochromes-natural and synthetic dyes-dyes – classification, synthesis of dye shift- congedred, bismark brown and erifstal violet, theories of dyeing –effect of temperature and salt on dyeing –dyeing of wool, silk and poly-esters-dyeing of cotton with reactive dyes-fastness properties –washing, light, rubbing and perspiration. (9 Hours)

**TEXT BOOKS**

1. Shenai. V.A., (1991) **Chemistry of Dyes and Principles of Dyeing Vol. II**, Mahajan Publishers, Ahmedabad.
2. Gopalakrishnan. R. (2012) sustainable fibursed textiles**Textile Fibres SSM**, Institute of Textile Technology, Mahajan Publishers, Ahmedabad.

**REFERENCE BOOKS**

1. Shenai. V.A. (1991) **Textile Fibres (Vol. I)**, Mahajan Publishers, Ahmedabad.
2. Shenai. V.A., (1998) **Technology of Beaching**, Mahajan Publishers, Ahmedabad.

**MAPPING**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	M	S	S	S	M
<b>CO2</b>	H	S	S	S	M
<b>CO3</b>	H	S	S	S	M
<b>CO4</b>	H	S	S	S	H
<b>CO5</b>	S	H	S	S	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>B.Sc., Bio Technology (I Year), Physics (II year), Botany (II Year), Bio-Chemistry (II Year)</b>			
<b>Title of the paper: ALLIED CHEMISTRY PAPER - I</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To understand the fundamentals of Chemical bonding.
2. To study Hybridizations, asymmetry and optical activity of organic molecules.
3. To study the basic principles of thermodynamics and electrochemistry.

### Course Outcomes (CO)

K1 – K5	CO1	Understanding the fundamental aspects of chemical bonding and interhalogen compounds.
	CO2	Learn about the fundamental aspects of Hybridization, stereochemistry which includes a symmetric carbon, optical isomerism, resolution and Geometrical isomerism.
	CO3	Study on the various concepts in Thermodynamics.
	CO4	Study on the various concepts in Electrochemistry.
	CO5	Acquiring knowledge about Fuel gases and Petroleum.

### UNIT-I

#### Concepts of Chemical bond

1. Chemical Bonding - Molecular orbital theory- bonding, anti bonding and non - bonding molecular orbitals - Energy order of MO's - Diamagnetism and Para magnetism - Bond order -Molecular orbital configuration of H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub>.
2. Inter halogen Compounds - Types of Inter halogen Compounds. Preparation, properties, uses and Structures of ICl, BrF<sub>3</sub> and IF<sub>5</sub>.
- 3: Preparation, properties, structure and uses of diborane . (12 Hours)

### UNIT-II

#### Hybridisation and isomerism in compounds

1. Hybridization and VSEPR theory-Hybridization of BeCl<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub> and NH<sub>3</sub>.
2. Optical isomerism- Symmetry, elements of symmetry, cause of optical activity Optical isomerism of lactic acid and tartaric acid - Racemisation, Resolution.
3. Geometrical isomerism of maleic acid and fumaric acid. (12 Hours)

### UNIT-III

#### Energetics

Introduction - Scope and limitations - Basic terms - system, surroundings - Types of system, state of system, state variables. Thermodynamic processes - Isothermal, Adiabatic, Isobaric, Isochoric and cyclic processes - Reversible and irreversible processes - Spontaneous process. First law of thermodynamics - Mathematical

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formulation-limitations. Need for Second law - various statements of second law. Joule - Thomson effect. Enthalpy - Free energy change. (12 Hours)

### UNIT-IV Electrochemistry

Introduction - Electrolysis - Conductance of electrolytes - Specific conductance, equivalent conductance, molar conductance - Kohlrausch law - Applications - Determination of degree of dissociation - Conductometric titrations. Buffer Solutions and pH: Buffer solutions- buffer action - Determination of pH of buffer solutions - Buffer solutions in living systems. pH definition - Determination by Colorimetric (indicator) method and electrometric method (Conductometric) only. Principles of electroplating and its uses. (12 Hours)

### UNIT-V

#### Chemistry of Fuels

1. Fuel gases - Qualities of good fuel. Advantages of gaseous fuels over solid and liquid fuels. Short accounts of natural gas, water gas, semi water gas, carburetted water gas, producer gas and oil gas (manufacturing details not required).
2. Petroleum-Classification of Petroleum-Refining of crude oil-Cottrell's Process-Removal of Sulphur Compounds-Fractional distillation- Fraction by distillation of crude-Important liquid fuels derived from Petroleum-Gasoline Oil-Kerosene Oil-Diesel Oil.

(12 Hours)

*\*self study portion*

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

### TEXT BOOKS

1. Arun Bahl and B.S.Bahl, (2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi,
2. Gurdeep. R. Chatwal,(2013) **Reaction Mechanism and Reagents in Organic Chemistry**, Himalaya Publishing House Delhi
3. M.K. Jain, S.C. Sharma, (2013) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi
4. R.D.Madhan- Modern Inorganic Chemistry, S.Chand and company, New Delhi.
5. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publication limited, New Delhi.

### REFERENCE BOOKS

1. M.G Arora, (2008) **Stereochemistry in Organic Compounds**, Anmol Publications Private Ltd New Delhi.
2. Jagdamba Singh and Yadav,(2009) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers.
3. I.L.Finar, (2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

**MAPPING (Physics)**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	M	M	M
<b>CO2</b>	S	H	M	H	M
<b>CO3</b>	S	M	M	M	M
<b>CO4</b>	S	H	H	H	H
<b>CO5</b>	S	H	H	M	S

S – Strong

H – High

M – Medium

L – Low

**MAPPING (Bio-Chemistry)**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	M	M	M
<b>CO2</b>	S	M	M	H	H
<b>CO3</b>	S	M	M	H	M
<b>CO4</b>	S	H	H	H	H
<b>CO5</b>	S	S	H	M	S

S – Strong

H – High

M – Medium

L – Low

**MAPPING (Botany)**

<b>PSO</b> <b>CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	M	M
<b>CO2</b>	S	H	M	H	H
<b>CO3</b>	S	M	H	H	M
<b>CO4</b>	S	H	H	H	H

S – Strong

H – High

M – Medium

L – Low

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**MAPPING (Bio – technology)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H
<b>CO5</b>	S	H	H	H	S

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

		<b>B.Sc., Bio Technology (I Year), Physics (II year), Botany (II Year), Bio-Chemistry (II Year)</b>	
<b>Title of the paper : ALLIED CHEMISTRY PAPER - II</b>			
Batch 2021 – 2022	Hours / Week 4	Total Hours 60	Credits 4

### Course Objectives

1. To know the fundamentals of Coordination compounds.
2. To learn about some natural products, amino acids and proteins.
3. To study about adsorption, solution and synthetic polymer.

### Course Outcomes (CO)

K1 – K5	CO1	Understanding the fundamental aspects and applications of coordination chemistry.
	CO2	Study on the various heterocyclic compounds, carbohydrates and amino acids which include their classification, preparation and properties.
	CO3	To gain knowledge about amino acids and vitamins.
	CO4	Know about the principles of adsorption and solution.
	CO5	Acquire the knowledge about synthetic polymers, fibers and plastics

### UNIT-I

#### Coordination compounds

Complexes (Mononuclear complexes only)

- (i) General aspects- central metal atom, Ligand- types of ligands. Coordination number of central metal atom, oxidation number of central metal atom – Nomenclature (IUPAC system)
- (ii) Theories of Complexes - Werner's theory, Sidgwick theory - EAN rule, Pauling's theory and its application to Potassium Hexacyanoferrate (II), Tetracarbon nickel (0).
- (iii) Chelation- Definition, examples. EDTA and its applications.
- (iv) Biological role of Hemoglobin and Chlorophyll (12 Hours)

#### UNIT-II Chemistry of Natural Products

1. Heterocyclic compounds – Nomenclature - Preparation - Properties and uses of Furan, Thiophene, Pyrrole and Pyridine. Comparison of the basicities of Pyrrole and Pyridine with amines.
2. Carbohydrates- Classification - Preparation and reactions of glucose and fructose - Interconversion of glucose to fructose and vice versa. (12 Hours)

### UNIT-III

#### Amino acids

1. \*Amino acids – Classification - Preparation - Gabriel Phthalimide synthesis, Strecker synthesis, Amination of  $\alpha$  - halo acid-properties.
2. Preparation of Peptides - Bergmann method.
3. Vitamins-Definition-Classification-Sources-Deficiency-Disease. (12 Hours)



#### UNIT-IV

**Adsorption:** Sorption- Adsorption- absorption- types of adsorption-physical adsorption-chemical adsorption-factors affecting adsorption-difference between physical and chemical adsorption-applications of adsorption

**Solution:** Avogadro number – mole concept – atomic weight, molecular weight, equivalent weight – primary and secondary standards - normality, molarity, molality, weight percentage, volume percentage, dilution from stock solutions-Simple problems.

(12 Hours)

#### UNIT-V

**Synthetic polymers** – Nomenclature, Types of polymers – Addition and condensation polymerization.

**Synthetic fibers** – *\*Important requirement of a fiber*, difference between natural and synthetic fiber, properties of synthetic fiber, Preparation of nylon 6 and nylon 6,6.

**Synthetic plastics** – Classification , thermosetting and thermoplastic plastics – differences, properties.

(12 Hours)

*\*self study portion*

#### Teaching Methods

Powerpoint presentation/Seminar/Quiz/Discussion/Assignment

#### TEXT BOOKS

1. Arun Bahl and B.S.Bahl,(2012) **Advanced Organic Chemistry**, S. Chand and Co., New Delhi,
2. M.K. Jain, S.C. Sharma, (2013) **Modern Organic Chemistry**, Vishal Publishing Co., Delhi,
3. R. Gopalan, P.S. Subramanian & K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand & Sons,
4. Arun Bahl and B.S.Bahl, Physical chemistry, S. Chand and Co., New Delhi,
5. Puri B. R. Sharma L. R., M. S. Pathania, (2013) Principles of Physical Chemistry, Vishal Publishing Co., New Delhi.

#### REFERENCE BOOKS

1. R. Gopalan and V. Ramalingam, Concise Coordination Chemistry, Vikas Publishing House Pvt..Ltd, New Delhi.
2. Jagdamba Singh and Yadav, (2009) **Organic Synthesis**, Vol. I and II. Pragathi and Prakasam Publishers, 1<sup>st</sup> Edition.
3. I.L.Finar,(2009) **Organic Chemistry**,Vol.I and II, Addison-Wesley Longman.

## MAPPING (Physics)

CO	PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1		S	H	M	H	M
CO2		S	S	H	H	H
CO3		S	H	M	H	M
CO4		S	H	H	M	H
CO5		S	H	H	M	H

S – Strong

H – High

M – Medium

L – Low

## MAPPING (Bio-Chemistry)

CO	PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1		S	H	M	H	M
CO2		S	M	H	M	H
CO3		S	H	H	H	M
CO4		S	H	H	M	M
CO5		S	H	H	H	M

S – Strong

H – High

M – Medium

L – Low

## MAPPING (Botany)

CO	PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1		S	M	M	H	H
CO2		S	S	H	M	H
CO3		H	H	H	H	M
CO4		S	H	H	M	H
CO5		S	H	H	H	M

S – Strong

H – High

M – Medium

L – Low

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**MAPPING (Bio – technology)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H
<b>CO5</b>	S	H	H	M	H

**S** – Strong

**H** – High

**M** – Medium

**L** – Low

<b>B.Sc., Bio Technology (I Year), Physics (II year), Botany (II Year), Bio-Chemistry (II Year)</b>			
<b>Title of the paper : ALLIED CHEMISTRY PRACTICAL – I VOLUMETRIC AND ORGANIC ANALYSIS</b>			
Batch 2021 – 2022	Hours / Week 3	Total Hours 90	Credits 2

### Course Objectives

1. To demonstrate the basic laboratory technique of titration.
2. To gain deep knowledge about analysis of organic substances.
3. To identify the functional groups of unknown compounds.

### Course Outcomes (CO)

K1 – K5	CO1	Remember the basics of volumetric titrations.
	CO2	Studying the use of indicators for various titrations.
	CO3	Understanding about preliminary analysis of organic compounds.
	CO4	Identification of the functional groups.
	CO5	Focuses on job opportunities on various chemistry and chemistry related sectors.

### Volumetric Analysis

1. Estimation of Sodium hydroxide using standard Sodium Carbonate Solution
2. Estimation of Hydrochloric acid-standard Oxalic acid
3. Estimation of Oxalic acid- Standard sulphuric acid.
4. Estimation of ferrous Sulphate –Standard Mohr salt solution.
5. Estimation of Oxalic acid- Standard ferrous Sulphate solution.
6. Estimation of Potassium permanganate- Standard sodium hydroxide solution

### Organic Analysis

1. Detection of elements (N, S, Halogens).
2. To distinguish between Aliphatic and Aromatic.
3. To distinguish between Saturated and unsaturated.
4. Functional group test for Phenol, acids, (mono and di), aromatic primary amine, amide (mono and di), dextrose.
5. Systematic analysis of Organic compounds containing one functional group and characterization by confirmatory tests.

### REFERENCE BOOKS

1. V. Venkateswaran, R. Veeraswamy, A.R. Kulandaivelu,(1997) **Basic Principles of Practical Chemistry**, New Delhi, Sultan Chand and Sons.
2. N. S. Gnanaprasam and G. Ramamoorthy, (2006) Organic Chemistry Lab manual, S. Viswanathan Private Limited, Chennai.

## UCH 100

Time – 3 Hours

Max. Marks: 30

### Distribution of Total Marks 30

Record	5
Volumetric	12
Organic Analysis	13

### Distribution of Volumetric – 12 Marks

Error up to 2%	12
3%	9
4%	5
>4%	2

- ❖ Reduce 1 mark for each arithmetic error
- ❖ For wrong or no calculation, reduce 25% of the marks awarded. (Here, the examiners have to do the calculation and then, have to award marks)

### Distribution of Organic Analysis - 13 Marks

Preliminary Tests	- 3
Aliphatic / Aromatic	- 2
Saturated / Unsaturated	- 2
Special elements	- 3
Functional group	- 3

**MAPPING (Physics)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H
<b>CO5</b>	S	H	H	H	M

S – Strong

H – High

M – Medium

L – Low

**MAPPING (Bio-Chemistry)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	M	H	M	H
<b>CO3</b>	S	H	H	H	M
<b>CO4</b>	S	H	H	M	M
<b>CO5</b>	S	H	H	M	S

S – Strong

H – High

M – Medium

L – Low

**MAPPING (Botany)**

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	M	M	H	H
<b>CO2</b>	S	S	H	M	H
<b>CO3</b>	H	H	H	H	M
<b>CO4</b>	S	H	H	M	H
<b>CO5</b>	S	H	H	H	M

S – Strong

H – High

M – Medium

L – Low

## UCH 102

### MAPPING (Bio – technology)

<b>PSO CO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>
<b>CO1</b>	S	H	M	H	M
<b>CO2</b>	S	S	H	H	H
<b>CO3</b>	S	H	M	H	M
<b>CO4</b>	S	H	H	M	H
<b>CO5</b>	S	H	S	S	M

**S** – Strong

**H** – High

**M** – Medium

**L** – Low