

## DEPARTMENT OF CHEMISTRY

### PREAMBLE

UG : Programme Profile and the Syllabi of Courses Offered in Semester V and VI Along with III And IV Evaluation Components (With Effect From 2018 – 2021 Batch onwards)

### PROGRAMME PROFILE B.Sc. (Chemistry)

#### Programme Specific Outcome (PSO)

Upon Completion of the Programme, the Students will be able to

- Development of the skills in handling various chemicals, apparatus and instruments.
- Application of the principles of thermodynamics and chemical kinetics in chemical reactions.
- Acquiring the knowledge on heterocyclic compounds and natural products.
- Ability to apply the basic principles of various spectroscopic, electro and thermo analytical methods to characterize the compounds.
- Industrial insights on polymers, textile dyes, fibre and Medicinal Chemistry.

Semester	Part	Category	Course Code	Course Title	Pervious Course Code	Contact Hrs/ Week	Min/Max	
I	I	Tamil/Hindi/French	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil-I/ Advanced Tamil-I/ Hindi-I/ French-I	UTAL103/ UTAL104	4	2/3	
	II	English	UENL107/ UENL108	General English-I/ Advanced English-I	-/ UENL106	5	3/4	
	III	Core I		UCHM104	Fundamentals of Chemistry	-	2	1
		Core II		UCHM105	General Chemistry –I	-	4	4
		Core III		UCHM106/UCHM107	Analytical Chemistry	-	4	4
		Core Practical I		UCHR204/UCHR205	Volumetric Analysis	-	3	-
		Allied I		UPHA102	Allied Physics - I	-	3	3
		Allied Practical I		UPHR103	Allied Physics Practical-I	-	3	2
	IV	Value Education					2	1
	<b>Total</b>						<b>30</b>	<b>20/22</b>
II	I	Tamil/Hindi/French	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil-II/ Advanced Tamil-II/ Hindi-II/ French-II	UTAL203/ UTAL204	4	2/3	
	II	English	UENL207/ UENL208	General English-II/ Advanced English-II	-/ UENL206	5	3/4	
	III	Core IV		UCHM202	General Chemistry –II	-	6	6
		Core Practical I		UCHR204/UCHR205	Volumetric Analysis	-	3	4
		Allied II		UPHA201	Allied Physics II	-	3	3
		Allied Practical I		UPHR202	Allied Physics Practical- II	-	3	2
	IV	NME				-	4	2
		Soft Skill				-	2	1
	V	Extension Programme/ Physical Education/NCC				-	-	1/2
	<b>Total</b>						<b>30</b>	<b>24/27</b>
III	I	Tamil/Hindi/French	UTAL305/ UTAL306/ UHIL301/ UFRL301	Basic Tamil-III/ Advanced Tamil-III/ Hindi-III/ French-III	UTAL303/ UTAL304	4	2/3	

	II	English	UENL307/ UENL308	General English-III/ Advanced English-III	-/ UENL306	5	3/4
	III	Core V	UCHM305	General Chemistry –III	UCHM303	5	5
		Core Practical II	UCHR404/UCHR405	Semi Micro Qualitative Inorganic Analysis	-	3	-
		Core VI	UCHM306	Separation & Purification Techniques	UCHM304	3	3
		Core VII		Online Course (NPTEL/ST)	-	3	1/2
		Allied	UMAA304	Algebra, Differential Calculus and Trigonometry	-	5	5
IV	Value Education				2	1	
<b>Total</b>						<b>30</b>	<b>20/23</b>
IV	I	Tamil/Hindi/French	UTAL405/ UTAL406/ UHIL401/ UFRL401	Basic Tamil- IV/Advanced Tamil-IV/ Hindi-IV/ French-IV	UTAL403/ UTAL404	4	2/3
	II	English	UENL407/ UENL408	General English/ Advanced English	-/ UENL406	5	3/4
	III	Core VIII	UCHM405	General Chemistry –IV	UCHM402 UCHM403	5	5
		Core Practical II	UCHR404/UCHR405	Semi Micro Qualitative Inorganic Analysis	-	3	4
		Core IX	UCHM406	Instrumental Method of Analysis	UCHM404	4	4
		Allied	UMAA406	Integral Calculus, Laplace Transform & Ordinary Differential Equation	-	5	5
		Core X Project/ paper	UCHP501/UCHM507	Project/Dairy and its Products	-	2	-
	IV	Soft Skill	USKS401			2	1
V	Extension Programme/ Physical Education/NCC				-	2	
<b>Total</b>						<b>30</b>	<b>24/28</b>
V	III	Core XI	UCHM508	Inorganic Chemistry – I	UCHM501 UCHM504	5	4
		Core XII	UCHM509	Organic Chemistry –I	UCHM502 UCHM505	6	5
		Core XIII	UCHM506	Physical Chemistry –I	UCHM503	5	4
		Core Practical III	UCHR501	Gravimetric Analysis	-	4	4
		Core Practical IV	UCHR605	Physical Chemistry Practical	-	4	-
		Core X Paper/ Project	UCHP501/ UCHM507	Project / Dairy and its Products	-	4	4/5
	IV	Value Education				2	1
<b>Total</b>						<b>30</b>	<b>22/23</b>
VI	III	Core XIV	UCHM611	Inorganic Chemistry II	UCHM601 UCHM607	4	4
		Core XV	UCHM612	Organic Chemistry II	UCHM602 UCHM608	4	4
		Core XVI	UCHM609	Physical Chemistry II	UCHM603	4	4
		Core XVII	UCHM613	Physical Chemistry III	UCHM610	4	4
		Major elective	UCHO602 UCHO603 UCHO604	Polymer Chemistry Medicinal Chemistry Forensic Chemistry	-	5	4

			UCHO605	Dyes and Textile fibre			
		Core Practical IV	UCHR605	Physical Chemistry Practical	-	3	4/4
		Core Practical V	UCHR606	Organic Analysis and Preparation	-	4	4
		Viva –Voce	UCHM605	Comprehensive Viva-Voce	-	-	1
	IV	Soft Skill	USKS601		-	2	1
	V	Extension Programme/ Physical Education			-	-	2
<b>Total</b>						<b>30</b>	<b>30/32</b>
<b>Grand Total</b>						<b>180</b>	<b>140/155</b>

## LIST OF COURSES OFFERED TO OTHER DEPARTMENTS ALLIED AND ALLIED OPTIONAL COURSES

Semester	Part	Category	Course Code	Course Title	Pervious Course Code	Contact hrs per week	Credits
							Min/Max
I	III	Allied- I	UCHA102	Chemistry – I		5	4
IV	III	Allied- I	UCHA402	Chemistry for Physics		3	3
I	III	Allied Practical-I	UCHR103	Volumetric & Organic Analysis	-	3	2
IV	III	Allied Practical-II	UCHR404	Volumetric Analysis		3	2
V	III	Allied Optional	UCHA502 UCHA504 UCHA505 UCHA506	Industrial Chemistry Dairy Chemistry Agricultural Chemistry Environmental Chemistry	-	5	4

## NON- MAJOR ELECTIVE COURSES

Semester	Part	Category	Course Code	Course Title	Pervious Course Code	Contact hrs per Week	Credits
							Min/Max
II	IV	Non major Elective	UCHE204	Food Chemistry	-	4	2

## EXTRA CREDIT EARNING PROVISION

Semester	Category	Course Code	Course Title	Pervious Course Code	Hrs per Week	Credits
						Min/Max
II	Core	UCHI201	Internship	-	-	1
IV	Core	UCHI401	Internship	-	-	1
VI	Core	UCHS601/ UCHP601	Green Chemistry (Self Study Paper) / Project	-	-	1/2

**EXPERIENTIAL LEARNING (MANDATORY/ONLY FOR INTERESTED STUDENTS)**

Related Paper	Work Experience		Proposed Period (Sem. Break/May/ Any Other)	Collaborating Agency	Mode of Evaluation
	Nature of the Course/Institution	Proposed Duration (No.of Days/Weeks/Months)			
UCHM509	Organic Farming	2 days	August	MSME	To Get Certificate

**SKILL ORIENTATION PROGRAMME (MANDATORY/ONLY FOR INTERESTED STUDENTS)**

Semester	Category	Course Code	Course Title	Collaborating Agency	Hours/Days /Month	Mode of Evaluation
V	Core	UCHT501	Industrial Lab Safety	TCIL	4 days	To Get Certificate

**INORGANIC CHEMISTRY – I  
UCHM508**

**Semester : V**

**Category : Core XI**

**Class Major : III-B.Sc. Chemistry**

**Credit : 4**

**Hours/Week: 5**

**Total Hours: 65**

**Objectives:**

**To Enable the Students**

- Learn the binary compounds.
- Understand organometallic compounds.
- Acquire the basic concept and theory of co-ordination chemistry and nuclear chemistry

**Learning Outcomes:**

**On Completion of the Course, the Student will be Able to**

- Understand the classification, preparation, properties and uses of binary and organometallic compounds
- Comprehend the theories, crystal defects and semi-conducting nature of metallic state substances.
- Acquires the basic concepts of nuclear chemistry, radioactivity and nuclear transformations.
- Applying the knowledge of gravimetric and precipitation techniques in the chemical industries.

**UNIT-I BINARY AND ORGANOMETALLIC COMPOUNDS**

**11 Hrs**

Binary compounds - Hydrides, borides and nitrides - Classification, preparation, properties and uses. Organometallic compounds of alkenes like ethylene & butadiene, alkynes like acetylene & diphenyl acetylene and cyclopentadiene.

**UNIT –II GRAVIMETRIC ANALYSIS**

**12 Hrs**

Principles of gravimetric analysis – Gravimetric factor – Calculations involved – conditions for precipitation – Theory of precipitation – Types of precipitants - Organic

precipitants & advantages – Purity of precipitates – Co-precipitation and post-precipitation – precipitation from homogeneous solution; crucibles – Types and maintenance – Washing of the precipitates – Drying and ignition of precipitates.

### **UNIT- III SOLID STATE**

**15 Hrs**

Packing of atoms (Bcc, Ccp and Hcp) - Theories of Bonding - Electron gas, Pauling and band theories. Structure of alloys - Interstitial solid solutions - Hume-Rothery rule - Crystal defects in Stoichiometric and non-Stoichiometric compounds. Semi-conductors - extrinsic and Intrinsic - N-Type and P-Type - Composition, structure and uses in electronic industry

### **UNIT- IV NUCLEAR CHEMISTRY**

**12 Hrs**

Introduction - Composition of nucleus and nuclear forces. Nuclear stability - n/p ratio - mass defect, binding energy, packing fraction and magic numbers - Nuclear shell and liquid drop models. Isotopes - Detection and separation - Isotopic constitution of elements - Whole number rule - Isobars, isotones and nuclear isomers.

### **UNIT -V RADIOACTIVITY AND NUCLEAR TRANSFORMATIONS**

**15 Hrs**

Radioactivity - Discovery, detection and measurement (Wilson Cloud Chamber) - radioactive emission - Disintegration theory - Modes of decay - Rate of disintegration - Half-life- Average life - Radioactive series. Nuclear transformations - Use of Projectiles - Nuclear Reactions - Fission and fusion - Nuclear reactor - Applications of radioisotopes - Carbon dating - Radioactive waste disposal.

### **Reference Books**

- Madan, R.D. (2008). *Modern Inorganic Chemistry*. (2<sup>nd</sup> ed.), S. Chand and Company Ltd. New Delhi.
- Satyaprakash. Tuli, G.D. Basu, S.K. and Madan, R.D. (2006). *Advanced Inorganic Chemistry* (Vol. I & II). S. Chand. New Delhi.

### **Text Books**

- Soni, P.L and Mohan Katyal. (2007) *Text Book of Inorganic Chemistry*. (20<sup>th</sup>ed.), Sultan Chand & Sons. New Delhi.
- Lee, J.D. (1991). *Concise Inorganic Chemistry*. (4<sup>th</sup>ed.), ELBS.

### **e-Resources**

- [http://dpuadweb.depauw.edu/harvey\\_web/eTextProject/pdfFiles/Chapter8.pdf](http://dpuadweb.depauw.edu/harvey_web/eTextProject/pdfFiles/Chapter8.pdf)
- [https://www.fys.ku.dk/~jjensen/Book/echap1\\_3.pdf](https://www.fys.ku.dk/~jjensen/Book/echap1_3.pdf)
- [https://preparatorychemistry.com/Bishop\\_Book\\_atoms\\_16.pdf](https://preparatorychemistry.com/Bishop_Book_atoms_16.pdf)
- <https://www.mcvts.net/cms/lib/NJ01911694/Centricity/Domain/136/chap24.pdf>
- [https://uomustansiriyah.edu.iq/media/lectures/6/6\\_2017\\_03\\_14!12\\_38\\_50\\_AM.pdf](https://uomustansiriyah.edu.iq/media/lectures/6/6_2017_03_14!12_38_50_AM.pdf)
- [https://shodhganga.inflibnet.ac.in/bitstream/10603/24695/2/02\\_chapter%201%20with%20references.pdf](https://shodhganga.inflibnet.ac.in/bitstream/10603/24695/2/02_chapter%201%20with%20references.pdf)

**ORGANIC CHEMISTRY – I**  
**UCHM509**

**Semester** : V  
**Category** : Core XII  
**Class Major** : III-B.Sc. Chemistry

**Credits** : 05  
**Hours/Week** : 06  
**Total Hours** : 78

**Objectives:**

**To Enable the Students**

- Understand reactions of alcohols and phenols
- Identify the organic compounds of nitrogen
- Classify the Carbohydrates
- Develop the Carbonyl compounds

**Learning Outcomes:**

**On Completion of the Course, the Student will be Able to**

- Acquires the knowledge of preparation, properties and applications of alcohols, phenols, thiols and ethers.
- Understands the knowledge of reaction mechanisms of nitro and carbonyl compounds.
- Classifies and elucidates the structure, properties and uses of carbohydrates.

**UNIT- I REACTION OF ALCOHOLS, PHENOLS & THIOLS** **15 Hrs**

**Alcohols:** Reactions with sodium - HX (Lucas test) – Esterification. Oxidation with PCC - Alkaline KMnO<sub>4</sub> - Acidic dichromate - Conc. HNO<sub>3</sub>. Oxidation of diols - Pinacol-pinacolone rearrangement.

**Phenols:** Preparation – Bimene hydroperoxide method - Diazonium salts. Reactions – Electrophilic substitution - Nitration, halogenations and sulphonation. Gattermann-Koch reaction, Houben - Hoesch condensation, Schotten Baumann reaction. Acidic character of phenol, Comparative strength of alcohol and phenol.

**Thiols:** Nomenclature - Methods of preparation, properties and uses. Thioethers – Nomenclature - Methods of preparation, properties and uses.

**UNIT- II NAME REACTIONS** **15 Hrs**

Mannich reaction, Birch reduction, Dakin reaction, Simmons - Smith reaction, Kolbe-schmitt reaction, Mukaiyama reaction, Hundiecker reaction, Chichibabin reaction, Nef reaction, Stephen reaction, Reimer-tiemann reaction, Wurtz reaction, Ullmann reaction, Norrish type cleavage.

**UNIT -III ORGANIC COMPOUNDS OF NITROGEN** **15 Hrs**

**Nitro Compounds:** Preparation of nitroalkanes and nitroarenes. Reduction of nitrobenzene under various conditions, nitro-acid nitro tautomerism.

**Amines (aliphatic and aromatic):** Classification, preparation from alkyl halides, Gabriel- Phthalimide synthesis, Hofmann bromamide reaction. Hofmann and Saytzeff Elimination, Carbylamine test, Hinsberg test, with NaNO<sub>2</sub>+HCl, Schotten-Baumann reaction, Electrophilic substitution in aniline: nitration, bromination and sulphonation.

**Diazonium salts:** preparation from aromatic amines. Conversion to Benzene, Phenol and Azodyes.

**UNIT- IV CARBONYL COMPOUNDS** **18 Hrs**

**Aldehydes and Ketones:** Structural significance of the carbonyl function and Nomenclature. Formaldehyde, acetaldehyde, acetone and benzaldehyde - Preparation from

acid chlorides & Nitriles. Reactions with HCN, ROH, NaHSO<sub>3</sub>, Amino derivatives. Iodoform test, Aldol condensation, Cannizzaro's Reaction, Wittig Reaction, Benzoin condensation, Clemmensen reduction, Wolff Kishner reduction and Meerwein-Ponndorf-Verley reduction.

**Carboxylic Acids & Their Derivatives:** Preparation of formic, Acetic and benzoic acids. Synthetic applications of diethyl malonate & Ethyl acetoacetate. Preparation of acid chlorides, Anhydrides, Esters and amides from acids and their inter-conversion. Comparative study of the Nucleophilicity of acyl derivatives. Reformatsky reaction, Perkin condensation and Hell-Volhard-Zelinsky reaction.

## UNIT –V CARBOHYDRATES

15 Hrs

Carbohydrates - Classification – Aldoses and ketoses, Reducing and non-reducing sugars - Reactions of glucose and fructose – Osazone formation, mutarotation and their mechanism - Structural elucidation of glucose and fructose – Pyranose and furanose forms – Haworth's method. Determination of ring size- Haworth projection formula - Configuration of glucose and fructose - Epimerization - Chain lengthening and chain shortening of aldoses - Inter conversion of aldoses and ketoses – uses of glucose. Disaccharides and polysaccharides - Reactions and structural elucidation of sucrose and maltose - Properties, structure and uses of starch and cellulose.

### Reference Books

- Morrison and Boyd, R.T. (2010). *Organic Chemistry* (VI ed.,). Prentice Hall of India. New Delhi.
- Ahluwalia, V.K & Rakesh Kumar Parashar. (2015). *Organic Reaction Mechanisms*. (IV ed.,). Narosa Publishing house.

### Text Books

- Soni, P.L. (2010). *Text Book of Organic Chemistry*. Sultan Chand.
- Bahl and Arun Bahl. (2014). *Advanced Organic Chemistry*. S. Chand.
- Peter Sykes. (2013). *A Guide Book to Mechanism in Organic Chemistry*. (VI ed.,)

### e-Resources

- <http://www.ncert.nic.in/ncerts/l/lech202.pdf>
- [https://www.angelo.edu/faculty/kboudrea/index\\_2353/Chapter\\_03\\_2SPP.pdf](https://www.angelo.edu/faculty/kboudrea/index_2353/Chapter_03_2SPP.pdf)
- [http://www.chtf.stuba.sk/~szolcsanyi/education/files/Organicka%20chemia%20II/Pre-dnaska%209\\_Sacharidy/Doplňkove%20studijne%20materialy/Carbohydrates\\_Boudreaux.pdf](http://www.chtf.stuba.sk/~szolcsanyi/education/files/Organicka%20chemia%20II/Pre-dnaska%209_Sacharidy/Doplňkove%20studijne%20materialy/Carbohydrates_Boudreaux.pdf)
- <https://authors.library.caltech.edu/25034/17/BPOCchapter16.pdf>
- <http://cms.gcg11.ac.in/attachments/article/105/NITRO%20COMPOUNDS.pdf>

**PHYSICAL CHEMISTRY-I**  
**UCHM506**

**Semester** : V  
**Category** : Core XIII  
**Class Major:** III-B.Sc. Chemistry

**Credits** : 4  
**Hours/Week** : 5  
**Total Hours** : 65

**Objectives:**

- To improve the ability of mathematical calculations involved in physical chemistry.
- To enable the students to understand the concepts of thermodynamics and apply it to more space physical and chemical system.
- To make the students know the concepts of chemical kinetics and to apply the concepts of kinetics to different processes.

**UNIT-I PARTIAL MOLAR PROPERTIES** **12 Hrs**

Chemical potential – Gibbs Duhem equation – Effect of temperature and pressure on chemical potential – Chemical potential in systems of ideal gases – Duhem margules equation.

**Homogeneous catalysis**-Definition- Function of a catalyst in terms of gibbs free energy of activation. Heterogeneous catalysis- Application of catalysis.

**UNIT-II PHASE RULE** **13 Hrs**

Concepts of phase, Components and degrees of freedom with examples. Gibb's Phase Rule-Derivation, Classius - Clapeyron equations and their applications to equilibria in Phase Transitions. (Solid– Liquid, Liquid – Vapour, Solid-Vapour)

**One Component System:** Phase diagram-Water and sulphur systems.

**Reduced Phase Rule:** Two component systems - Simple eutectic: Lead-Silver system - Formation of compound with Congruent melting point:  $\text{FeCl}_3$  -Water system , Other examples formation of compound with incongruent melting point: Na-K system

**UNIT-III ADSORPTION:** **10 Hrs**

Physisorption & chemisorption- Freundlich adsorption isotherm – Langmuir adsorption isotherm –Bet equation (no derivation) application of adsorption.

**Concept of fugacity & activity:** Determination of fugacity of a gas- Change of fugacity with temperature. Activity & activity coefficient- Determination of activities – variation of activity of a gas with temperature & pressure- Nernst distribution law – limitations- Thermodynamic derivation –Applications.

**UNIT-IV CHEMICAL KINETICS I** **15 Hrs**

**Order and molecularity of reactions:** Definition of rate, order rate law, rate constants, molecularity – Simple reactions involving zero, first, second and third order reactions derivations of rate equations for zero, first, second and third order reactions - pseudo first order reactions. Derivation of half life time – Change with examples. Methods to determine order of reactions. Problems based on order, Rate equations and  $T_{1/2}$ .

**Types of reactions:** Reversible or opposing, consecutive and parallel reactions (simple ideas only). Thermal chain reactions (i)  $\text{h}_2$  and  $\text{br}_2$  reaction (ii) Dissociation of acetaldehyde steps involved only (no kinetics expressions needed)



## UNIT-V CHEMICAL KINETICS II

15 Hrs

**Theories of chemical reaction rates:** Factors affecting chemical reactions – Nature of reactants concentration, Catalyst, Solvent polarity and ionic strength (only qualitative ideas), Arrhenius theory of chemical reaction rates collision theory of bimolecular and unimolecular reactions. Lindemann hypothesis, Transition state or absolute reaction rate theory (ARRT)

### Text Books:

- Puri Sharma Pathania.(2009). *Principles of Physical Chemistry*. Shoban Lal Nagin Chand & Co. Jalandhar.
- Soni, P. L. (2006). *Text Book of Physical Chemistry*. Sultan Chand.

### Reference Books:

- Negi and Anand. (2000). *Physical Chemistry*. New Age.
- Kundu and Jain. (1999). *Physical Chemistry*. S. Chand.

## GRAVIMETRIC ANALYSIS

UCHR501

(This Replaces the Course UCHR601 Gravimetric Analysis Found in Academic Council Booklet-II)

Semester :V

Credit : 4

Category : Core Practical III

Hours/Week : 4

Class Major: III-B.Sc. Chemistry

Total Hours : 52

### Objectives:

#### To Enable the Students

- Analyze the ions or metals present in the given substance by gravimetric method.
- Acquire quantitative skills to get accurate result.

### Experiments:

#### Part I : Gravimetric Estimation

1. Estimation of Sulphate as Barium sulphate.
2. Estimation of Barium as Barium sulphate.
3. Estimation of Barium as Barium chromate.
4. Estimation of Lead as Lead chromate.
5. Estimation of Calcium as Calcium oxalate monohydrate.
6. Estimation Zinc or Magnesium as oxinate.

#### Part-II

1. Physical constant (melting & boiling point)

### Text Books:

- Venkateswaran,V. Veerasawamy, R. & Kulandaivelu, A. R. (1998) *Basic Principles of Practical Chemistry*. S. Chand & Sons Publications.

### Reference Books:

- Vogel's. (1989). *Text book of Quantitative Chemical Analysis* (5<sup>th</sup> ed.), ELBS/ Longman. England.

- Thomas, A. O. (1999). *Practical Chemistry*. Scientific Book Center. Cannanore
- Sundaram, S. and Viswanthan, S. (1998). *Practical Chemistry*. (3 Volumes).

**PHYSICAL CHEMISTRY PRACTICAL**  
**UCHR605**

(This Replaces the Course UCHR501 Physical Chemistry Practical Found in Academic Council Booklet-II)

**Semester: V & VI**

**Credit : 4**

**Category: Core Practical- IV**

**Hours/Week: 4 + 4**

**Total Hours: 52+52**

**Objectives:**

**To Enable the Students**

- Acquire skills through the experimental techniques.
- Interpret the experimental results.

**1. Distribution law:**

- a) Determination partition coefficient of iodine between carbon tetra chloride and water.
- b) Equilibrium constant of the reaction  $KI + I_2 = KI_3$

**2. Kinetics:**

Determination of the orders of the following reactions.

- a) Acid catalysed hydrolysis of an ester (Methyl or Ethyl Acetate).

**3. Molecular Weight of Solute** – Rast method using Naphthalene, Meta Dinitrobenzene and Diphenyl as solvents.

**4. Heterogeneous Equilibria:**

Phenol – water system CST.

**5. A) Effect of Impurity** – 1 % NaCl or 2% Succinic acid solutions on phenol determination of the concentration of the given solution.

**B) Determination of the Transition Temperature of the Given Salt Hydrate.**  $Na_2S_2O_3 \cdot 5H_2O$ ,  $CH_3COONa \cdot H_2O$ ,  $SrCl_2 \cdot 6H_2O$ ,  $MnCl_2 \cdot 4H_2O$ .

**6. Electrochemistry: Conductivity**

- A) Determination of cell constant.
- B) Conductometric titration of a strong acid against a strong base.

**7. Potentiometric Titration**

- A) Strong acid against a strong base.

**8. Calorimetric Titration.**

**9. Polarimetric– inversion of sugar.**

**Text Books**

- Venkateswaran. V, Veerasawamy. R. & Kulandaivelu, A. R. (1998). *Basic Principles of Practical Chemistry*. S. Chand & Sons Publications.

**Reference Books**

- Vogel's. (1989). *Text Book of Quantitative Chemical Analysis*. (5<sup>th</sup>ed.), ELBS/ Longman. England.
- Thomas, O. (2000). *Practical Chemistry*. Scientific Book Center. Cannanore.
- Sundaram, S. (1999). *Practical Chemistry*. (3<sup>rd</sup>Vol).

# PROJECT

UCHP501

Semester : V  
Category : Project  
Class & Major: III-B.Sc., Chemistry

Credit :1

## Objectives:

### To Enable the Students

- Acquire the Research Knowledge About the Subject.
- Analyze the Experiments on their Own Knowledge.

### Mini-Project:

- This course will be offered as project for the final year ug students under extra credit earning provision to gifted students outside the class hours.
- It could be done either individual or as a group with the maximum of three students

## Evaluation Scheme for the Project (Internal-60 + External-40)

### Internal Assessment:

S. No	Component	Marks
1	Review of the Literature	10
2	Title of the Topic	
3	Experimental	10
4	Characterization	20
5	Result and Discussion	30
6.	Conclusions	60
Total		

### External Assessment:

1. Report : 10
  2. Presentation : 20
  3. Viva-Voce : 10
- Total : 40

## INORGANIC CHEMISTRY – II

UCHM611

Semester : VI  
Category : Core XIV

Credits : 4  
Hours/Week : 4  
Total Hours : 52

## Objectives:

### To Enable the Students

- Understand Biological Aspects of Metals.
- Classify Metallurgy of d-block Elements.
- Compare Lanthanides and Actinides.

### Learning Outcomes:

#### On Completion of the Course, the Student will be Able to

- Understands the fundamentals of subatomic particles, Nucleon theory, Orbital electron capture

- Acquires the basic knowledge, Isomerisation and applications of coordination compounds.
- Classifies and elucidates the structure, Preparation, Properties and applications of biological, carbonyl and nitrosyl compounds.

### **UNIT- I LANTHANIDES**

**12 Hrs**

General study involving electronic configuration, Oxidation state, Magnetic properties and complexation behaviour - Lanthanide contraction - Comparative study of lanthanides and actinides.

### **UNIT- II ACTINIDES**

**10 Hrs**

General study involving electronic configuration, Oxidation state, Magnetic properties and complexation behaviour - Actinide contraction - Comparative study of lanthanides and actinides.

### **UNIT- III COORDINATION CHEMISTRY**

**12 Hrs**

Types of ligands – Chelations & effects of chelation- Applications of complexes- IUPAC nomenclature-Theories of coordination compounds – Valence bond and its application crystal field theory – Splitting of d-orbitals on oh, td & square planar complexes – Cfse- calculation of cfse in oh & td complex. Stability of complexes - Factors affecting stability. unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes - Trans effect. Application of coordination compounds

### **UNIT- IV BIOINORGANIC CHEMISTRY**

**10 Hrs**

Biologically important coordination compounds - Chlorophyll, hemoglobin and vitamin b<sub>12</sub>- Structure and applications (elucidation not required). metal carbonyls - Mono and polynuclear carbonyls of ni, fe, cr, co and mn- synthesis, reaction, structure and uses. nitrosyl compounds -Classification, preparation and properties - Structure of nitrosyl chloride and sodium nitro prusside.

### **UNIT- V ACIDS AND BASES**

**08 Hrs**

Arrhenium concept - Lowry-Bronsted concept - Lux-flood concept - The solvent system concept - The Lewis concept - Hard & soft acids and bases - Pearson's concept - HSAB principle and its applications.

#### **Reference Books**

- Soni, P. L. and Mohan Katyal. (2007). *Text Book of Inorganic Chemistry*. (20<sup>th</sup> ed.), SultanChand & Sons. New Delhi.
- Lee, J. D. (1991). *Concise Inorganic Chemistry*. ELBS. (4<sup>th</sup> ed.,)

#### **Text Books**

- Madan, R.D. (2008). *Modern Inorganic Chemistry*. (2<sup>nd</sup> ed.), S. Chand and Company Ltd. New Delhi.
- Puri, B.R. Sharma, L.R. & Kalia. K.C. (2011-12). *Principles of Inorganic Chemistry*. (31<sup>st</sup> ed.,).

## e-Resources

- [https://chandand.weebly.com/uploads/9/2/2/7/92278224/\\_inorganic\\_chemistry\\_\\_a\\_textbook\\_series\\_\\_lawrance\\_g.a.introduction\\_to\\_coordination\\_chemistrywiley\\_\\_2010\\_.pdf](https://chandand.weebly.com/uploads/9/2/2/7/92278224/_inorganic_chemistry__a_textbook_series__lawrance_g.a.introduction_to_coordination_chemistrywiley__2010_.pdf)
- [https://fns.uniba.sk/fileadmin/prif/chem/kag/Bakalar/vch\\_noga/GEN\\_INORG\\_CHEM15.pdf](https://fns.uniba.sk/fileadmin/prif/chem/kag/Bakalar/vch_noga/GEN_INORG_CHEM15.pdf)
- <http://www.rbmcollege.ac.in/sites/default/files/files/reading%20material/hard-and-soft-acids-and-bases.pdf>
- <http://downloads.hindawi.com/journals/ijp/2001/107129.pdf>

## ORGANIC CHEMISTRY – II UCHM612

<b>Semester</b>	<b>: VI</b>	<b>Credit</b>	<b>: 04</b>
<b>Category</b>	<b>: Core XV</b>	<b>Hours/Week</b>	<b>: 04</b>
<b>Class &amp; Major</b>	<b>: III B.Sc. Chemistry</b>	<b>Total Hours</b>	<b>: 52</b>

### Objectives:

#### To Enable the Students

- Understand heterocyclic compounds
- Illustrate the Terpenoids and Alkaloids
- Analyze Aminoacids and Nucleic acids
- Categorize rearrangement reactions.

### Learning Outcomes:

#### On Completion of the Course, the Student will be Able to

- Acquires the knowledge of synthesis and aromaticity of hetero cycling compounds.
- Gains the knowledge of structural properties of the amino acids, peptides, proteins and nucleic acids.
- Understands the mechanism and reactions of molecular rearrangement.
- Justifies the isolation and structural determination of natural products and its classification.

## UNIT-I HETEROCYCLIC COMPOUNDS

12 Hrs

Molecular orbital and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with emphasis on the mechanism of electrophilic substitution reaction - Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed five and six-membered heterocyclic compounds. Preparation and reaction of indole, quinoline and isoquinoline with special reference to Bisler-Napieralski synthesis. reaction mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

## UNIT-II NATURAL PRODUCTS

10 Hrs

Occurrence of terpenoids and alkaloids. Terpenes - Definition - General properties – Isoprene rule – Structural elucidation of citral, Geraniol, A-Terpenol and Camphor. Alkaloids - Definition – General properties – Classification – Isolation – Structure determination of conine, piperine and nicotine.

### UNIT- III AMINOACIDS, PEPTIDES, PROTEINS AND NUCLEIC ACIDS 12 Hrs

**Aminoacids:** Classification, Structure and stereochemistry of amino acids, Isoelectric point of amino acids. Preparation and properties of amino acids - Tests for amino acids.

**Peptides:** Structure and nomenclature, Synthesis of polypeptides (General methods). Solid phase peptide synthesis. Structure determination of polypeptides- End group analysis.

**Proteins:** Classification of protein, Structure of protein (Determination of structure are not required). Protein de-naturation and re-naturation.

**Nucleic Acids:** Introduction, Constituents of nucleic acid, RNA and DNA, Types of RNA, Structure of DNA.

### UNIT-IV REAGENTS AND THEIR APPLICATIONS 08 Hrs

Reagents and their applications in organic chemistry – Anhydrous  $\text{AlCl}_3$ ,  $\text{P}_2\text{O}_5$ ,  $\text{H}_2/\text{Pd}-\text{BaSO}_4$ ,  $\text{Zn}/\text{Hg}-\text{HCl}$  and  $\text{Ag}_2\text{O}$ , Diazomethane, DDQ, DCC, LTA,  $\text{KMnO}_4$ ,  $\text{H}_2\text{O}_2$ ,  $\text{CrO}_3$ , MCPBA,  $\text{NaBH}_2$ .

### UNIT- V MOLECULAR REARRANGEMENT 10 Hrs

Classification – Types of skeletal rearrangements - Anionotropic and cationotropic, Inter molecular and intra molecular rearrangements - Mechanisms, Migratory aptitude, Inter or intra molecular of the following rearrangements: Hofmann rearrangement, Beckmann rearrangement, Benzil-Benzilic acid rearrangement, Baeyer-Villiger, Fries rearrangement, Claisen rearrangement, Benzidine rearrangement, Curtius rearrangement, Wagner-Meerwein rearrangement and Wolff rearrangement.

#### Reference Books

- Morrison and Boyd, R.T. (2010). *Organic Chemistry*. VI Edition – Prentice Hall of India. New Delhi.
- Ahluwalia and Rakesh Kumar Parashar, V.K. (2011). *Organic Reaction Mechanisms*. Narosa Publishing House.

#### Text Books

- Soni, P.L. (2010). *Text Book of Organic Chemistry*. Sultan Chand.
- Bahl and Arun Bahl (2014). *Advanced Organic Chemistry*. S. Chand.
- Gurdeep Chatwal. (2010). *Chemistry of Natural Products*. Himalaya Publishing House.
- Finar, I. L (Volume - I)(2010). *Natural Products in Stereo Chemistry*. (VI ed.,).

#### e-Resources

- <https://www.alchemyst.co.uk/pdf/Organic/rearrangements.pdf>
- <https://nptel.ac.in/content/storage2/courses/104101005/downloads/LectureNotes/chapter%2011.pdf>
- [https://application.wiley-vch.de/books/sample/3527317864\\_c01.pdf](https://application.wiley-vch.de/books/sample/3527317864_c01.pdf)
- <https://www.weizmann.ac.il/plants/aharoni/sites/plants.aharoni/files/uploads/june192007.pdf>
- [https://application.wiley-vch.de/books/sample/3527332014\\_c01.pdf](https://application.wiley-vch.de/books/sample/3527332014_c01.pdf)
- [http://www.chem.gla.ac.uk/staff/stephenc/teaching/HeterocycleLectures2011\\_2C12.pdf](http://www.chem.gla.ac.uk/staff/stephenc/teaching/HeterocycleLectures2011_2C12.pdf)

# PHYSICAL CHEMISTRY-II

## UCHM609

Semester : VI  
Category : Core XVI  
Class & Major: III-B.Sc. Chemistry

Credits : 4  
Hours/Week : 4  
Total Hours : 52

### Objectives:

#### To Enable the Students

- Acquire the knowledge about the essential concepts of physical chemistry
- Analyze the various photophysical and photochemical processes
- Evaluate the physical concepts of molecular spectroscopy in molecular interaction

### UNIT-I GROUP THEORY

12 Hrs

VSEPR theory - Symmetry operations and symmetry elements ( $E$ ,  $C_n$ ,  $\Sigma$ ,  $S_n$ ,  $I$ ) - Products of symmetry operations - Groups and properties of a groups - Classes and subgroups - Group multiplication table - Point groups.

### UNIT-II PHOTOCHEMISTRY

08 Hrs

Law of photochemistry, Jablonski diagram: Photophysical processes – Fluorescence and phosphorescence - Conditions for phosphorescence emission - Quantum yield – Determination of quantum yield. Kinetics of  $H_2-Cl_2$  and  $H_2-Br_2$  reactions - Basic concepts of photosensitization – Chemiluminescence and bioluminescence.

### UNIT- III ELECTRO CHEMISTRY-I

12 Hrs

Electrolytic conductance, Specific equivalent and molar conductance, Measurement – variation of conductance with dilution for strong and weak electrolytes, Kohlraush's law - Applications of conductivity measurements – Conductometric titrations - Ionic mobility- Transport number and its determination by Hittorff's and moving boundary methods - Debye-Huckel Onsager equation - Verification of Onsager equation, Wien effect and Debye-Falkenhagen effect.

### UNIT-IV ELECTRO CHEMISTRY-II

13 Hrs

Electrode potential: Standard electrode potentials, Reference electrodes–Primary and secondary reference electrode - Saturated calomel electrode – Importance of electrochemical series - Derivation of Nernst equation and its use in calculating EMF of cells - Relationship between EMF and (i) Free – energy changes (ii) Enthalpy changes (iii) Entropy changes - Liquid junction potential - Applications of EMF- Potentiometric titrations – Acid base and redox titrations.

### UNIT-V PHYSICAL PRINCIPLES OF MOLECULAR SPECTROSCOPY

7 Hrs

Doppler broadening - Line spectra and band spectra – Molecular spectra - Rotational spectra of diatomic molecules – Reduced mass – Relative intensities of rotational spectral lines - Vibrational spectra of diatomic molecules – Zero point energy – Electronic spectra: Franck-Condon principle – Electronic spectra of diatomic molecule.

### Text Books

- Puri, Sharma and Pathania. (2010). *Principles of Physical Chemistry*. Shoban Lal Nagin Chand & Co. Jalandhar.
- Soni, P.L. (2011). *Text Book of Physical Chemistry*. Sultan Chand.
- Colin, N. Banwell & Elaine M. McCash. (2012). *Fundamentals of Molecular Spectroscopy*. (4<sup>th</sup> ed.,) Tata McGraw Hill Education Pvt. Ltd.

### Reference Books

- Negi and Anand. (2010). *Physical Chemistry*. New Age International Publishers.
- Kundu and Jain. (2010). *Physical Chemistry*. S. Chand.

## PHYSICAL CHEMISTRY III UCHM613

<b>Semester</b>	<b>: VI</b>	<b>Credits</b>	<b>: 04</b>
<b>Category</b>	<b>: Core XVII</b>	<b>Hours/Week</b>	<b>: 04</b>
<b>Class &amp; Major:</b>	<b>III-B.Sc. Chemistry</b>	<b>Total Hour</b>	<b>: 52</b>

### Objectives:

#### To Enable the Students

- Understand the Absorption spectroscopy
- Compare the NMR and Mass spectroscopy
- Distinguish the energy and fuel cell

### Learning outcomes:

#### On completion of the course, the student will be able to

- Acquires the basic knowledge of Nanochemistry.
- Understands the fundamentals of basic spectroscopic techniques.
- Applies the knowledge to control the water pollution, environmental and energy management systems.

### UNIT -I UV VISIBLE-AND IR SPECTROSCOPY 12 Hrs

**UV-visible spectroscopy:** Woodward-Fieser rules - Types of electronic transitions - Effect of conjugation – Hydrogen bonding - Concepts of chromophore, auxochrome, bathochromic, hypsochromic, hyper chromic and hypochromic shifts.

**Infra-red spectroscopy:** Molecular vibrations, Hook's Law, Selection rules, Intensity and position of IR bands, Measurement of IR spectrum, Finger print region, Characteristic absorptions of various functional groups.

### UNIT- II NMR SPECTROSCOPY AND MASS SPECTROMETRY 12 Hrs

**Proton magnetic resonance (<sup>1</sup>H NMR) spectroscopy:** Magnetic and non-magnetic nuclei, Nuclear shielding and de-shielding, Chemical shift, Spin-spin splitting and coupling constants, Intensity of signals.

**Mass spectrometry:** Basic principle, Mass spectrum - Molecular ion peak – Base peak- Isotopic peak- Metastable peak- Nitrogen and ring rule - General fragmentation modes.

### UNIT- III BASICS OF NANO CHEMISTRY 08 Hrs

Definition, Length scales and importance of nanoscale and its technology – Classification of nanomaterials (0D, 1D and 2D) - Self-assembly of materials – Self-assembled nanostructures – Porous solids-Carbon and zeolites, nanowires, nanomachines and quantum dots.



## UNIT-IV ENERGY SYSTEMS

12 Hrs

**Batteries:** Primary and secondary batteries - Difference between primary and secondary batteries - Chemistry of primary batteries such as zinc-carbon and alkaline - Secondary batteries such as lead acid, nickel cadmium, metal hydrides, lithium ion, lithium phosphate - Advantages, disadvantages, limitations of primary and secondary batteries.

**Supercapacitor:** Definition of capacitor, Supercapacitor, Specific capacitance, Charge and energy density - Working principle of supercapacitor- Types of supercapacitor- Symmetric, asymmetric and hybrid supercapacitor - Applications and limitations of supercapacitor.

**Fuel Cell:** Definition, Working principle and components of fuel cell – General characteristics, EMF and types of fuel cells - Advantages, disadvantages and applications of fuel cells.

## UNIT- V APPLICATIONS OF SPECTROSCOPY

08 Hrs

**IR spectroscopy:** Identification of functional groups - Interpretation of the spectra of alcohols, aldehydes, ketones and esters (Aliphatic and aromatic).

**UV spectroscopy:** Identification of conjugated dienes, trienes, unsaturated carbonyl compounds and aromatic compounds.

**NMR spectroscopy:** Interpretation of  $^1\text{H}$  NMR spectra of ethyl bromide, ethanol and acetaldehyde.

**Mass spectroscopy:** Interpretation and fragmentation patterns of n-butane, 1-butanol and benzene, toluene - Mc-lafferty rearrangement of butanal and 2-pentanone.

### Text Books

- Gregor Hoogers. (2003). *Fuel Cell Technology Handbook*. CRC Press.
- David Linden. (1984). *Handbook of Batteries and Fuel Cell*. McGraw-Hill Book Company.
- Dudley H Williams and Ian Fleming. (1984). *Spectroscopic Methods in Organic Chemistry*. (IV ed.,). Tata McGraw-Hill Publishing Company Ltd. New Delhi.

### Reference Books

- Sharma, Y.R. (2013). *Elementary Organic Spectroscopy*. S. Chand & Company Ltd.
- Shanmugam, S. (2010). *Nanotechnology*. MJP Publishers. Chennai.
- Patrick Salomon. (2008). *A Handbook on Nanochemistry*. Dominant Publishers and Distributers. New Delhi.

### e-Resources

- [http://www.mssl.ucl.ac.uk/~gbr/workshop3/papers/Paerels\\_school\\_Mar17.pdf](http://www.mssl.ucl.ac.uk/~gbr/workshop3/papers/Paerels_school_Mar17.pdf)
- <https://www.lehigh.edu/~kjs0/carey-13.PDF>
- <https://www.svce.ac.in/departments/chemistry/CITM/CY6151%20Notes%20PDF/Unit%20V%20-%20Nanochemistry.pdf>
- <http://folk.ntnu.no/fredrol/Nanomaterials%20and%20Nanochemistry.pdf>
- [https://www.who.int/water\\_sanitation\\_health/resourcesquality/watpolcontrol.pdf](https://www.who.int/water_sanitation_health/resourcesquality/watpolcontrol.pdf)
- <https://www.intechopen.com/books/water-challenges-of-an-urbanizing-world/water-pollution-effects-prevention-and-climatic-impact>

# POLYMER CHEMISTRY

UCHO602

<b>Semester</b>	<b>: VI</b>	<b>Credit</b>	<b>: 4</b>
<b>Category</b>	<b>: Major Optional</b>	<b>Hours/Week</b>	<b>: 5</b>
<b>Class and Major:</b>	<b>III B.Sc. Chemistry</b>	<b>Total Hours</b>	<b>: 65</b>

## Objectives:

- To provide students with an overview of the structure and composition of Polymers, types of polymerization and a working knowledge of polymer nomenclature
- To introduce students to polymer processing techniques.
- To expose students to the applications of polymers in everyday life.

## UNIT-I INTRODUCTION TO POLYMERS 13 Hrs

Monomers, oligomers, polymers and their characteristics - Classification of polymers - Natural, synthetic, linear, cross linked and network, plastics, elastomers, fibres, homopolymers and co-polymers - Bonding in polymers - Primary and secondary bond forces in polymers - Cohesive energy and decomposition of polymers. Molecular mass of polymers,  $M_n$  and  $M_w$ .

## UNIT-II MECHANISM FOR POLYMERIZATION 11 Hrs

**Chain growth polymerization:** Cationic, anionic, free radical polymerization, stereo regular polymers - Ziegler Natta polymers. Step growth polymers

## UNIT-III TECHNIQUES OF POLYMERIZATION AND POLYMER DEGRADATION 11 Hrs

Bulk, solution, suspension, interfacial and gas phase polymerization. Types of polymer degradation, thermal degradation, mechanical degradation, photo degradation, photo stabilizers.

## UNIT-IV INDUSTRIAL POLYMERS 17 Hrs

Raw material, preparation, fiber forming polymers, elastomeric material. Thermoplastics - Polyethylene, polypropylene, polystyrene, polyacrylonitrile, poly vinyl chloride, poly tetra fluoro ethylene, nylon and polyester. Thermosetting plastics - Phenol formaldehyde and epoxide resin. Elastomers - Natural rubber and synthetic rubber - Buna-n, buna-s and neoprene. Conducting polymers - Elementary ideas – Examples - Poly sulphur nitriles, polyphenylene, polypyrrole and polyacetylene.

## UNIT-V INTRODUCTION TO POLYMER PROCESSING 13 Hrs

Compounding - Polymer additives - Fillers, plasticizers antioxidants and thermal stabilizers fire retardants and colorants. Processing techniques - Calendaring, die casting, compression moulding, injection moulding, blow moulding, extrusion moulding and reinforcing.

## Text Book:

- Gowariker, V.R. (1995). *Polymer Science*. Wiley Eastern.

**Reference Books:**

- Misra, G.S. (1996). *Introductory Polymer Chemistry*. New Age International (Pvt) Ltd.
- Kumar, A. & Gupta. S.K.(1978). *Fundamentals and Polymer Science & Engineering*. Tata McGraw-Hill.
- Billmeyer, F.N. (1971). *Textbook of Polymer Science*. Wiley Inter science.

**MEDICINAL CHEMISTRY**

UCHO603

**Semester : VI****Credits : 4****Category : Major Elective****Hours/Week: 5****Class & Major: III-B.Sc. Chemistry****Total Hours: 65****Objectives:****To Enable the Students**

- Understand the essential concepts of Medicinal chemistry
- Categorize various drug candidates and its mechanism of action
- Design and synthesize drug molecules by appropriate chemical moieties

**UNIT-I INTRODUCTION****16 Hrs**

Important terminology used in medicinal chemistry - Mechanism of action of drugs - Metabolism of drug. Naming of drugs - Assay in general. Drug and their mode of action - Causes of common disease and their treatment by drugs – Encapsulation. Indian medicinal plants - Traditional practice. Testing of potential drugs using experimental animals - Clinical trial and wide spread use after the approval – Side effects.

**UNIT-II ANTIBIOTICS****15 Hrs**

Synthesis, assay and uses of chloramphenicol, streptomycin and penicillin. Structural features – SAR – Functional group responsible for drug action – Structural modification that enhance and retard the potency (for the above drugs). Action of drug - Drug action and physiochemical properties, hydrophobicity, electronic effect, steric effect.

**UNIT-III ANTIPYRETICS AND ANALGESICS****10 Hrs**

Classification - Action of analgesics - Narcotics analgesics – Morphine and its derivatives with reference to SAR - Synthetic analgesics – Pethidines and methadones. - Antipyretic analgesics – Salicylic acid derivatives, indolyl derivatives and p-amino phenol derivatives – Mechanism of action.

**UNIT-IV NARCOTICS AND NON NARCOTICS****13 Hrs**

Tranquilizers - Sedatives - Psychedelic drugs (LSD), Antineoplastic and hypoglycemic drugs – Diabetics - Cause and control - Organic pharmaceutical aids and their role as preservatives, antioxidants, colouring, flavouring and sweetening agents, emulsifying agents - Stabilizing and suspending agents – Ointment bases.

## UNIT-V SYNTHESIS OF DRUGS AND CHEMICAL USES

11 Hrs

Procaine hydrochloride, meprobamate, oxy-phenbutazone, hydralazine hydrochloride, methyl dopa, propranolol hydrochloride, iso propamide iodide, chloropheniramine maleate, indomethacin and ibuprofen.

### Text books

- Sudha, P.N. (1998). *Applied Chemistry*. Supra Associates Vellore.
- Jayashree Ghosh. (1999). *Fundamental Concepts of Applied Chemistry*. S.Chand Publications.

### Reference books

- Billmeyer, F. (2002). *Textbook of Polymer Science*. New Age international.

## FORENSIC CHEMISTRY

UCHO604

Semester : VI

Credit : 4

Category : Major Elective

Hours/Week : 5

Class&Major : III-UG

Total Hours : 65

### Objectives:

#### To enable the students

- Identify the food contamination and food poisons
- Examine suitable method for detecting the crime, forgery and medical aspects

## UNIT- I FOOD ADULTERATION

15 Hrs

Contamination of wheat, rice, dhal, milk, butter - With clay, sand, stone, water and toxic chemicals (e.g. kasseri dhal with mentanil yellow). Food poisons - Natural poisons (alkaloids, nephrotoxins), pesticides (DDT, BHC, follidol), chemical poisons (KCN). First aid and antidotes for poisoned persons. Heavy metal (Hg, Pb, Cd) contamination of sea food. Use of neutron activation analysis in detecting poisoning (e.g., as in human hair).

## UNIT –II TRANSPORTATION

10 Hrs

Drunken driving - Breath analyzer for ethanol. Incendiary and timed bombs in road and railway tracks. Defusing live bombs. Hit and go traffic accidents - Paint analysis by AAS. Soil of toxic and corrosive chemicals (e.g., conc.acids) from tankers.

## UNIT- III CRIME DETECTION

15 Hrs

Accidental explosions during manufacture of matches and fire-works (as in sivakasi). Human bombs, possible explosives (gelatin sticks, rdx). Metal detector devices and other security measures for VVIP. Composition of bullets and detection of powder burns. Scene of crime: finger prints and their matching using computer records. Smell tracks and police dogs. Analysis of blood and other body fluids in rape cases. typing of blood. dna fingerprinting for tissue identification in dismembered bodies. Blood stains on clothing. cranial analysis (head and teeth).

#### **UNIT-IV FORGERY AND COUNTER FEITING**

**13 Hrs**

Detecting forgery in bank cheques/drafts and educational records (mark lists, certificates), using UV-light. Alloy analysis using AAS to detect counterfeit coins. Checking silver line water mark in currency notes. Jewelers- detection of gold purity in 22 carat ornaments, detecting gold plated jewels, authenticity of diamonds (natural, synthetic, glassy).

#### **UNIT-VMEDICAL ASPECTS**

**12 Hrs**

Misuse of scheduled drugs. Burns and their treatment by plastic surgery. Metabolite analysis, using mass spectrum – Gas chromatography. Detecting steroid consumption among athletes and race horses.

#### **Text Books**

- Richard Safestein. and Criminalistics. (2014). *An Introduction to Forensic Science (College Version)*. Pearson Pentice Hall.
- James, S. H. and Jon J Noard. (2009). *Forensic Science: An Introduction to Scientific and Investigative Techniques*. CRC Press.

#### **Reference Books**

- Ngaire E. Genge.(2008). *The Forensic Casebook. The Science of Crime Scene Investigation*. Ebury Digital.

### **DYES AND TEXTILE FIBER**

**UCHO605**

**Semester : VI**

**Credits : 4**

**Category : Major Elective**

**Hours/Week: 5**

**Class & Major: III-UG**

**Total Hours: 65**

#### **Objectives:**

##### **To Enable the Students**

- Understand the various dye molecules and its properties
- Categorize the preparation and properties of fibers, polymers, dyes and its applications

#### **UNIT – I DYES AND DYE INTERMEDIATES**

**10 Hrs**

Classification of dyes (based on their use and on their structures) – Classes of dyes for dyeing on different fabrics (natural and manmade). Important dyestuff intermediates – Their names and structures. General properties of dye stuff – Linearity, coplanarity, fastness properties, fluorescene, optical brighteners.

#### **UNIT – II FIBER SCIENCE**

**15 Hrs**

Fiber classification – Properties (count, denier, tex, staple length, spinning properties, strength, elasticity and creep) natural fibres – Cotton, wool, silk – General characteristics. Synthetic fibres – Polyamide fibre (nylon 66 – preparation nylon degradation) – Polyester fibre (preparation, degradation) – Polyacrylonitrile fibre (preparation, properties) – Viscose (preparation and properties). Identification tests for cellulose, cotton, wool, silk, rayon, acrylic, viscose, polyamide and polyester fibres.

**UNIT – III DYE APPLICATIONS-I PRE TREATMENTS****15 Hrs**

Sizing and desizing – Purpose – Desizing methods (hydrolytic and enzymatic). Scouring – Purpose – Kier boiling – Alkali scouring – Acid scouring – Principles involved in these methods. Bleaching – Methods (hypochlorite, peroxide and bleaching powder bleaching).

**UNIT – IV DYE APPLICATIONS- II PRINCIPLES OF DYEING****15 Hrs**

Dye bath preparation – M.L.ratio – Fixation of dye and additive concentration on the basis of weight of the material – Methods of expressing the concentrations in dye bath (GPL). dyeing assistants – Wetting agent (TR oil – Preparation and purpose) – Anionic and non-ionic detergents (examples, functions) - Leveling agents (examples, functions) – Fasters improvers (example functions) – Dispersing agents (examples, functions) – Exhausting agents (examples, functions) – Mordants – Ingrain. Dye bath recipe model (Dyeing of cotton with reactive dyes, sulfur dyes, aboicdyes – Dyeing of polyester with disperse dyes with and without carriers, dyeing of silk with metal - Complex dyes).

**UNIT – V DYE APPLICATIONS – II****10Hrs**

Vat dyeing – classification of vat dyes – Vatting – Dyeing procedure – Exhaustion in vat dyeing – Oxidation. Reactive dyeing – Hot and cold brand – Principles involved in the dyeing process – Batch and continuous processes. Dyeing of polyester and blends – Function of dispersing agents – Fiber swelling – Carrier dyeing – High temperature dyeing – Selection of dye stuff.

**Text Books**

- Shenai, V.A. (1984). *An Introduction to Dye Stuff and intermediates*. Sevak Publications. Wadela. Bombay.
- Abrahard, E.N. (1989). *Outlines of Chemistry of Dye Staff and Intermediates*. Chemical Publishing. New York.

**Reference Book**

- Chatwal and Anan. (2009). *Synthetic Organic Dyes*. Himalaya Publishing House.

**ORGANIC ANALYSIS AND PREPARATION****UCHR606**

(This Replaces the Course UCHR602 Organic Analysis Found in Academic Council Booklet-II)

**Semester: VI****Credit :4****Category: Core Practical - V****Hours/Week : 4****Total Hours : 52****Objectives:**

To Enable the Students

- Analyze the special element and functional group present in the given organic compound.
- Acquire skill to prepare the organic compound.

**I) Organic preparations:**

1. Oxidation (Benzaldehyde to benzoic acid).

2. Hydrolysis (Methyl salicylate or Ethyl benzoate to the acid).
3. Nitration (meta-Dinitrobenzene or picric acid).
4. Halogenation (para-Bromoacetanilide from acetanilide).
5. Diazotisation (Methyl orange).
6. Acylation (Benzoylation of betanaphthol).

## II) Micro level organic analysis:

### Reaction of the following functional groups:

Aldehyde, Ketone, Carboxylic Acid (Mono and Di), Ester, Carbohydrate (Reducing), Phenol, Aromatic primary amine, Amide, Nitro compounds and anilide. Analysis of organic compound containing one functional group and characterization with a derivative.

### Text Books

- Venkateswaran. V, Veeraswamy. R. & Kulandaivelu, A. R. (1998). *Basic Principles of Practical Chemistry*. S. Chand & Sons Publications.

### Reference Books

- Thomas, A. O. (1999). *Practical Chemistry*. Scientific Book Center. Cannanore.
- Sundaram, S.(1998). *Practical Chemistry*.(3<sup>rd</sup>Vol).
- Vogel's. (1998) *Text Book of Practical Organic Chemistry*. Longman.

## GREEN CHEMISTRY UCHS601

<b>Semester</b>	: VI	<b>Credit</b>	: 1
<b>Category</b>	: Self Study	<b>Hours/ week</b>	: 2
<b>Class &amp; Major</b>	: III B.Sc. Chemistry	<b>Total Hours</b>	: 26

### Objectives:

#### To Enable the Students

- Trace the Principles of Green Chemistry and its Development
- Evaluate the Green Synthetic Routes for Solvent Free Reactions

### UNIT-I INTRODUCTION

**10 Hrs**

Definition - The current status of chemistry and the environment - Evolution of the environmental movement - The role of chemists and goals - Prevent waste - Synthetic methods to design - Awareness of toxicity and their chemical products.

### UNIT –II EXAMPLES OF GREEN CHEMISTRY

**08 Hrs**

Green reactions - Green reagents - Green solvents and reaction conditions - Green chemical products.

### UNIT – III FUTURE TRENDS IN GREEN CHEMISTRY

**08 Hrs**

Oxidation reagents and catalysts – Biomimetic - Multifunctional reagents- Combinatorial green chemistry - Current pollution problems - Energy focus.

### Text Book

- Dr. Kidwai (1997). *Green Chemistry Theory & Practice*. Boston, December.

### Reference Books

- Collins ,T.J. (1996). *Green Chemistry* in Mac Millan Encyclopedia of Chemistry, MacMillan Inc. New York.
- Anastas, P.T. and Williamson. T.C. (1996). *Green Chemistry*. Oxford Univ. Press.
- Breslow, R. (1998). *Chemistry Today and Tomorrow*. American Chemical Society, Washington. DC.

### III and IV EVALUATION COMPONENT OF CIA

Semester	Course Code	Course Title	Component-III	Component-IV
V	UCHM508	Inorganic Chemistry I	Assignment	Seminar
V	UCHM509	Organic Chemistry I	Reaction Writing (Chemdraw)	Seminar
V	UCHM506	Physical Chemistry I	Problem Solving	Seminar
VI	UCHM611	Inorganic Chemistry II	Poster	Seminar
VI	UCHM612	Organic Chemistry II	Mechanism Writing	Seminar
VI	UCHM609	Physical Chemistry II	Problem Solving	Seminar
VI	UCHM613	Physical Chemistry III	Assignment	Seminar
VI	UCHO602 UCHO603 UCHO604 UCHO605	Polymer Chemistry Medicinal Chemistry Forensic Chemistry Dyes and Textile Fiber	Assignment	Seminar



## PROGRAMME PROFILE M.Phil (Chemistry)

(With Effect From 2020-2021 Batch Onwards)

Semester	Category	Course Code	Course Title	Hrs per Week	Credit
I	Core I	MCHM105	Research Methodology	6	5
	Core II	MCHM106	Instrumental Methods of Analysis	6	5
	Core III	MCHM107	Special Area of Study	-	5
	Core IV	MRPE101	Research and Publication Ethics (RPE)	-	2
II	Core V	MCHD201	Dissertation & Viva voce	-	13
<b>Total</b>					<b>30</b>
<ul style="list-style-type: none"><li>▪ Paper Presentation (Minimum One) &amp;</li><li>▪ Publication of Articles in Journals (Minimum One) are Mandatory for Submission of Dissertation.</li></ul>					

### III & IV EVALUATION COMPONENTS OF CIA

Semester	Course Code	Course Title	Component III	Component IV
I	MRPE101	Research and Publication Ethics (RPE)	Assignment	Tutorials